



Report on Occupational Safety and Health in Liberia's Agriculture Sector

ACTIONS TO REDUCE CHILD LABOR (ARCH) RESEARCH STUDY



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The findings on occupational safety and health conditions in Liberia's agriculture sector presented in this report are based on a rapid assessment conducted in Margibi, Montserrado and Nimba Counties in June and July 2015.

The rapid assessment research team included Katharine A Coon, Ph.D., Dr. Roland Massaquoi, Ph.D. and Sylvester Arnolfo. The Liberian ARCH program staff provided invaluable support to this research on all levels. Special thanks are given to James Yekeh, Linus Weh and Mulbah Yorgbor and the communities and individuals that shared their stories.

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Executive Summary

Study background

In 2013, the United States Department of Labor (USDOL) funded the Action to Reduce Child Labor (ARCH) program, which operates in three counties in Liberia's rubber belt and collected data on child labor in agriculture through its baseline survey. Results indicated that the use of child labor in agriculture is still widely practiced in Liberia and is perpetuated by poverty and food insecurity. The baseline survey documented high frequencies of child labor in smallholder rubber, charcoal, sugarcane, palm oil, and crop farming, yet little was known about labor conditions in these value chains, which function outside of the large plantations operated by international companies and national elites.

A study on Occupational Safety and Health in Liberia's Agriculture Sector (OSH-LAS) was funded by the USDOL to address the knowledge gap regarding labor conditions in the aforementioned five value chains. The study included a literature review and rapid assessment field study conducted in June and July of 2015. The field study described labor conditions and occupational safety and health (OSH) hazards in five value chains: rubber grown by Liberian farmers, upland and swamp rice, charcoal, oil palm, and cane alcohol (cane juice) made from sugar cane.

Study methods and location

Qualitative methods were used for the rapid assessment field study. These included stakeholder meetings with county leaders (N=38); town hall discussions with citizens of ten rural communities (N=516); separate male and female focus group discussions (N=55); and one-on-one life history and expert interviews (N=25). Informants were purposively selected to ensure inclusion of people active in all five study value chains, as well as male and female youth and youth leaders. Field work was conducted in Kakata and Ganta cities, Saclepea town, and ten rural communities in Margibi, Montserrado and Nimba counties.

Background on Liberia's agricultural labor force

Agriculture is the largest sector in Liberia in terms of employment and the dominant livelihood in rural communities, where 78% list agriculture, forestry or fishing as their primary occupation. The productivity of Liberia's agricultural workers is low because of obsolete planting materials and lack of modern inputs, use of manual labor for most tasks, and low levels of functional literacy. Only 41.6% of rural dwellers can read or write a simple sentence in any language, whereas 71.9% of urban dwellers are able to do this. The vast majority of Liberian agricultural workers are in informal and vulnerable employment, working for themselves, as unpaid family labor, or for others without formal contracts. Typically, most rural Liberians cobble together livelihoods by working in several value chains at different times during the year.

Summary of main findings on OSH hazards in Liberia's agriculture sector

To start with, the OSH-LAS study investigated the already existing context and knowledge surrounding OSH hazards in Liberia's agriculture sector. The study found that rural Liberians, the majority of whom are farmers, are in fact aware of the injuries caused by each type of agricultural task and in each value chain node, and they know that the consequences of being injured can be dire for themselves and for their families who depend on their labor. However, there has been an absence of adoption of agricultural innovations, particularly improved OSH practices.

In addition, there are some risky behaviors followed that are both widespread and habitual and due to the cultural context, have not been observed to contribute to the prevalence of OSH issues. For example, drinking cane juice alcohol while working is common, encouraged by the belief that drinking leads people to be more active and stronger in their work. Informal estimates by OSH-LAS study participants suggest that 60% - 80% of all basic agriculture and value chain related injuries occur when people are intoxicated. Sleep deprivation, hunger, worry, and depression also commonly affect people and increase their risk of injury during agricultural work.

Consequently, the OSH-LAS study found that minor injuries, major traumatic injuries and illnesses that disable people for months, and death resulting from injuries sustained while working in agriculture are all very common occurrences with serious economic and psychosocial costs due to lost labor productivity, lost income, and lost capacity to care for children. The burden of agricultural injuries is not limited to the time that an accident occurs or to the time it takes for an injury to heal superficially. For many Liberians, the burden continues as chronic pain for the rest of their lives. In such instances, children within families where parents suffer from injuries and chronic pain are often required to assume a major role in the family's farming activities to help provide food for their families. The study observed that families with members who are injured, experience a higher rate of poverty, exacerbated by severe hunger, and low social status within their communities.

One of the most striking findings of the OSH-LAS study is the extent to which labor conditions in Liberia's non-concession agriculture sector have been ignored by researchers, donors, and others concerned with improving agricultural productivity, economic growth, and youth employment. There are no widely available programs in Liberia, either traditional or modern, to sensitize and train people about safety in agriculture work.

Rural Liberians use "Personal Protective Equipment" (PPE), including rubber boots, eye goggles, gloves, long pants, and long-sleeved shirts that are widely available in markets, to protect themselves while working. However, PPE is a personal choice that requires a cash investment,

and because people often lack cash or have to prioritize spending on basic food security or medicine, many people work without PPE or any other protection.

Rural Liberians who are injured during the course of their work go to traditional bone setters and herbalists, western clinics and hospitals, and itinerant traders called “black baggers” who move from market to market selling a wide assortment of western and indigenous medicines. The choice of which modality to use when injured appears to be based on a combination of factors, including convenience, cost, type of injury and who in the area has a reputation as the best healer.

Summary of common OSH hazards by agricultural task and value chain

OSH hazards fall into two broad categories: those associated with basic agricultural tasks across all value chains; and those that are unique to specific value chains.

Hazards associated with basic agricultural tasks: Liberian farming systems are based on frequent rotation of land under cultivation and so entail regular clearing and cleaning of forest, brush, and swamps for farms. Established tree crop farms also should be maintained by regular clearing of growth under trees, called “brushing.” Hazards associated with these and other basic agricultural tasks are summarized in the following table.

<i>Hazards cross-cutting all basic agricultural activities</i>		
<ul style="list-style-type: none"> • open defecation in bush while working; lack of potable water in bush while working • drinking “bush” water from open streams or shallow pits dug into ground • blade injuries and puncture wounds from machetes, cutlasses, axes, tapping knives, sharp stumps, and sharp trash • snake and insect bites • alcohol intoxication while engaged in dangerous work 		
<i>Hazards associated with different basic agricultural tasks</i>		
clearing land, hauling logs, fencing, brushing	preparing land for planting, planting, weeding	pest control, harvesting
<ul style="list-style-type: none"> • Being crushed / killed by falling trees and rolling logs • Being trapped in fires used to burn brush after clearing • Skeletal problems from head-carrying heavy logs • Possible herbicide exposure 	<ul style="list-style-type: none"> • Skeletal problems from bending over all day • Swamp farms – heightened exposure to water-borne diseases, parasites, pollution • Swamp farms – heightened risk of respiratory problems • Possible herbicide exposure 	<ul style="list-style-type: none"> • Injuries from rocks shot out of slings to scare birds • Loss of fingers in rodent traps • Health issues resulting from eating diseased plants or improper use of pesticide. • Possible pesticide exposure • Skeletal problems from head-carrying heavy loads from

		fields <ul style="list-style-type: none"> • Collapse of inadequate crop storage structures.
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Hazards associated with the rubber value chain: Rubber, grown on semi-subsistence smallholder farms and medium-sized commercial farms, is the most important cash crop in Liberia, with up to half of all agricultural workers estimated to be involved in this value chain. Both males and females of all ages work on rubber. The chemicals used to process rubber are dangerous, unregulated, and widely available. There are no rubber training programs, licensing systems or standards to ensure the safety of informal sector rubber workers. Common hazards include acid burns; blindness and lung problems from exposure to acid fumes; blindness from tree bark falling in eyes; blade injuries from tapping knives; puncture wounds, sprains, and snake and insect bites; respiratory problems from working in damp conditions; risk of being robbed while tapping rubber; and risks to children from acid that is not properly stored in homes.

Hazards associated with the rice value chain: Rice is Liberia's most important staple, with annual per capita consumption of 120 kilograms. Although most of the rice sold in Liberian markets is imported, almost three fourths of *all* rural households still grow it using manual labor, mainly for their own consumption. There are two rice production systems in Liberia: (i) upland rice based on shifting cultivation of hilly slopes and (ii) swamp rice cultivated in wet bottomland valleys. Sixty percent of all rice growing households grow only upland rice, 20% grow only swamp rice, and 20% grow both. It takes 10 months to produce a rice crop, and because of both the high percentage of households growing it and the length of its production season, more Liberians may be exposed to OSH hazards through rice than through any other value chain. The hazards associated with rice are described in the table on basic agricultural tasks on the previous page. In particular, rice is associated with high frequencies of debilitating blade and puncture wounds and with diseases that include tetanus, schistosomiasis, and bilharzia. The main burden of injury and disease from rice may fall on women, since they provide most of the day-to-day labor over its long production season. The OSH burden carried by women as a result of manual rice production may have significant negative impacts on household food security and on children's wellbeing, due to women's key roles in both these areas. This requires further research, especially given donor and Government of Liberia (GOL) programs that prioritize the rice sector.

Hazards associated with the charcoal value chain: 99% of Liberians depend on biomass fuel for cooking, and charcoal is the preferred fuel in urban areas. Exploding urban demand for charcoal is having profound impacts on rural communities, where its production attracts ex-combatants, widows, and landless families. Since charcoal is often produced by family units,

children of charcoal producers are highly vulnerable. Charcoal burning emits toxic gasses which may result in long-term cognitive damage to children, and children of charcoal producers are likely to miss a large number of school days. Hazards associated with charcoal production include: cuts and lacerations from stacking ovens; death from falling into burning ovens; burns from sparks, cinders, and heated ground; inhalation of soot, carbon monoxide, and other toxic gasses; eye damage from heat and steam; sleep deprivation; dehydration and flu-like symptoms; increased risk of malaria from sleeping outside; and risk of being robbed in bush.

Hazards associated the cane alcohol (cane juice) value chain: Liberians have grown sugar cane to distill into alcohol for centuries. Today it is widespread as a cash crop for both male and female semi-subsistence farmers. Sugar cane growers use mechanical mills to extract juice, and both mill owners and farmers distill fresh juice into alcohol using simple equipment comprised of narrow necked metal boiling jugs and copper tubing. OSH hazards associated with cane juice production are linked to the milling and distilling stages of the value chain. Young males, including both adolescents (aged 13-19) and youth (aged 19-35 in the Liberian context) and commonly known as “mill boys”, are hired by mill owners (without formal contracts) to operate the mills, which are typically run without safety guards. Mill boys work long hours and consume alcohol, which is part of the culture around mills. The combination of alcohol consumption and lack of safety measures has resulted in a cadre of disabled male youth who have lost limbs in milling accidents. Serious injuries are also caused when faulty distilling equipment explodes. There are no safety standards to protect the youth operating the cane mills. Nor are there standards regulating the quality or proof of the alcohol produced, so in addition to accidents from unsafe equipment, death from alcohol poisoning is not uncommon.

Hazards associated the oil palm value chain: Farmers throughout Liberia grow hybrid oil palm and harvest wild trees, with about half of the country's total production of crude palm oil coming from wild groves. In 2008 - 2009 the government of Liberia began signing new concession contracts for oil palm plantations with international companies such as Golden VerOleum and Sime Darby. Over the next decade these and other companies are slated to develop hundreds of thousands of hectares of trees, along with processing and export facilities. International investments are expected to stimulate expansion of the local palm oil value chain in Liberia, so there is likely to be strong demand for agricultural workers who are skilled in all stages of oil palm production, harvesting, handling, and processing. Hazards associated with developing new farms are the same as for all basic agricultural tasks. Value chain hazards are linked to harvesting performed by males of a wide age range and starting in adolescence, who climb 10 to 15 meters into the crowns of trees using handmade equipment that breaks under stress, causing falls which lead to serious injury or death. Liberians familiar with the oil palm value chain estimate that 10% to 15% of harvesters sustain a life-threatening injury. Hazards

are also linked to manual, labor intensive methods for processing palm oil, which is done by adolescent girls and women who stay in the bush overnight.

Lack of data, training programs, legal standards, regulations, or enforcement capacity to improve the safety of agricultural value chains

Although several Liberian government agencies conduct relevant population level surveys (Ministry of Agriculture, Ministry of Health, and Ministry of Labor) none include questions designed to capture the extent of injury or lost productivity caused by OSH hazards in different agricultural value chains. At this time, there is no way to estimate the burden of injury, morbidity or mortality in Liberia caused by hazardous conditions in specific agricultural value chains, nor is there a way to estimate the social and economic costs of agriculture related injuries, morbidity, and mortality. This absence of data contributes to the invisibility of the safety and health of the agricultural labor force as an issue for concern for the government of Liberia and donors.

Gaps in three crucial areas have been identified as largely responsible for the high rates of injury and disease associated with the five value chains studied include:

- Lack of trade associations with trade standards and training programs for workers in each of the value chains and value chain nodes.
- Lack of safety standards, regulations, and enforcement capacity to ensure the safety of equipment used for agricultural and value chain tasks.
- Lack of safety standards, regulations, licensing procedures, and enforcement capacity to reduce Liberian's exposure to dangerous agro-chemicals, including ensuring that only those trained in the proper handling and use of dangerous agro-chemicals have access to them.

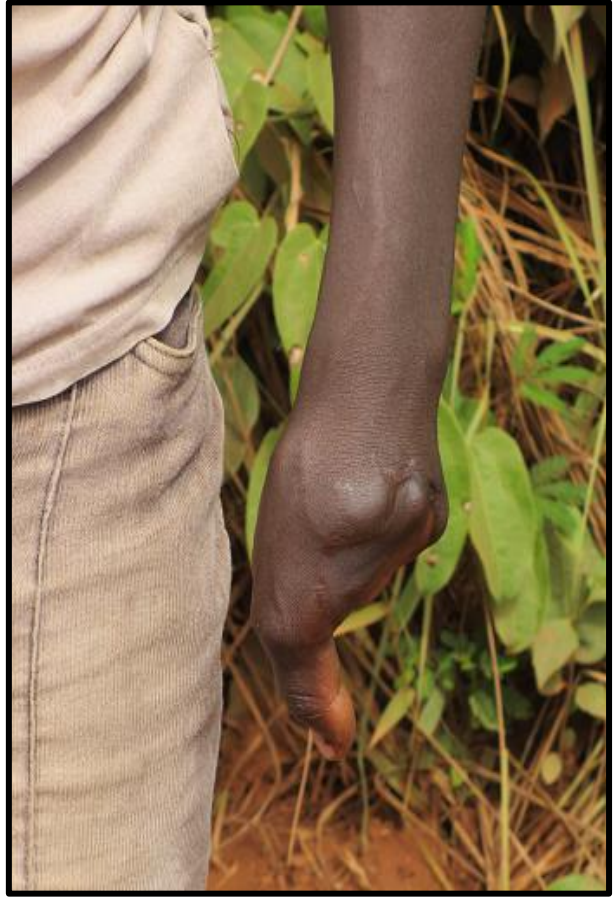


Photo: An adolescent sugar cane worker who suffered from a disabling maiming of his left hand.

Part One – Introduction to the Occupational Safety and Health in Liberia's Agriculture Sector study

1. Context/Background

This study is presaged by an initial report, funded by the United States Department of Labor (USDOL), that considered labor conditions on Liberia's large international rubber concessions, such as Firestone. Conducted by research organization Verité Fair Labor Worldwide in 2011, the study determined that labor conditions for formal employees of Liberia's large rubber plantations are meeting standards set by Liberia's trade unions and that the use of child labor among formal employees of the large rubber companies has been mostly eliminated [1]. However, as explained in further detail below, the report also indicated much poorer working conditions among the smallholder rubber farmers surrounding the plantations.

In 2013, USDOL launched the Action to Reduce Child Labor (ARCH) project, with the goal of reducing child labor in rural farming communities. The project operates in the rubber belt of Liberia, including Margibi, Montserrado and Nimba Counties and began by conducting a baseline survey [2], to gather greater information on the prevalence of child labor and the conditions that lead to it. The results indicated that the use of child labor in agriculture is still widely practiced in Liberia and is perpetuated by poverty and food insecurity. The ARCH baseline survey found high frequencies of child labor in rubber grown outside of plantations and in charcoal, sugarcane, palm oil, and crop farming. The survey also validated the assumption that a critical root cause of child labor was the lack of OSH awareness within rural communities. As such, the Occupational Safety and Health in Liberia's Agriculture Sector (OSH-LAS) study is a crucial part of the puzzle to determine the impact of the poor working conditions and how this links to child labor.

2. Purpose

Although labor conditions on Liberia's large rubber plantations continue to be monitored by trade unions representing rubber workers¹, there is a lack of research done on labor conditions facing workers in the rest of Liberia's agriculture sector. The OSH-LAS study will help to address this knowledge gap. The main purpose of this study is to identify and describe labor conditions, especially OSH hazards, common in Liberia's *non-concession* agriculture sector. For the purposes of this report, non-concession agriculture is defined as all agricultural activities except

¹ Liberia has two prominent trade unions devoted to rubber: General Agriculture and Allied Workers Union (GAAWUL); and Firestone Agriculture Workers Union of Liberia (FAWUL). Both play important roles enforcing labor standards and providing training and services for formal employees of the large rubber concessions [2, 16, 17].

or excluding those of the large rubber and oil palm plantations which operate on the basis of concessions from the Government of Liberia (GOL). Non-concession agriculture includes the activities of:

- producer cooperatives and individually or collectively owned commercial farms which typically range from 50 to 200 hectares
- mixed food and cash crop smallholder farms, which typically range from 2.5 to 10 or more hectares
- all value-added activities such as production of oil from wild or hybrid oil palm, charcoal making, cassava processing, alcohol production, etc.
- all value added bulking, marketing, and distribution activities

As mentioned under the executive summary, one of the most striking findings of the OSH-LAS study is the extent to which labor conditions in Liberia's non-concession agriculture sector have been ignored by researchers, donors, and others concerned with improving agricultural productivity, economic growth and youth employment. Labor, along with land and plant material, is one of the three fundamental inputs to agricultural systems around the world. Just as with land and plant material, the quality of labor is critical to agriculture sector productivity and growth.

To date, the tendency among policymakers has been to equate agricultural labor with human capital, and to focus on formal education as the catalyst for improving the human capital applied to agriculture. Although formal agricultural education is essential to agricultural development, improving the basic safety of agricultural work may also be critical given that majority of the subsistence farmers are illiterate, and their production practices remain rudimentary and routine. What are the occupational safety and health issues confronting Liberia's agricultural labor force? What are the impacts of high risk labor conditions on human health and on agricultural productivity? The OSH-LAS study found that frequent minor injuries, major traumatic injuries and illnesses that disable people for months, and death resulting from injuries sustained while working in agriculture, are all common occurrences with serious economic and psychosocial costs to individuals and households due to lost labor productivity, lost income and lost capacity to care for children.

This report provides necessary stakeholders with contextually grounded information on OSH hazards in common agriculture fields. This information is critical to ensure that the Government and its partners develop, implement and enforce effective policies, standards, laws and regulations to improve the safety of agricultural work in Liberia. It is hoped that the findings from the OSH-LAS study will inspire and empower additional research and advocacy to improve the conditions for agriculture labor in Liberia. The timing of the study and of this

report, coming shortly after the Liberian legislature approved the Decent Work Bill, is important [3].

It is also hoped that findings from the OSH-LAS study will improve understanding of how and why Liberian children continue to remain vulnerable to significant hazards in agriculture work, despite progress on child labor. Pressure to use child labor in agriculture is related to poverty and food insecurity. With better understanding of the feedback loops between the negative health impacts of agriculture work and continued cycles of poverty, the ARCH program and its partners will be able to identify strategies to reduce child labor that also address the root causes of child labor in Liberia.

3. Research objectives

The OSH-LAS study included four research objectives:

1. To document agricultural hazards in common cash-oriented agricultural value chains, including the contexts in which hazards occur and the population sub-groups most involved in the hazardous activities. (Part Three Sections 11 and 12)
2. To describe agriculture workers perceptions of common agriculture hazards, including measures they take to mitigate risks that they face while performing agricultural tasks. (Part Three Section 13)
3. To deepen insight into the situation of male and female 16 – 17 year old adolescents in relation to agriculture sector work. (Part Three Section 14)
4. To assess steps being taken and barriers preventing Liberian organizations from addressing hazardous conditions in agriculture. (Part Four Sections 15, 16, 17)

4. Conceptual framework

The OSH-LAS study used three conceptual frameworks to assess and analyze labor conditions and hazards faced by Liberian agriculture workers:

1. **Value chain mapping** was used to identify and describe hazards at each point in the production, processing, transport and marketing of the five study commodities.
2. **Labor demand analysis** was used to understand processes that cause labor to shift in and out of the different commodity value chains.
3. **Gender and lifecycle analysis** was used to identify population subgroups that appear to be at greatest risk to specific hazards in specific value chains.

4. Choice of value chains for study focus

All the various agricultural livelihoods pursued in Liberia, when taken together, comprise the agriculture sector. Since it would be impossible to study every agricultural commodity in Liberia within the scope of this research, we limited our investigation to five value chains: non-

concession rubber (rubber grown outside of large formal plantations), palm oil, charcoal, sugar cane and both swamp and upland rice. These were selected because: i) they are common in all parts of Liberia; ii) each one involves significant hazardous activities; and iii) most rural Liberians are engaged in activities across all or a sub-set of these value chains that exposes them to multiple hazards during the production, processing, transport and marketing of these commodities.

Table 1 contains contextual data on the relative importance of the five study value chains in Liberia. Almost twice as many households grow rice as grow cassava, and rubber is the most prevalent export oriented tree crop. Sugar cane and oil palm are both important domestically and in regional trade, and both have unique OSH issues.

Table 1. Agricultural households in Liberia engaged in production of crops

	Number of agricultural households	% of agricultural households	% male headed	% female headed
Total	284,760	100	75	25
Rice	209,740	73.7	74	26
Cassava	113,450	39.8	75	25
Rubber	49,290	17.3	85	15
Charcoal	NA	NA	NA	NA
Sugar Cane	31,400	11	81	19
Oil Palm	29,080	10.2	82	18
Cocoa	35,960	12.6	81	19
Coffee	24,240	8.5	79	21

Source: Liberia Ministry of Agriculture Report 2012 [4]

Two modifications to the initial selection of study value chains were made based on feedback from the field study. First, it became clear early in the study that the motorcycle transport sector in Liberia provides the rural farm to road-head and road-head to market transport system for agricultural commodities, and so plays a critical role in every value chain. It also plays an important role mediating youth involvement in agriculture. With large numbers of youth are drawn to the motorcycle transport sector as a means of income generation, the linkages between that sector and agriculture leads to greater exposure among these youth to agricultural work, incentivizing them to become involved in agricultural production. For these reasons, more emphasis was put on understanding the motorcycle transport sector than had been envisioned a priori.

Secondly, it became clear early in the field work that the end product of sugar cane production is cane alcohol, commonly known as cane juice in Liberia. As a reminder, value chain analysis emphasizes the importance of the end demand that generates economic incentives driving crop production, processing, transport and marketing. Using this logic, the field enquiry included production and use of cane alcohol, or cane juice. As will be described in greater detail later in the report, cane juice is addictive and consumption is widespread, so identifying it as the key end product of sugar cane production is a key detail.

5. Methods

The OSH-LAS study included a web-based literature review conducted in October 2014 and a three week rapid assessment field study conducted in Liberia in June and July 2015. The review included GOL documents, web accessed reports on child labor in Liberia, labor conditions in the Liberian rubber sector, labor force engagement of Liberian youth, agricultural value chain processes, and occupational safety and health in relation to agriculture employment.

The research team used qualitative methods for the rapid assessment field study. These included stakeholder meetings with county leaders in Kakata and Ganta cities (N=38); facilitated town hall discussions with the citizens of 10 rural communities (N=516); facilitated focus group discussions held separately with males and females in towns and in rural communities (N=55); and one-on-one life history interviews and interviews with experts (N=25). Informants were purposively selected to ensure inclusion of people active in all five study value chains, as well as



Photo: Dr. Coon conducting a focus group in Nimba County with adolescent boys, ages 16-17.

youth and youth leaders from rural communities and from towns. Informants included farmers, laborers, bulkers, traders, processors, youth and youth leaders, as well as key individuals from GOL, trade unions, hospitals and CSO's knowledgeable about conditions faced by Liberians working in agriculture.

A standard topic guide with simple, open ended

questions on OHS hazards, agricultural labor and adolescent involvement in agriculture was used in both group discussions and interviews. This ensured that the research issues were addressed consistently, allowing for triangulation and validation of findings across different communities and informants. At the same time, the open-ended format encouraged unscripted questions to probe findings and themes emerging in the research that could not have been anticipated a priori based on the literature review.

Rapid assessments are used for *discovery* oriented research, to generate descriptions of issues that are still largely undocumented. The OSH-LAS study used rapid assessment methods to generate a *descriptive* picture of labor conditions in Liberia's agriculture sector, along with factors associated with injuries and illnesses caused by agriculture work. Although the OSH-LAS field study focused on the rubber belt in three counties, findings on hazards encountered in the five study value chains can be generalized to other counties where people engage in the same value chains. Furthermore, findings on hazards encountered in activities that are similar across value chains, such as clearing land for new farms, can be extrapolated to the same activities in the cassava, cocoa and coffee value chains, which were not studied.

6. Description of the Study Location

The OSH-LAS study was organized out of ARCH Program offices in Kakata city and Saclepea town. Field work was conducted in Kakata and Ganta cities, in Saclepea town, and in 8 rural ARCH program communities and two rural non-ARCH communities in Margibi, Montserrado and Nimba counties. These sites are all in Liberia's central rubber and rice belt. In order to identify possible biases caused by the ARCH program's sensitization on child labor, interviews were also conducted in two rural communities without the ARCH program. Findings on labor conditions, hazards and injuries, and on the situation facing 16 and 17 year old youth were similar in ARCH and non-ARCH communities.

Table 2. OSH-LAS study locations

Counties (3)	Arch Program Districts (4)	ARCH Communities (8)	Non-Arch Program Districts (2)	Non-Arch Communities (2)	Non-Arch Towns (3)
Montserrado	Todee	Goba, Nyehn			
Margibi	Kakata	Larkeyata, Zannah			Kakata city
Nimba	Saclepea I	Flumpa, Gbehlin	Sanniquellie Mahn	Gbedin Rice Station	Ganta city
	Saclepea II	Yarsonnoh, Menhpa	Sanniquellie Mahn	Dingamo	Saclepea town



With poor road access, Todee District is the most remote district in Montserrado County. Households in Todee practice manual, semi-subsistence agriculture based on a mix of cash and food crops along with charcoal, palm oil, sugarcane and other products. [5] While smallholder rubber is present, it is not as prevalent as in ARCH program districts in Nimba County. Todee District shares a river border with Kakata District in Margibi County.

Kakata city, which lies on the border of Todee and Kakata Districts, is the third largest city in Liberia, and an important center for agricultural traders, wholesalers, processors and transporters buying from rural producers throughout central Liberia. Rural communities in Kakata District are not as isolated as those in Todee, but the mix of livelihoods practiced is similar to households in Todee. [6]

Further north, Saclepea I and Saclepea II districts are located just outside of Saclepea town, in central Nimba County, approximately 50 miles southeast of Ganta city. The Nimba Rubber, Inc. (formerly Cocopa Rubber plantation) abuts Saclepea II, and rubber farms owned by traditional or subsistence farming households are common in both districts. Households also produce rice, cassava and products such as palm oil, charcoal and sugarcane [7].

Ganta city, on the border between Nimba and Guinea, is the second largest city in Liberia and an important center for agriculture production and trade [7]. Dingamo, located 4.1 miles due west of Ganta city, is an old community that specializes in growing sugar cane and producing alcohol, which is traded all over the region. Gbedin, 14 miles northwest of Ganta city, is where members of the Dokodan Rice Farmers' Cooperative Society both live and specialize in swamp rice farming [16, 17].

Table 3 contains data on the percentage of agricultural households in each of the OSH-LAS study counties that produce rice, rubber, charcoal, sugar cane or palm oil.

Table 3. Percent of agricultural households producing study value chains by county

	Rice	Rubber	Charcoal	Sugar Cane	Oil Palm
Margibi	38%	21%	NA	9.8%	13%
Montserrado	31%	12%	NA	15.3%	9.3%
Nimba	82%	28%	NA	19.2%	14.3%

Source: Liberia Ministry of Agriculture Report 2012 [4]

Part Two – Background on Liberia's labor force and agriculture sector

7. Overview of the Liberian labor force

At the time of the last national census in 2008, Liberia's population was 3.5 million people, with a current estimate for 2015 of 4.397 million people [8, 9]. 76.2% are less than 35 years old and the median age is 18 years [9, 11]. Liberia is one of the world's poorest countries, with per capita income estimated at \$461 per year [9]. Rapid urbanization has been occurring at least since Liberia's civil war ended in 2003; as of the 2008 census the population was almost evenly split between urban and rural areas. Most urban dwellers live in Greater Monrovia, Ganta or Kakata [8].

Table 4. Demographic indicators

Indicators	Census 2008
Population (millions)	3.5
Percent Urban	47.0
Male life expectancy	51.6
Female life expectancy	53.9
	Liberia DHS 2013
Percent urban female headed households	38.5
Percent rural female headed households	30.8

Source: LISGIS Population and Housing Census 2008 [8] and Liberia Demographic Health Survey 2013 [11]

There were 1.804 million people classified as employment "eligible" in the 2010 Liberia Labor Force Survey (Table 5,) defined as all 15 – 64 year-olds in the population, of whom slightly less than two thirds were actively employed. Sixty-eight percent of all employed workers in Liberia (including the agriculture sector) are in "informal" employment, which is defined as employment without a legal contract or benefits [8, 10] and almost 80% are in "vulnerable" employment, which is defined as working for one's self (own-account) or working unpaid for one's household as a contributing family worker [10].

Table 5. Key employment facts

Indicator	Urban	Rural	Liberia
Labor force participation rate (%)	54.9	71.2	62.8
Informal employment rate (%)	59.3	75.0	68.0
Vulnerable employment rate (%)	67.5	86.1	77.9

Source: LISGIS Labor Force Survey, 2010 [10]

8. Overview of Liberia's agricultural labor force

Agriculture is the largest sector in Liberia in terms of employment and the main livelihood in rural communities, where 78% list agriculture, forestry or fishing as their primary occupation [10]. The productivity of agricultural workers is low because of obsolete planting materials and lack of modern inputs, use of manual labor for most tasks, and low levels of functional literacy. Only 41.6% of rural dwellers can read or write a simple sentence in any language, whereas 71.9% of urban dwellers are able to do this [10].

The vast majority of Liberian agricultural workers are in informal and vulnerable employment, since they work for themselves, as unpaid family labor, or for others without formal contracts [10]. As is common among those in informal and vulnerable employment, rural Liberians cobble together livelihoods by working in multiple value chains over the course of a year. Transport, mining (iron ore, diamonds, gold) and forestry are all sectors that employ significant numbers of young Liberian men, and hence compete with agriculture for labor [10].

9. Background and Challenges Facing Liberia's agriculture sector ²

Liberian agriculture is dominated by an upland (hilly), rain-fed, forest-based slash and burn farming system characterized by high labor intensity, shifting cultivation, very low mechanization, low productivity and problems with erosion. Dedicated to tree crops, rice and vegetables, the forest farming system is concentrated in the central belt of the country and is the largest single farming system in Liberia, accounting for almost half of the total land area under cultivation. A secondary tuber-based farming system is concentrated in the northern region and a fishing-mixed crop farming system in the coastal belt, predominately in south-eastern and western Liberia. Rice is the main staple, followed by cassava. Vegetables, palm oil, fish and livestock are also basic components of Liberian diets [12, 13, 14, 15].

Formal employment in agriculture is limited to rubber and more recently oil palm plantations, which cover thousands of hectares and which are operated by foreign companies or national elites under long-term concessions agreed between investors and the GOL. Other production structures include commercial farms owned by Liberians who depend on informally hired labor, and semi-subsistence smallholder farm households that grow a combination of food and cash crops and depend on a mix of household, community and informally hired labor [15]. There are also producer cooperatives and irrigated rice schemes started during the 1950's, 1960's and 1970's under successive Liberian presidents [13].

² Information on background and challenges facing Liberia's agriculture sector is a synthesis of several sources, including: the Liberia Ministry of Agriculture documents cited [4, 12, 13, 14, 15]; personal communication with Dr. Roland Massaquoi and Sylvester Arnolfo during the course of the OSH-LAS field study [16]; and discussions with participants in the OSH-LAS field study [17].

Many of the challenges facing Liberia's agriculture sector today are rooted in country's legacy as a rubber exporter. Starting in 1926, when the Firestone Plantation was established, through the end of the civil war in 2003, Liberian agriculture exhibited a bi-modal split between export crops produced on large plantations and a combination of export, food and local cash crops grown by rural subsistence farmers [12, 13, 14, 15, 16].

For much of the 20th century the concessions were the only institutions in Liberia to consistently provide training, high quality plant material and extension services, but these were private goods only for the concessions. Starting in the 1950's the GOL and donors launched agricultural and rural development programs by establishing large, mechanized farms and producer cooperatives, but because these were heavily subsidized by donors or by the GOL, most have not survived, and the ones that have survived have had negligible impact on the broader sector. Before the civil war, the majority of Liberian farmers were ignored by the GOL and donors alike [12, 13, 14, 15, 16].

Liberia's civil war (1989-1996 and 1999-2003) has also had a profound impact on current conditions in the agriculture sector. The civil war devastated the physical capital that was central to non-concession pre-war production systems. Tree crops were especially affected, since young, armed militias pillaged them for fuel, latex and palm fruit bunches all of which continued to be traded through informal networks [16, 17]. The war also devastated the human capital and transmission of skills which had formerly maintained high standards on domestically owned commercial tree crop farms [16]. Finally, the war eroded community cohesion along basic fault lines such as gender, clan and age rank, and this is making it difficult for communities to overcome dependency mentality and work together to modernize outdated agricultural production systems [16].

Although the GOL and donors are now focused on developing the capacity of non-concession farmers, especially those growing food crops, it will take time to rebuild the institutions and social cohesion needed to raise productivity and labor standards for this sector. This is seen today in the absence of standards, regulations or GOL enforcement capacity to protect Liberians who work in the non-concession agriculture sector.

10. Overview of the five study value chains and motorcycle transport sector

Rubber

Rubber is the most important cash crop in Liberia, with up to half of all agricultural workers estimated to be involved in its production or related down-stream value chain activities [15]. In contrast, there are ~ 8,450 formal employees of the large rubber concessions [21]. An estimated 130,000 hectares of rubber are owned by rural Liberian farmers on small and

medium farms [15]. Field processed latex from these farms is sold to rubber brokers, who sell it to the concessions [16].

For the past few years, the Firestone company has had the only functioning latex processing plant in Liberia, so it sets the price paid to Liberia's local rubber farmers. Between 2003 and 2008 rubber brokers were paying local rubber farmers \$2000 US per ton for field processed latex [16, 17]. The high price, driven by strong global demand for rubber, had mixed effects. On one hand it encouraged a black market in stolen latex, but the high price also encouraged local rubber farmers to rehabilitate their farms [16, 17]. In 2008, world demand for rubber began dropping. In 2008 Firestone responded by dropping the internal Liberian price for latex to \$1000 US per ton, and then in 2010 to \$500 US per ton, where it has been since [16, 17].



Photo by Lukas Olvnyk

Photo: An example of a cup used to collect latex from a rubber

Historically rubber has dominated Liberia's foreign exchange earnings, both in terms of absolute value and in terms of relative contribution (60 – 90%) to overall foreign exchange earnings [22]. Over the same period that rubber prices were dropping, foreign investment in iron ore mining came on line, with strong demand from China. These two factors converged to upend rubber's traditional export dominance. By 2013 rubber accounted for 22.2% of the value of exports (down from 61.6% in 2011), while iron ore accounted for 60.3% of the value of exports (up from 6% in 2011) [22].

The Liberian civil war, low rubber prices, and competition for labor have all had repercussions that impact safety conditions for labor in the non-concession rubber sector.

First, the non-concession rubber sector uses informally hired workers and family labor to tap latex. Neither group is trained for what is a technically exacting and dangerous job, since there are no training programs for these rubber

workers [16, 17]. Alcohol addiction and high labor mobility are common among for-hire rubber tappers, many of whom were affected by the civil war [16, 17]. Even so, rubber farmers have low bargaining power with for-hire tappers, due to competition for labor from other sectors. The farmers interviewed for this study have to pay tappers with latex, based on a 50:50 split of the output, even though tappers bear none of the costs of the farm. Because turnover is high and rubber prices are low, rubber farmers cannot afford to finance training the tappers themselves, as they did before the civil war. Together these factors are driving the “de-professionalization” of Liberia's non-concession rubber sector. [16, 17]

Second, low rubber prices also have increased pressure on the poorer and more vulnerable rubber-producing households to use untrained family labor, including children, youth and women, to tap latex. [16, 17] Third, even rubber farms that were rehabilitated after the war are not being maintained in the current low price era, so the ground under trees is covered with underbrush, which increases the risks of injury while rubber tapping, as underbrush is likely to contain thorns and hidden sharp objects. Finally, the poor condition of the rubber farms encourages theft from groves that have reverted to bush [16, 17].

Liberia has two prominent trade unions devoted to rubber: General Agriculture and Allied Workers Union – GAAWUL; and Firestone Agricultural Workers Union of Liberia - FAWUL. Both play important roles enforcing labor standards and providing training and services for formal employees of the large rubber concessions [2, 16, 17]. However, large concessions also subcontract parts of their operations to contract bosses, and laborers hired by contract bosses do not have any of the training opportunities, rights or protections of formal concession employees [2,16,17]. Firestone uses contract bosses to tap blocks of old trees with low latex output, before the blocks are sold to charcoal burners and then replanted. [16, 17]

There are no organizations in Liberia comparable to GAAWUL or FAWUL that represent domestic rubber farmers or tappers [16] The Rubber Planters Association of Liberia (RPAL)³ was formed in 1966 by the GOL as a private association to represent the interests of domestic rubber farmers [23, 26]. However, it was associated with corruption in Liberia's rubber sector during and after the civil war [24, 25]. Positions on the RPAL's governing executive committee have always been held by foreign concessions, the GOL and Liberian elites [23], and the extent to which the RPAL has or currently represents the interests of ordinary Liberian rubber farmers is unclear [27,28].

The law establishing the RPAL mandated that every rubber-producing household in Liberia is automatically a member [23] and thus subject to fees levied by the RPAL [16, 17]. For decades, the RPAL has levied a fee on all legal rubber sales, while Firestone levies a 4% tax deduction on every ton sold [16, 17, 27]. Both of these come out of the price paid to farmers, without any kind of quid pro quo in the form of training programs or support, according to farmers interviewed for the OSH-LAS field study [16, 17].

³ The RPAL came up in ARCH OSH-study field interviews, but there are no definitive sources on it available online. The information on RPAL in this section is a synthesis of OSH-LAS field study findings, validated as much as possible by online sources where the RPAL is mentioned, including UN reports, old academic papers, and current Liberian newspaper articles.

Rice

Rice is Liberia's most important staple, with annual per capita consumption of 120 kilograms [4]. Its cultivation is deeply intertwined with Liberian rural social structure and identity, and for centuries its production has relied on unpaid family and communal labor. Growing urbanization and mobility of the Liberian labor force since the civil war is making it harder for rural households to secure the labor needed to grow rice [4, 16].

Although almost three fourths of all agricultural households grow rice [4], Liberia as a whole depends on imported rice to maintain food balances. For example in 2010, 62% of Liberia's total rice consumption had to be imported [4]. Average yields from Liberian upland rice are estimated to be less than one quarter of global yields, and less than one half of yields in other parts of sub-Saharan Africa [15]. But because rice is so closely linked to food security, it has been the focus of GOL and donor programs since the 1970's [13]. In spite of this history of investment, most rural farm households still use manual labor to grow rice and keep almost 80% of the crop for their own use [12].

There are two rice production systems in Liberia: upland and swamp. Almost 60% of Liberia's rice producing households grow only upland rice, 20% grow only swamp rice and 20% grow both [12]. Upland rice farming is based on shifting cultivation of hilly slopes

that are cleared of trees and brush using chainsaws and fire, with dry seed broadcast after the dirt has been "scratched" or broken up. The production season for upland rice lasts nine to ten months [16]. Swamp rice is cultivated during the rainy season on swampy bottomland valleys that are cleared and prepared for transplanted rice seedlings in a process known as "puddling." Once a swamp rice farm is established, it has to be maintained but it does not have to be rebuilt. Vegetables are grown on swamp rice farms during the dry season [16]. Donor and GOL programs supporting the rice sector have all focused on swamp and / or irrigated rice.



Photo: Young rice farmers practicing puddling while wearing PPE boots.

Charcoal

With less than 1% of the population connected to an energy grid, 99% of Liberians depend on biomass fuel for cooking [29]. As in most of sub-Saharan Africa, charcoal is the preferred cooking fuel in urban areas, where exploding demand is closely tied to rural-urban migration.

Expert reviews of the energy sector in sub-Saharan Africa suggest that demand for charcoal throughout the continent will continue to increase dramatically through 2030 [29, 30]

The demand for charcoal from Monrovia and other towns is having profound impacts on rural communities, where its production attracts ex-combatants, widows and other single women, and people in general who are trying to cobble together a livelihood. Anyone who wants to make charcoal can get trees by paying a portion of the finished charcoal to the landowner, so barriers to entry are low [16,17].

In the rubber belt, the large concessions use charcoal burners to clear blocks of old trees that need to be replaced, and trees felled for farming are also turned into charcoal [16, 30].

However, feedback from rural communities during the OSH-LAS study suggests that urban demand is outpacing the wood generated by old rubber trees and by farming [17]. A 2007

Conservation International report raised concern about the vulnerability of Liberia's forests to charcoal, and informants for the ARCH study described how charcoal burners are moving farther into the bush every year [29, 17].



Photo: Typical roadside charcoal burning scene, with young children in the background observing.

This scenario has significant implications for Liberia's environment and for the safety and health of Liberians who produce charcoal. As stated by Brieland Jones (2015) in the publication, *Social and Environmental Impacts of Charcoal in Liberia*, "Liberia is home to a charcoal industry that is ruled entirely by informalities and lack of regulation" [29 p. 19]. Jones found a

striking lack of realism concerning charcoal in donor and in GOL energy policies, which remain fixated on electricity and renewable energy, even though recent analyses of Liberia's energy sector suggest that the transition away from charcoal will not happen until annual per capita incomes in Liberia reach a minimum of \$1,500 USD to as high as \$18,250 USD [29]. Since the current per capita income in Liberia is \$454 USD [9], this could take decades.

Charcoal production in Liberia is technically primitive, dangerous, and done by untrained workers in small groups that routinely include small children and adolescents [29, 17]. Once the charcoal is made it must be stored or it can spoil, so transport to warehouses is essential. Urban traders control charcoal transport, storage and sometimes loan money to charcoal

burners. Because they control marketing and credit, traders also control the prices producers get for their finished charcoal. Based on feedback from informants in the OSH-LAS study, rural people feel that being cheated by charcoal traders is one of the risks of charcoal production, highlighting their powerlessness as primary producers. [17]

There are no reliable data on volume of charcoal produced or on numbers of people engaged in the charcoal value chain as a primary or part-time livelihood, but Jones suggests that there are “likely thousands of rural charcoal producers” operating in Liberia [29]. The National Charcoal Union of Liberia (NCUL), which was established in 2004, is the only group in the country trying to collect data on the charcoal sector, and trying to improve conditions for workers in the charcoal value chain. Its 550 members, all Monrovia-based charcoal dealers, “serve as the sole advocates for charcoal producers in the country regarding fair wages, market access, research and sustainable development of the industry.” However, a lack of resources limits NCUL activities and prevents it from expanding beyond greater Monrovia [29].

Sugar cane / Cane alcohol (Cane juice)

Liberians have grown sugar cane to distill into alcohol for centuries [31, 32]. Today, 31,400 households grow it as a cash crop on 26,000 hectares of land, with the highest concentration in Nimba County [4]. Liberian alcohol is sold in local markets and traded throughout the region [17]. Since sugar cane is low investment to establish, it is widespread as a cash crop for both male and female semi-subsistence farmers [33].

Alcohol consumption is part of Liberian culture. Historically, anyone visiting a chief was expected to bring kola nuts and gin as a gift, and today agricultural workers often demand that the person hiring them provide alcohol for them to drink during the day, in addition to paying them wages [16, 17]. In terms of prevalence, 27% of women and 50% of men reported drinking alcohol during the month prior to the 2013 Liberia Demographic Health Survey [11]. Regular drinking increases with age: slightly more than 25% of 15 – 19 year-olds drink more than once a week, while more than half of 45 – 49 year-olds drink more than once a week. Twice as many men drink every day as women (10% versus 5%) and men drink more heavily than women [11].

Sugar cane is planted on the lower slopes of hills, below rice and rubber but above the wet valley bottoms where swamp rice and vegetables are grown. It is a hardy perennial grass and although it takes four years to establish, once established it can be harvested once a year with very little additional maintenance. Sugar cane growers take their cane to mills that use diesel powered mechanical crushers to extract cane juice. Mill owners function as growers, bulkers and traders in the cane-alcohol value chain; they grow their own cane and farmers pay them for the use of the mill with a portion of the cane juice. Both millers and farmers distill the fresh

juice into alcohol at sites near the mills, using simple equipment comprised of narrow necked metal boiling jugs and copper tubing [16, 17].

Oil palm

Farmers throughout Liberia grow hybrid oil palm trees and /or harvest wild oil palm. Before the civil war Liberia was a net exporter of crude palm oil, producing between 135,000 and 170,000 metric tons annually. Liberian production fell significantly during the war and Liberia is now a net importer of edible oils. In spite of this, Liberians export up to 3,000 tons of crude palm oil to neighboring countries through informal border trade. There are estimated to be about 25,000 hectares of medium-to-large oil palm farms owned by commercial farmers and another 75,000 hectares owned by smallholder farmers. About half of the country's total production of crude palm oil is estimated to come from wild groves. In 2008 - 2009 the GOL began signing new concession contracts for oil palm plantations with international companies such as Golden VerOleum, and Sime Darby. Now and over the next decade these and other companies are slated to develop hundreds of thousands of hectares of oil palm, along with processing and export facilities [12, 13, 14, 15, 35, 36].

Motorcycle Transport Sector

The motorcycle transport sector is exploding in Liberia in response to strong and growing demand for affordable transportation. Based in urban centers (especially Greater Monrovia, Kakata and Ganta) the sector is organized around bike owners who hire adolescent boys and male youth to operate the motorcycles. Motorcycles typically earn 2000 to 2,500 Liberian dollars per day, far more than the prevailing daily wage for agricultural labor, which is 200 Liberian dollars. Out of every seven days, the motorcycle riders keep one day's worth of receipts for themselves as their own pay. In addition to transport within urban centers, motorcycles provide farm to market and market to market transport for agricultural goods produced and sold by subsistence rural farmers and traders throughout Liberia. According to OSH-LAS study informants, transport of agricultural goods, which takes motorcycle riders well off of the main paved roads into back bush areas, is by far the most lucrative niche in the overall motorcycle transport business [16, 17].

The cost of a new motorcycle in Ganta, where they are imported through Guinea, although high, is still within reach of an ambitious adolescent or male youth who aspires to become an owner of his own motorcycles [16]. Because they can earn more in motorcycle transport than as agricultural laborers, and because there is a clear pathway to their own asset accumulation (which is not true of farming) the motorcycle sector holds great allure for male adolescents and youth from rural communities [16, 17].

Part Three – Findings on OSH conditions in Liberia's non-concession agriculture sector 4

Part Three presents findings from the OSH-LAS rapid assessment field study, in the following sections:

- Section 11 – Occupational safety and health hazards in the five study value chains & in motorcycle transport
- Section 12 – Exposure of population subgroups to different agricultural hazards
- Section 13 – People's perceptions of hazards, measures they take to reduce their risks of injury and how they treat injuries
- Section 14 - The situation of 16-17-year-old youth in relation to non-concession agriculture sector.

Unless otherwise cited, the information in Part Three comes from the people who participated in the OSH-LAS field study via town hall discussions (N = 516), focus group discussions (N = 55), and one-on-one expert or life history interviews (N = 25).

11. OSH hazards in the five study value chains and in motorcycle transport

OSH hazards in the five value chains fall into two broad categories: hazards that are associated with basic agricultural tasks across all value chains; and hazards that are unique to specific value chains and value chain nodes. The comments of OSH-LAS field study participants on hazards have been summarized in two tables. Table 6 presents summary findings on OSH hazards by agricultural task, and Table 7 presents summary findings on OSH hazards by specific value chains. The tables are presented first, followed by a discussion of some of the main hazards based on the narratives of OSH-LAS field study participants.

⁴ The information in Part Three is based directly on the findings of the OSH-LAS field study, unless stated otherwise with additional references.

Summary tables of OSH hazards by agricultural task and value chain ⁵

Table 6. Summary of OSH hazards reported by type of agricultural task

Clearing land, hauling logs, fencing farms	Preparing land for planting	Planting & Weeding
<ol style="list-style-type: none"> 1. all farms - crushed / killed by falling trees and rolling logs 2. all farms - short and long-term skeletal problems from head-carrying heavy logs 3. all farms - trapped in fires used to burn brush after clearing 	<ol style="list-style-type: none"> 1. all farms - long-term skeletal problems from bending over all day 2. swamp farms – exposure to water borne diseases, parasites, water pollution 3. swamp farms – heightened risk of respiratory problems 	<ol style="list-style-type: none"> 1. all farms – long-term skeletal problems from bending over all day 2. swamp farms – exposure to water borne diseases, parasites, water pollution 3. swamp farms – heightened risk of respiratory problems 4. all farms - possible herbicide exposure from misuse of chemical herbicides
Pest control	Harvesting	Brushing
<ol style="list-style-type: none"> 1. bird scaring – being hit in the head by rocks that are shot out of slings to scare birds 2. trapping rodents – losing fingers in traps set for rodents 3. possible pesticide exposure from misuse of chemical pesticides 	<ol style="list-style-type: none"> 1. cuts and skin abrasion from sugar cane fronds 2. skeletal problems from head-carrying heavy loads 3. danger from overloading inadequate crop storage structures 	<ol style="list-style-type: none"> 1. possible herbicide exposure from misuse of chemical herbicides
<p>Hazards cross-cutting all six basic agricultural activities</p> <ul style="list-style-type: none"> • open defecation; lack of potable water; drinking “bush” water • blade injuries; foot and puncture wounds • snake and insect bites • alcohol intoxication while engaged in dangerous work 		

Note – Table 6 applies to all basic agricultural tasks regardless of crop; but in the context of this study, it specifically applies to upland and swamp rice, and to the production of sugar cane itself.

⁵ The data in Tables 6 and 7 constitute a *qualitative summary* of different OSH hazards mentioned in the *descriptive narratives* of ARCH-OSH informants. They *are not* quantitative data, and therefore do not have an associated sample size.

Table 7. Summary of OSH hazards reported by value chain operation

Burning charcoal	Tapping rubber	Harvesting palm fruit	Processing palm oil
<ol style="list-style-type: none"> 1. cuts, lacerations from stacking ovens 2. burns from oven, sparks, cinders, heated ground 3. inhalation of soot, carbon monoxide & gasses 4. eye damage from heat and steam 5. sleep deprivation & dehydration 6. flu-like symptoms "thick blood" 7. increased risk of malaria from sleeping outside 8. risk of being robbed in bush 	<ol style="list-style-type: none"> 1. burns, skin and lung problems, blindness from improper handling of acid 2. blindness from tree bark falling in eyes 3. blade injuries from tapping knives 4. puncture wounds, sprains snake and insect bites, from underbrush 5. respiratory problems from damp conditions 6. risk of being robbed in bush 7. risks to children, society at large from widely available acid not properly stored 	<ol style="list-style-type: none"> 1. broken backs, necks, other life threatening injuries from falling out of palm trees from 20 to 30 feet in the air 2. bad thorns in fingers and hands from palm fronds at tops of trees 3. snake and wasp bites from snakes and insect nests at top of trees 4. increased risk of falling out of trees and slipping on ground (sprains) when harvesting in rainy season, when prices are highest 	<ol style="list-style-type: none"> 1. faulty drum barrels used to boil palm fruits leading to accidents with boiling water, fire 2. puncture wounds, sprains, snake and insect bites from working in the bush 3. respiratory problems from processing oil in pits with water
Operating sugar cane mills	Distilling alcohol	Operating chain saws	Operating motorcycles
<ol style="list-style-type: none"> 1. amputated hands, lower arms from accidents operating mills with no safety guards 2. increased risk of malaria around sugar cane mills 3. risk of alcohol addiction from constant exposure to alcohol 	<ol style="list-style-type: none"> 1. explosions from faulty distilling equipment 2. fatal alcohol poisoning due to lack standards, regulations, or procedures to measure proof 	<ol style="list-style-type: none"> 1. blade accidents leading to lost fingers, maimed hands. 	<ol style="list-style-type: none"> 1. accidents from riding overloaded bikes on slippery mud roads 2. risk of being robbed in remote settings away from main paved roads

Discussion of OSH hazards from OSH-LAS field study informant narratives

OSH hazards from land and brush clearing: Liberian farming systems are based on frequent rotation of land under cultivation and so entail regular clearing and cleaning of forest, brush and swamps for farms. Since old upland rice farms are abandoned as a way to restore soil fertility, carving fresh farms of primary or secondary growth is the first major task of the upland rice production cycle. Swamp rice also involves clearing trees and brush from the swamp, and then tromping the wet mud with feet to breakup clumps. Likewise, chopping down forest to establish new tree farms, clearing brush under established tree crops, rotating tree stock by replacing blocks of old trees with new trees, and chopping down trees for charcoal are activities ubiquitous across Liberia. Even new sugar cane farms have to be cleared and then brush-cut for three or four years before the cane is established.



Photo: A young male adolescent showing scars accrued from blade wounds, as is typical of rural Liberians.

Participants in the town hall discussions described all activities involving felling trees, clearing land and preparing swamps as a major source of injuries that they regularly experience. The most serious injuries appear to relate to felling trees. Trees are commonly felled both by hand axes and also by gasoline-powered chain saws. Chain saw operators are typically adult men who hire out their services for daily wages plus costs of fuel and oil for the chainsaw, and then work with a male crew to clear a new farm, typically 0.5 – 2 hectares.

Participants in all the town hall discussions described situations where trees fall unpredictably and seriously injure or kill men who are caught off-guard underneath. While this is a risk with axe clearing, it appears to be a greater risk with chain saws, since the trees are cut so fast with chain saws that men do not have

time to move before it is too late. People sustain crushed and broken bones from falling trees and rolling logs while clearing land, but people are also killed. Participants in the Zannah town hall meeting said that they had lost 20 young men this way over the past few years. The claim was checked with the Kakata District Community Health Officer, who confirmed that it is entirely plausible for a rural community to lose 20 young men to injuries while clearing land over a five-year period. However, this does not show up in national health statistics, because

communities (at least before the Ebola epidemic) do not have to report deaths or cause of deaths to the government.

It was beyond the scope of this study to analyze the technical details of how trees are felled or logs handled, to identify causes of injury. But lack of technical training and failure to use safety measures such as ropes and helmets, appear to be involved. Another factor appears to be a culture of poor safety habits on the part of chain saw operators and land-clearing crews—for example, not making sure everyone is out of danger before a tree is felled. As with the rubber industry, there may also have been a rupture or breakdown, brought about by Liberia's civil war, in the transmission of traditional skills and safety measures used to clear land.

Once trees have been felled, the wood is cut and hauled into piles for charcoal or other burning. Hauling is done by men and women via head-loading what are often very heavy sections of tree trunks or limbs. Over time, the weight causes short and long-term damage to people's heads, necks and spines, leading to chronic skeletal deformities and chronic pain. Older men and women described, in the town hall meetings, the chronic pain they suffer from years of head-loading heavy logs. Another danger is slipping while head-loading logs, which happens because of wet conditions and poor foot-wear. Loading logs into piles, usually for charcoal burning, is another hazardous operation. Several town hall participants described accidents when piles of wood fell apart because they were poorly stacked, again leading to crushed or broken limbs.



Photo: A town hall participant showing his foot injury sustained from use of a blade. The rubber flip flop is an example of footwear used by most rural Liberians.

Land and brush clearing are also associated with foot injuries that occur when people step on sharp stumps or trash, and with wounds when people accidentally cut themselves with cutlasses or machetes. Both men and women spoke about puncture wounds and blade injuries more frequently than anything else. Once sensitized, the OSH-LAS research team began to notice the scars on people's feet, legs and arms. Most rural Liberians have one or more thick scars from

puncture wounds or blade cuts. Although people continue to work with these injuries, some are so severe that people have to stop working while the injury heals. In Yarsonnoh, all 30 women participating in the all-female town hall discussion confirmed that they sustain minor

injuries from sharp objects or self-cutting on a fairly regular basis. At least 8 out of the 30 women had also, at least once in their lives, been forced to stop working for several months because of injuries.

Another danger associated with land clearing comes from the use of fire to burn land after trees have been felled. There were no anecdotal estimates of how frequently accidents occur when land is being burned. But people in Zannah were still deeply disturbed by an incident that had occurred a few months before the OSH-LAS study, where several people died when they were trapped in a land clearing fire.

OSH hazards from exposure to diseases: Farming activities in Liberia expose agricultural laborers to significant risk of contracting insect-borne diseases. Malaria is the leading cause of morbidity [34], and heightened exposure to malaria is associated in people's minds with activities that involve being outside at night, including charcoal burning and waiting in queues at sugar cane mills. Agricultural work is also linked to respiratory problems, the second leading cause of morbidity in Liberia. [34] Informants associate respiratory problems with rubber tapping, because it is done early in the morning when the grass and brush are damp and the air is still cool, so that tappers end up chilled in damp clothing. Respiratory problems may also be



Photo: A town hall participant showing his infected wound.

common among swamp rice workers, because of their exposure to damp, and among charcoal burners because of their exposure to toxic smoke.

The long hours of work in brackish water required for swamp rice exposes swamp rice workers to schistosomiasis and bilharzia. According to informants in rice-producing communities, both these diseases are common and can be extremely debilitating and even life threatening, forcing people to stop working. Women may be at greater risk than men, since they specialize in swamp rice. Several informants indicated that, in their experience, water borne diseases have negative impacts on the productivity of their farms and on their ability to maintain their livelihoods, and also on their children and families when women are sick.

OSH hazards from open defecation and drinking untreated water: The incidence of diarrhea and intestinal parasites among the agricultural labor force may also be greater than commonly realized. Participants at town hall discussions were asked about their drinking water sources and defecation habits while farming, and answers were consistent across all the OSH-LAS research sites. If the farming activity takes place close to a well people will drink water from the well. But if the work is more than a 10 or 15 minute walk from a well, people drink “bush water”. Most farms are five or more kilometers from people’s homes [16], which is where potable well water is concentrated. So drinking untreated water from streams or from damp low spots in the bush may actually be fairly common among agricultural workers.

Informants said that they defecate in the open bush if they have to relieve themselves during the day. Open defecation and untreated water are risk factors for parasite infections and diarrheal diseases. According to recent data, only 4% – 6% of adult outpatient visits to medical facilities are for diarrheal disease [34], but given the lack of potable water and sanitation during the day for agricultural workers, this may underestimate actual prevalence among rural adults.

OSH hazards from exposure to insects, snakes and plants: Insect and snake bites and injuries from plant leaves and thorns were mentioned as common problems in every town hall discussion, but except for oil palm production, people do not associate them with the same class of life threatening or long-term debilitating injuries or diseases from land clearing that were just discussed. Although poisonous snakes are common, the only accounts in this study of people bitten by snakes included descriptions of how they had self-treated by cutting the bite, sucking the venom and applying leaves to the wound, so local knowledge and practices may be effective in treating snake bites. Alternatively, dangers from snake bite may be more life threatening than reflected in the narratives told by informants for this study.

The one activity where informants linked snakes to life threatening situations was in harvesting wild oil palm. Poisonous snakes often live in the tops of palm trees where fruit bunches are, but they can’t be seen until the climber harvesting the palm gets to the crown of the tree, 20 to 30 feet in the air. At that point the climber either must try to kill the snake, which is difficult since he is hanging precariously by a reed harness, or fall out of the tree from 20 to 30 feet.

The last observation of note made by OSH-LAS study participants about snake and insect bites concerns the relationship between risks of these injuries and the poor condition of rubber farms. Snakes and insects thrive in the thick underbrush that grows under rubber and other tree crops, unless the brush is cleared on a regular basis. On well-maintained rubber farms, brush is cleared two or three times a year, but in the current era of low rubber prices, most farmers have stopped keeping the ground under trees clean. As a result, people tapping rubber

face higher risks of injury from snakes and insects than they did when the farms were maintained.

Two plant-derived injuries associated with sugar cane and oil palm are also common: skin irritation from exposure to the sharp, lacerating edges of sugar cane fronds when people harvest the canes without wearing protective clothing; and bad puncture wounds to fingers and hands from thorns on the fronds of oil palm trees.

OSH hazards from chemicals used to process rubber: Sulphuric acid and ammonia, used to field-process rubber after it has been collected from tapping cups, are widely available in Liberia. According to study informants, anyone in Liberia can purchase these chemicals, which are affordable even to poor tappers. There is no system in Liberia to license, track, regulate or ensure proper handling and use of these highly toxic and dangerous products. Because there are no professional standards or training programs for non-concession rubber tappers, the use of the chemicals by tappers off of the large plantations was described by OSH-LAS informants as more often than not sloppy and dangerous. For example, pure sulphuric acid is taken to the blocks of rubber trees being tapped in large containers. Small quantities of acid are then measured into buckets and mixed with water before being added to raw tree latex. Firestone and other large concessions have strict controls over this sequence, and the men executing it wear safety gear and are trained to work with these chemicals. In contrast, non-concession rubber tappers carry the sulphuric acid into tree blocks in sub-standard containers, carry it to different processing sites among the trees in open buckets that slosh and can spill if the person trips, and use nothing to protect their eyes, mouth, lungs and face from the vaporous steam that is generated when the acid is mixed with water. When OSH-LAS study town hall participants talked about rubber, they also made a connection between the hurry that the tappers are in and acid accidents. Price points in the rubber value chain, especially in the current period of low prices, necessitate volume tapping and field processing, so tappers are usually rushing to meet quotas, and this together with the conditions just described, leads to accidents.

Although data on injury rates from acid among people tapping rubber in the non-concession sector are not available, the narratives of OSH-LAS study participants suggest that they could be quite high, especially among psychologically vulnerable parts of the labor force, for example those with alcohol addiction issues. The kinds of injuries mentioned most frequently include acid burns on hands, arms, legs and feet, and blindness caused by acid fumes and acid splashing into people's eyes. Low-grade damage from chronic exposure may also be a problem. The OSH-LAS research team conducted a life-history interview with a male youth who was head-loading field processed rubber from the bush to the road for forward transport to a broker, and

noted that the skin on the boy's hands and arms showed discoloration typical of chronic acid exposure. [16]

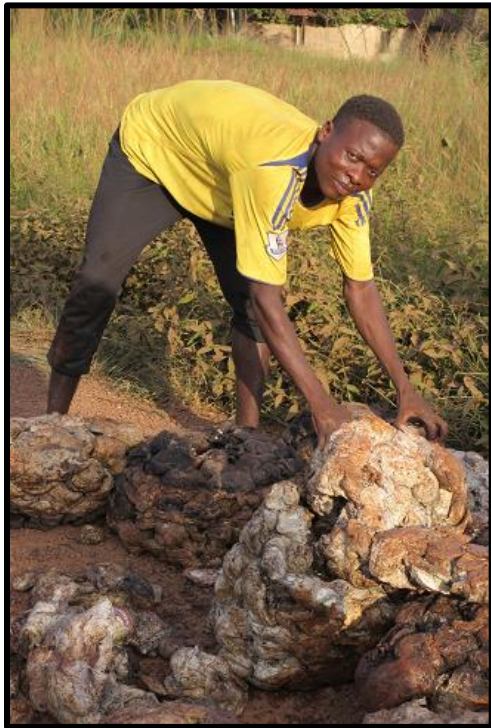


Photo: The subject of the life-history interview in the process of head-loading heavy rubber bundles for pick-up by broker.

Participants in town hall discussion and expert informants both pointed out that the free availability of acid used to process rubber also poses threats to broader society, especially children and women. Participants in town hall discussions described incidents where children drank or were severely burned by acid that was not being stored properly in their homes, as well as incidents where acid was used as a weapon against women in domestic violence cases.

OSH hazards from unregulated use of agrochemicals:

Unregulated use of herbicides and pesticides by untrained people may be another problem that exposes agricultural workers to OSH hazards. It should be noted that none of the farmers who participated in the OSH-LAS study said that they use agrochemicals. However, during the discussion at the Gbedin Rice Station, people complained about lack of training on the correct use of herbicides and pesticides, noting that the high burden of human and plant diseases makes swamp rice farming commercially nonviable without agrochemicals. Since

the Gbedin Rice Station was founded in the 1970's as a flagship for modern rice production, the families there expressed bitterness at having been "abandoned" by the GOL and donors, and left to revert to semi-subsistence low-input low-output production.

Although the farmers at Gbedin Rice Station did not claim to use agrochemicals, the possibility that some of the larger rice farmers may be using them without training or safety standards came out in an interview with the Nimba County environmental protection officer, who reported that agrochemicals are being sourced through Guinea. The issue needs to be looked at carefully to see how widespread the use of herbicides and pesticides really is, and to develop responses that support farmers to transition to environmentally safe and sustainable uses of modern inputs. Failing to do so will only punish the farmers in Liberia who are most committed to modernizing the agriculture sector.

OSH hazards from fire, heat, toxic gasses while burning charcoal: Charcoal burners are among the most vulnerable workers in Liberia, and passionate comments at OSH-LAS town hall

meetings were made when people talked about charcoal. "We have nothing but our bodies, our bodies between us and starvation. That is why we have to throw ourselves into this work, that is why we have to sacrifice our bodies" and "It is only poverty that forces us to do such things" are two examples. The first systematic study to focus on charcoal in Liberia was released in May, 2015 [29] and validates the ARCH study's observations about OSH hazards in this value chain.

Charcoal production is a technically demanding process that begins with digging a large shallow depression, called a "coal bed," where the charcoal is produced. The wood being turned into charcoal is tightly stacked in the center of the bed and then covered with layers of dirt and grass. The covered stack (or "oven") is ignited and monitored to ensure that no air gets in, because if that happens the wood turns to ashes and the investment is lost. When the charcoal is done it is raked out and doused with water. The cooled charcoal is packed into sacks and head-loaded to bulking points for pickup by charcoal traders. Charcoal burners, often with their wives and children, live at the charcoal producing site for days at a time to monitor the burning oven and then cool and pack the charcoal.

Every step of the charcoal value chain includes hazards. As already mentioned, crushing and cutting injuries occur when cutting, hauling and stacking wood for charcoal ovens. Burning ovens shoot off hot sparks and emit toxic gasses (including carbon monoxide). Burning ovens also have to be checked to make sure that no holes in the dirt cover have developed. According to OSH-LAS informants, this is the most dangerous task of all, since it involves climbing a ladder propped against the burning oven to inspect the top. Whenever charcoal was discussed, there were grim jokes about people falling into badly constructed ovens. The jokes were discounted until an informant verified the reality of the accident with a description of a recent incident that he had personally witnessed, of a 14 year old boy who was burnt to death when he climbed on top of a burning charcoal oven to check it for his father.

Exposure to intense heat and hot steam when the charcoal is raked out of the oven and doused with water are not life threatening, but people are scalded and many complain of eye damage from the heat. People packing charcoal have no protection from coal dust. The coal bed itself is dangerous because of sleep deprivation, toxic gas, hot sparks and the hot ground of the coal bed, and in general because of the proximity of the fire.

Data on injury rates among charcoal burners was collected by Jones [29] Out of 160 individuals (128 men, 36 women) surveyed from communities with high concentrations of charcoal burning households, there was a 75% injury rate among all respondents. Injuries included "moderate to severe lacerations and burns that, in a developed context, would require immediate medical attention." Furthermore "lack of treatment often limits participation in

income generating activities for long periods of time, usually due to infection. In three instances respondents reported the death of a colleague due to these working hazards.” [29]

OSH hazards from environmental pollution and trash: Water pollution from mining, erosion and human waste, as well as widespread strewing of trash across the landscape, also have implications for the health and safety of Liberia's agricultural workers. The issues of exposure to human waste has already been discussed. Beyond human waste polluting streams, which informants acknowledge happens, informants in Todee also believe that the streams in their vicinity are being polluted by chemicals from nearby iron ore mines being run by a Chinese mining company. Rubber tappers also cause water pollution via a widespread practice of washing and then sometimes storing field processed latex in streams, allowing sulphuric acid and ammonia to leach into the water [16] Soil erosion of the steep hillsides where rubber and upland rice are grown is also a serious problem, and this is directly related to slash and burn farming practices. [16]

Finally, it is common to see trash littering the land off of the main roads: broken glass bottles, rusted chunks of metal, etc. There are no data on the extent of the problem, in particular if trash is concentrated mainly along main roads, or if it extends into the bush. But in several of the town hall discussions participants talked about stepping on sharp trash in the same contexts that they spoke about stepping on sharp stumps, and there were several firsthand accounts of foot injuries, some of them very serious, caused by broken glass.

OSH hazards from sub-standard and faulty equipment: Old or defective equipment is common in Liberia and exposes the agricultural labor force to risks in any situation where power machines are used, where products are boiled in containers or containers are used to transport dangerous substances, or where rope harnesses are used. As is the case with chemicals, there are no training programs, standards, regulations or enforcement mechanisms to ensure that the equipment used by agricultural workers is safe.

Sugar cane mills: Problems with sub-standard equipment are most egregious in the cane-alcohol industry, where diesel-powered crusher mills are used to extract cane juice. It is common for mill owners to have 13 to 18 years old male youths operating the mills. The work involves hard, repetitive motion, lifting and guiding stacks of cane along a short moving belt into rotating crusher rods. There are no regulations that mandate the use of safety guards on the milling machines to protect the boys' hands, no limits on the number of hours that boys can work, and nothing to prevent the boys from consuming alcohol. This combination results in what OSH-LAS study informants regularly described as among the most exploitive labor conditions in Liberia, leading to a small but notable cadre of young men who have lost their hands and sometimes parts of their forearms to accidents with sugar cane mills. As with other

injuries, there are no reliable frequency data on hand and arm maiming linked to the sugar cane alcohol industry. But according to farmers from Dingamo, who specialize in sugar cane and alcohol production, a boy is maimed this way in their general vicinity about once every one and a half to two years.

The same Dingamo farmers, both in group discussion and in an expert one-on-one interview, were open about the problems leading to this situation. Alcohol is part of the culture around mills, so the boys feeding the cane into the crushers are exposed to it and often begin drinking. Although the mills (which are imported through Guinea) come with safety guards, owners like to operate the mills without the guards, so they remove them. It was not clear why mill owners do this, but a hypothesis is that the safety guards slow down the speed with which the cane can be fed into the crushers, and so reduce efficiency. During cane harvests, mills back up, with cane growers waiting hours and often overnight in queues for their cane to be crushed. The longer cane waits before it is crushed, the lower the juice extraction ratio, so boys are under pressure to work long hours. The combination, of alcohol and long hours lifting and feeding cane into the unprotected rotating shafts of the mills, leads to inevitable accidents, where cloth from a boy's sleeve gets caught in a stack of cane being sucked into the rotor shafts, pulling the boy's hand in with it.

It should be noted that the use of boys to operate sugar cane mills violates Liberia's child labor laws, but the mill owners interviewed for the OSH-LAS study (who are from a non-ARCH community) did not seem to be aware of child labor laws—at least they did not mention them as a factor influencing behavior in the industry.

The OSH-LAS research team unexpectedly met a 20-year-old male youth on the road between Saclepea Town and Ganta who had lost his left hand in a mill accident. He was an orphan from a nearby rural community. When he was 12 years old his guardian “gave” him⁶ to a sugar cane mill owner, who acquired two other boys at the same time. The three boys started doing small jobs, but were operating the mill by the time they were 14 years old. The accident that cost this youth his hand occurred when he was 15 years old. The mill owner took the youth to the hospital and stood by him while the injury was healing. But the mill owner cut his ties with the boy when the stump healed, refusing to help him find an alternative livelihood. The boy returned to his rural community and over a few years managed to scrape together enough capital to open a small food shop.

⁶ The youth used the word “gave” to describe the transaction between his aunt and mill owner.

Oil palm climbing equipment: Sub-standard equipment is also a problem in the palm oil value chain. Oil palm accidents are related to the harnesses that climbers use to get to the tops of palm trees. The harnesses are made of flat plant fiber ropes tied into elliptical hoops. Climbers wrap part of the rope around the trunk of the palm tree and part around their lower back, and then tie the hoop together on the side, where the ends of the rope overlap. The climber leans against the rope hoop for support as he uses his hands and feet to shimmy up the slender trunk. Accidents happen when the rope comes open where it has been tied, or the fibers break from the pressure of the climber's body, or the hoop slips on the trunk. When any of these things happen, climbers fall out of the trees and onto their backs, often from 20 to 30 feet in the air. Depending on the height of the fall and the ground underneath, injuries can be very severe, including broken backs and ruptured organs. According to informants, these falls typically either kill the person, or else take several months to years to recover from, during which time the person depends on relatives for survival.



Photo: A local community member demonstrating operation of a harness used to collect palm oil.

As with other OSH hazards, there are no data on injuries caused by falls from oil palm trees. But an expert informant, from an area where most men harvest palm, estimated that 10% - 15% of all palm harvesters have a traumatic accident. All of the OSH-LAS study town hall discussions included second-hand accounts of falling accidents, and there were at least three participants who had survived these falls.

Other sub-standard equipment: Although the cane-alcohol and palm oil value chains have the most visible instances of OSH hazards caused by sub-standard equipment, the problem exists throughout the non-concession agriculture sector. For example, chain saws are often missing safety guards and containers used for transport and processing are frequently old and rusty. Informants said that accidents occasionally occur because faulty cane juice distilling rigs explode. Palm oil processing involves boiling palm fruits in large metal drums over open fires in the bush, and old drums can be hard to balance. These factors create a risk that drums will tip over, spilling scalding water or actually bursting. Finally, containers that non-concession rubber

tappers use to carry sulfuric acid and ammonia are frequently sub-standard, without any way to seal or close them.

OSH hazards in the motorcycle transport sector: The main risk from riding motorcycles is of accidents caused by poorly banked and badly rutted roads, which are especially dangerous during the rainy season. The danger from roads is amplified by the common practice of overloading motorcycles with excessively high and wide cargo, making them hard to balance and to see around. According to OSH-LAS informants in Margibi, there have also been incidents in the past few years when motorcycle riders, who went into the bush to pick up produce for farmers, were ambushed and murdered by thieves who stole their motorcycles. Based on the motorcycles on the road and on informal head counts of motorcycle boys idling at stands in Kakata and Ganta, use of helmets by motorcycle riders is quite common, although not universal. However, it is unusual to see a passenger with a helmet.

12. Exposure of population sub-groups to different agriculture hazards

Exposure to agricultural hazards happens when people engage in agricultural tasks or value chain activities that are hazardous (as described in Section 11 of this report). In Section 12, we use a simple method based on gender, approximate age and forms of labor organization to estimate the extent to which different population sub-groups are exposed to hazards.

In Liberia, gender and age influence the agricultural tasks that a person is likely to perform. Gender and age also influence the *ways* in which a person is likely to engage in different tasks. The organization of labor in non-concession agriculture takes different forms including: working for oneself (called own-account); working as an unpaid family laborer; working in collective labor groups, called *kuu*; and working as the informal employee of a contract boss.

In order to estimate the engagement of different population sub-groups in different tasks and value chains, we a) look at whether or not each subgroup does that task, and b) then look at the number or different ways that the subgroup engages. The number of ways that a population sub-group engages is treated as a proxy for the relative exposure of that group to the agricultural hazards that are associated with each of the agricultural tasks and value chains described in Tables 6 and 7.

In order to estimate engagement and exposure, we first define the population sub-groups that are engaged in non-concession agriculture. We then provide background on how gender and age correlate with a) the division of labor and b) the organization of labor. We then summarize and discuss findings from the OSH-LAS field study on the engagement and exposure of each sub-group in Tables 8 and 9.

Definition of population sub-groups

The population sub-groups discussed in this section of report include:

- Children from birth to 12 years of age
- Adolescents from 13 to 17 years of age
- Youth from 18 – 34 years of age
- Adults 35 years of age and older

These groups reflect ways that Liberians commonly think about relationships between gender, age and agricultural labor. Since this is a descriptive study, the groups are not based on a statistically enumerated data set. Thirteen to 17 year-olds are grouped together for the purpose of this study because, based on OSH-LAS informant narratives, children's involvement with the five study value chains is determined by their physical maturity and family circumstances far more than by their chronological age. Thirteen is used as a proxy for onset of puberty, and although Liberian children can legally work when they turn 16, they are still subject to child labor laws through the age of 17 years. At age 18 Liberians are no longer covered by child labor laws, but they do not become legal adults until they are 35 years old.

Background on gender, age and the organization of agricultural labor

Gender and agricultural labor: Traditionally, Liberian societies allocated agriculture tasks on the basis of gender. This is still true, although the division of labor by gender has broken down since Liberia's civil war, when women farmers started doing tasks that only men had done before. At its simplest, men dominate and are still more likely to be involved in activities that require physical strength: cutting trees, hauling timber, fencing plots and burning cleared land. Women are more likely to be involved in tasks related to preparing cleared ground for seeds, planting, weeding and tending growing crops. Men fence farms and set traps to prevent rodents from eating crops. Women are responsible for preventing birds from eating crops. Men and women work together to harvest and store crops. Today, although many women work on male tasks, especially on their own farms, it is less common for men to work on female tasks unless it is for wages.

The division of labor by gender is still rigid in tasks that involve use of machines, as males dominate any activity that is mechanized. Hence, among the five study value chains, it would be highly unlikely to find a female working as a cane mill operator. Likewise chain saw operators, truck drivers and motorcycle drivers are almost always men. The division of labor by gender is also still strong in the palm oil value chain. Climbing palm trees to harvest fruit is done by boys and men. Processing and trading palm oil are both dominated by women. Boys, girls, men and women all participate in most aspects of rubber and charcoal production.

Age and agricultural labor: Traditionally, Liberians believed that children were duty-bound to provide labor to their parents in exchange for being raised and educated. Today the use of child labor is also perpetuated and exacerbated by extreme poverty [16, 17]. As a result of both factors, child labor in non-concession agriculture is still very widespread [1]. Little children start by helping with easy tasks like picking up stones, but are expected to help with harder and harder tasks as they grow [16,17].

For most Liberians, onset of puberty triggers a shift in a child's status in regard to agricultural labor, regardless of chronological age [16, 17, 18]. In this context, it should be noted that less than 25% percent of all Liberian children under the age of five years had had their births registered when data for the 2013 Demographic and Health Survey was collected in 2011-2012 [11]. Birth registration was even lower among age-cohorts born during the civil war, so chronological age can be difficult to establish and is not a salient or meaningful marker of children's status for most rural Liberians. Children are expected to start helping their families with *all* agricultural work when they reach puberty and are physically strong, regardless of precise chronological age. In addition to helping their families, adolescent children (especially boys) work as employees of contract bosses and sell their labor via kuus [16, 17].

In Liberia the legally defined youth cohort between 18 and 34 years of age are neither adults nor children. For many youths, access to land is a problem, but they sell their labor as employees and through kuus and try to invest in their own enterprises when possible.

Adults are legally defined as people who are 35 years and older. In terms of cultural ideals, an adult is someone who has secure access to land and to other economic assets. Although adults engage in gender appropriate agricultural tasks, they are also more likely than are younger age cohorts to hire others, either through kuus or as employees, to work for them.

Discussions with OSH-LAS study informants suggest that there is a fourth group: that of seniors or elders. Older Liberians who have farmed all their lives and who are often burdened with chronic pain from old injuries, want to retire from active agricultural work, while still maintaining control over their farms.

Forms of labor organization in non-concession agriculture: Agricultural work is organized in different ways that are defined on the basis of who one is working for, whether or not one is being paid for the work, and whether or not one is working in a kuu or as an individual employee. Own-account workers are people who work for themselves and who control the crop, product or income from the work. Heads of household enterprises and individuals running their own informal small and medium enterprises (SMEs) are typically classified as own-account workers. Unpaid family labor is mostly provided by spouses, children, or other dependents of own-account workers.

Kuus are generally groups of 10 – 30 people who join together for a pre-specified length of time and purpose, either to provide collective labor on each other’s farms in rotation, or to sell their collective labor to third parties for cash income. When a kuu is hired, the contract is negotiated by the kuu boss or queen for the whole group, similar to unions and collective bargaining. A person who hires a kuu is not in the same category as a contract boss, because they are hiring a collectively organized entity for a short period of time. The use of kuus is very common; it provides farmers with a flexible way to source and manage their labor needs, at the same time as providing many of the same people with a way to earn cash income by selling their labor.

In contrast, a person who hires someone directly is functioning as a contract boss and the person who works is the employee. Most contract boss-employee relations in non-concession agriculture are informal, in that there is no legally enforceable contract.

Summary tables of engagement in agriculture task and value chains by population subgroup and type of labor organization ⁷

Table 8 presents findings on how population sub-groups are likely to be engaged in agricultural tasks that are common across multiple value chains. Together with Table 6, it provides a snapshot of hazards each population group is exposed to while engaged in basic agricultural labor.

Table 8. Engagement in agricultural tasks by population sub-group and type of labor organization

Sub-group	Clearing Land, Hauling Logs, Fencing	Preparing Land for Planting
All Children 5 – 12	uncommon	family
Boys 13 – 17	family, kuu	family, kuu
Girls 13 – 17	uncommon	family, kuu
Male Youth 18 – 34	own-account, kuu	own-account, kuu
Female Youth 18 – 34	family, own-account, kuu	family, own-account, kuu
Male Adults 35 +	own-account, kuu	own-account, kuu
Female Adults 35	family, own-account, kuu	family, own-account, kuu
Sub-group	Planting and Weeding	Pest Control
All Children 5 - 12	family	family
Boys 13 – 17	family, kuu	family
Girls 13 – 17	family, kuu	family
Male Youth 18 – 34	own-account, kuu	own-account, kuu

⁷ The data in Tables 8 and 9 are best estimates of practices based on *descriptive narratives*. They are not quantitative data.

Female Youth 18 – 34	family, own-account, kuu	family, own-account, kuu
Male Adults 35 +	own-account, kuu	own-account, kuu
Female Adults 35	family, own-account, kuu	family, own-account, kuu
Sub-group	Harvesting	Brushing
All Children 5 - 12	family	uncommon
Boys 13 – 17	family, kuu	family, kuu
Girls 13 – 17	family, kuu	family, kuu
Male Youth 18 – 34	own-account, kuu	own-account, kuu
Female Youth 18 – 34	family, own-account, kuu	family, own-account, kuu
Male Adults 35 +	own-account, kuu	own-account, kuu
Female Adults 35	family, own-account, kuu	family, own-account, kuu

Note – Table 11 applies to all basic agricultural tasks regardless of crop; but in the context of this study, it specifically applies to upland and swamp rice, and to the production of sugar cane itself.

Table 9 presents findings on how population sub-groups are likely to be engaged in specific value chain activities. Together with Tables 7, it provides a snapshot of hazards each population sub-group is exposed to while working in key value chains.

Table 9. Engagement in value chains by population sub-group and type of labor organization

Sub-Group	Burning Charcoal	Tapping Rubber	Harvesting Palm Fruit
All Children 5 - 12	family	family	uncommon
Boys 13 – 17	family	family, kuu	own-account, family
Girls 13 – 17	family	family	uncommon
Male Youth 18 – 34	own-account, employee	family, kuu, employee	own-account
Female Youth 18 -34	family, own-account, employee	family, kuu	uncommon
Male Adults 35 +	own-account, employee	own-account, kuu, employee	own-account
Female Adults 35	family, own-account, employee	family, kuu	uncommon
Sub-Group	Processing Palm Oil	Operating Cane Mills	Distilling Alcohol
All Children 5 - 12	family	uncommon	uncommon
Boys 13 – 17	family	employee	family, employee
Girls 13 – 17	own-account, family	uncommon	uncommon
Male Youth 18 – 34	own-account	employee	own-account, employee
Female Youth 18- 34	own-account, family	uncommon	own-account, family
Male Adults 35 +	own-account	mill owners	own-account, employee
Female Adults 35 +	own-account, family	uncommon	own-account, family

Sub-Group	Operating Chain Saws	Operating Motorcycles	
All Children 5 - 12	never	never	
Boys 13 – 17	uncommon	employee	
Girls 13 – 17	uncommon	uncommon	
Male Youth 18 – 34	own-account, employee	own-account, employee	
Female Youth 18 –34	uncommon	uncommon	
Male Adults 35 +	own-account, employee	own-account	
Female Adults 35	uncommon	uncommon	

Discussion of population sub-groups engagement with agriculture from OSH-LAS field study informant narratives

Children before puberty – Table 8 engagement in agricultural tasks: In terms of basic agricultural tasks, pre-pubescent children “belong to women” [18] which means that they are expected to help their mothers with their work. The basic picture is of a child accompanying her/his mother to the farm to help prepare soil, plant and weed. Bird-scaring was the only specific task that OSH-LAS informants described as associated with pre-pubescent children, although older people also do it.

Although not mentioned by OSH-LAS informants, children are exposed to insect and snake bites, drinking “bush water” and poor nutrition while working on farms, especially when it is far from their homestead. There were also many young Liberian children with blades in all the rural communities visited by the OSH-LAS research team. Although the exact age that children typically start using them was not ascertained, it is common to see youngsters walking along with knives, cutlasses or machetes of all kinds. Since very few children wear covered shoes or long pants and sleeves, exposure to blade and puncture wounds and to skin problems begins early in life.

Children before puberty – Table 9 engagement in value chains: Children are involved as family labor in charcoal burning, rubber tapping, and processing palm. From a public health perspective, charcoal and rubber pose the greatest threats to children, charcoal because of inhalation of toxic gasses and heightened exposure to malaria and diarrheal disease, and rubber because of exposure to acid. Of the two, charcoal may be the worst, because it has not received the attention from the international community, donors, or GOL MDAs and Liberian CSOs that child labor in rubber has received. According to Jones, 57.1% of the charcoal producers that he and colleagues surveyed (N=160) routinely utilize child labor in the production phase, in the charcoal beds while the coal is being burned [29].

Although children's roles only involve hauling water and then sorting and packing the finished coal, they live in the coal beds with their parents for the three to four days and nights it takes to produce an oven of coal. According to OSH informants, children's common injuries come from stepping on hot rocks and cinders; but exposure to toxic gasses and coal dust may be much more devastating in terms of long-term damage to children's physical, mental and cognitive development. The combination of being withdrawn from school and exposure to toxins has grave implications for charcoal burning communities. As stated by Jones "The forecasted



Photo: Children carrying machetes while wearing no safety equipment is a common sight throughout rural Liberia.

increase in charcoal demand in coming years may expose more children to serious injury, while preventing them from engaging in educational activities, unless the social effects of energy production are holistically considered in national policies" [29].

Adolescent boys 13 – 17 – Table 8 engagement in agricultural

tasks: When boys reach a point in their development where they are perceived as physically mature and strong, they are considered fit for hard agricultural work. At the same time, boys this age are still considered children, in the sense of being duty-bound to provide labor to their parents. This ambiguity in their status means that they can be called on for family labor on all tasks, regardless of the task's gender association. Adolescent boys also work in kuus formed by adults and establish kuus of their own as a way of earning money for themselves.

Adolescent boys 13 – 17 – Table 9 engagement in value

chains: According to OSH-LAS study informants, post-puberty boys work in all value chains as well as in motorcycle transport, and are often involved in the most dangerous activities within those value chains. Once again, the ambiguity

of their status as physically strong but still "children" means that they are exposed both to opportunity and to exploitation. The ways that adolescent boys engage varies by value chain. According to informant narratives, adolescent boys work on all aspects of charcoal production as family labor, including building the piles and checking the burning ovens for air leaks, so in addition to toxic gasses, they are exposed to immediate risk of serious injury or death.

Adolescent boys tap rubber as family labor and they also form kuus to tap rubber in exchange for money. According to an expert informant from GAAWUL, the one area that adolescent boys do not work is as employees of the concession bosses who are sub-contracted by the big

plantations. International attention paid to child labor in rubber has made concession bosses careful not to hire males that could be younger than 18 years of age. However, there are no similar scruples, nor attention paid to precise chronological age, in the non-concession agriculture sector.

Harvesting palm fruit, which is very dangerous, is almost always done by adolescent boys and men. Boys harvest palm as unpaid family labor both for their mothers and girlfriends, and harvest for their own-account to sell the fruit bunches to women who process and bulk palm oil as a small business. The key in oil palm harvesting is that it is a solitary activity that takes no start-up capital, so entry is easy. However, the solitary nature of the work increases the danger, since if there is an accident it can be hours before the boy is found. Adolescent boys and men also harvest oil palm bunches as employees or in kuus for pay for local owners of cultivated oil palm farms, which are becoming increasingly common.

Adolescent boys as young as 13 are targeted for operating the mills used to crush sugar cane for cane juice, and it is here that their potential for being exploited is most acute. As was true of the boy described in Section 11, boys who are employed in cane mills are typically from disadvantaged circumstances, which adds to their vulnerability. As well as operating the mills, these boys often help distill the mill owner's share of cane juice as part of their jobs. According to informants, alcohol addiction is common among boys who have worked at mills.

The motorcycle transport sector is also a prime employment target for adolescent boys, who start off working for contract bosses who own fleets of motorbikes. But here, in the opinion of both boys and adults, the balance between opportunity and exploitation falls on the side of opportunity. Rural boys who go to urban centers dream of becoming motorcycle drivers since the pay is lucrative compared to any other employment, and there are opportunities to advance for anyone who works hard. The sector also provides a crucial farm to market transport for agricultural goods, so between that and the good pay, motorcycles boys gain status and are objects of admiration and envy in their homes communities. But there are risks, especially for boys who choose not to wear helmets or protective clothing, apparently underestimating the severity of the associated hazards coupled with police inconsistency of enforcing the use of helmets by motorcycle riders.

Adolescent girls 13 – 17 – Table 8 engagement in agricultural tasks: The exposure of adolescent girls to work on basic agriculture tasks is similar to that of boys, except that they are not as likely as boys to work in male gendered area such as tree felling. As with boys, their engagement in basic agriculture tasks is mainly as family labor or through kuus.

Adolescent girls 13 – 17 – Table 9 engagement in value chains: Adolescent girls engage with specific value chains in very different ways than boys do, mostly because the gender-based

division of labor is still very strong in relation to work that is mechanized or has a motor element to it. As a result, girls do not face as much overt exploitation as boys, but at the same time girls do not have positive opportunities to earn income or to invest in assets that boys have.

There were no instances in OSH-LAS informant narratives of adolescent girls working on charcoal production as unpaid family labor, but this should not be taken to mean that they don't. Instead it may mean that they are not as likely as boys to perform the most dangerous tasks. When adolescent girls tap rubber it is mostly as unpaid family labor. Girls do not work at mills and there were no instances where OSH-LAS informants spoke of girls distilling alcohol, although girls may do so as unpaid family labor. It is also extremely rare to see girls driving motorcycles.

It is unusual for girls to harvest oil palm bunches, and there were no stories of girls falling out of palm trees (as there were many for boys.) However, girls do process oil from the palm fruits. While this involves exposure to long hours of backbreaking work in the bush, it is also the only value chain node where girls can earn their own income through direct productive activity, as opposed to petty trading and food preparation which are female gendered economic spheres.

Male youth 18 – 34 – Table 8 engagement in agricultural tasks: Male youth actively contributed to all the town hall discussions held for the OSH-LAS field studies. This cohort appears to dominate work on tasks that require strength and stamina, so are especially involved in land clearing. It is not clear to what extent male youth work as family labor or in reciprocal labor *kuus* for parents or in-laws who control land, work as own-account farmers on land that they themselves control, or sell their labor to other farmers. But comments in town hall meetings and focus group discussion suggest that selling labor through *kuus* to older farmers may be fairly common and also may be a flash-point in inter-generational conflict around the transmission of control over land and farm management from older men to younger men. During one of the town hall discussions elderly rice farmers complained that wages being paid to male youth for labor was too high. Later, in a follow-up focus group with male youth, the youth leader described the difficulties that young men who want to farm are having with the older men who still control the land and most farm management decisions. According the male youth, older men do not want to try out new ideas and are resistant to change. [16, 17]

Male youth 18 – 34 – Table 9 engagement in value chains: The 2015 male youth cohort (IE: between 18 – 34 years of age in 2015) was born between 1981 and 1998, and so grew up during Liberia's civil war. In terms of value chain participation, they appear to be highly mobile both physically and economically, working in charcoal, as rubber tappers, as oil palm harvesters

and as chain saw operators. They also distil and sell alcohol, work in transport as contract bosses and employees, and in mining, forestry and in informal SME employment in towns.

Expert informants commented on the vulnerability of this cohort, and the life history of a male youth from this age group conformed to this trope. He had moved between mining and charcoal production trying to support a wife and young children with no access to land or help from family. He put all his capital into charcoal, but the charcoal trader failed to pay him after she had picked up the load (a common story) so he lost everything and went to work in Kakata for daily wages that barely provided enough to survive, let alone save. The youth advocate in Kakata Town, from the Ministry of Youth and Sports, said that this cohort's extensive involvement in charcoal production is because of their inability to find better livelihoods.

Women in the Todee District town hall discussions said that some of these young men move from one rural community to the next. They marry wives in different places to gain access to trees and labor for charcoal burning; then, when the resources to make charcoal are used up, they move on, deserting the woman and children they sired.

Female youth 18 - 34 – Table 8 engagement in agricultural tasks: Female youth put long hours into all areas of agriculture as family labor, for their own-account farming and in reciprocal and paid kuus. Most females in the 18 – 34 year old cohort have young children, so in addition to farming they put long hours into childrearing and domestic work.

OSH-LAS study informants said that in their experience, both youth and adult women are more vulnerable to injuries and waterborne diseases from rice farming than other population sub-groups, since women are the ones who tend rice day in and day out for the 9 months required to produce a crop. The women in the all-female town hall discussion in Yarsonnoh said that most of their injuries and sickness come from working on rice. Since almost 75% of agricultural households in Liberia grow rice (see Table 1) the public health impact may be significant.

During the same all-female town hall discussion an old woman, who was a mid-wife in the community, talked about the impact on children when young mothers are injured or become sick from farming. Mothers were described by Liberian research partners as the heart of Liberian rural households [16]. They do most of the cooking and cleaning and are the ones to make sure that children are fed, bathed and ready to go to school. When young mothers are too injured or sick to work, as in the case studies described in Section 11, the burden of work both inside and outside the house falls onto their children. The old midwife's point was that young mother's burden of injury and sickness from their agricultural work puts a severe strain on families, with especially adverse impacts on their children's wellbeing.

Female youth 18 - 34 – Table 9 engagement in value chains: Because of ways that economies in West Africa, including Liberia's, are divided based on gender, female youth engagement in

value chains is much more limited than that of male youth. Female youth burn charcoal and tap rubber, mostly as family labor or for wages. Since charcoal wholesaling and trading are female activities, young women may also work as agents for urban charcoal wholesalers and traders. Female youth are involved in the palm oil value chain as processors and traders, but they rarely climb trees. Females do not operate chain saws, work in transport, nor operate sugar cane mills, although they may distill alcohol for personal use or sale as unpaid family labor or as an own-account activity. Petty trade in foodstuffs and food preparation for tea shops or restaurants are both spheres that are dominated by young females.

Male adults 35 and older - Table 8 engagement in agricultural tasks: Adult men, especially those in local leadership roles, were very active participants in all the OSH-LAS field study town hall discussions, so most of the discussion of injuries and sicknesses caused by exposure to OSH hazards in non-concession agriculture were based on their own experience and the experiences of their families and community members. Adult men's engagement in agriculture is similar to that of male youth 18 -34. Although they engage in all tasks, as a generalization they concentrate on activities related to land clearing, fencing, trapping rodents, brushing and other heavy work. Men are not as involved in the daily work of soil preparation, planting, weeding and tending field crops as women are, which is why women may be at higher risk of diseases associated with rice production than men. Men who are 35 years and older are more likely than younger men to be working on farms that they themselves own. Adult men participate in kuus, especially reciprocal kuus where the members work on each other's farms in rotation, without cash changing hands. But the option of forming kuus to sell labor for cash to third parties is available to everyone, so it would be surprising if adult men did not also do this.

One important observation about men 35 years of age and older was the extent to which they have chronic pain from old farming injuries. Many of the older men's narratives included descriptions of injuries that they had had over their lifetime of work in agriculture: falling out of trees and nearly dying, thorns permanently embedded in their hands or feet, deep scars from acid burns, permanent limps from legs that were crushed or broken which never healed properly. What became clear thinking about older men's narratives, is that the burden of pain from OSH hazards in non-concession agriculture is not limited to the time that an accident occurs, or to the time it takes for an injury to heal superficially. For many Liberians, the burden continues in the form of chronic pain that takes its toll for the rest of their lives.

Male adults 35 and older – Table 9 engagement in value chains: Adult men are involved in all value chain activities. They burn charcoal, harvest and process palm oil and distill alcohol both as own-account activities and as employees of contract bosses. They work with chain saws, sugar cane mills and in transportation as both owners and as employees of SMEs. Rubber appears to be the only value chain where kuu groups are common, where people sell their

labor through kuus to commercial rubber farmers. Non-concession rubber also includes own-account and family labor, as well as concession bosses and employees.

Female adults 35 and older – Table 8 engagement in agricultural tasks: Adult women were also active participants in all of the OSH-LAS field study town hall discussions. Like their male counterparts, their engagement in agricultural tasks is also very similar to that of younger women ages 18 – 34 years of age. However, there are some important differences between older and younger women worth noting. By the time most women are 35 years old their children are no longer young, so they have time to concentrate on farming, and many are serious farmers. More and more, women in this age group who have accumulated some assets or who have rights to land in their natal communities are investing in their own-account tree farms. In 2010, 15% - 20% of tree crop farms belonged to women (Table 1) and the proportion has likely risen since then. None of this impacts adult women's engagement in agricultural tasks, but it does mean that they are more likely than younger women to be own account workers and to hire labor either directly or through kuus. Whereas younger women are more likely than older women to work as unpaid family labor and to sell their labor.

As with older men, many older women are in chronic pain from a lifetime of injuries. The injuries that women carry into old age may be slightly different from men's, just as their exposure to agricultural tasks is slightly different. While men are more likely to experience trauma from felling or falling out of trees, women are more likely to have long-term skeletal injuries and deformities from a lifetime of bending over in rice fields and carrying heavy loads on their heads.

Female adults 35 and older – Table 9 engagement in value chains: Adult women work in charcoal, rubber, oil palm, and alcohol, but they are unlikely to be involved with SMEs involving machines or transportation, including chain saws, mills or motorcycles. Like men, their participation spans the range of working for their own account, working for others as employees, and having SMEs of their own where they employ others. Many of the older women who participated in town hall discussions in Todee and Kakata districts are widows. In addition to all the other hazards with charcoal burning, this group is vulnerable to losing their investments because they lack the strength to pack or supervise coal ovens properly. Several older women described the intense emotional and economic shock that they experienced when their ovens turned to ashes, saying that for them this is one of the significant hazards of charcoal production.

13. People's perceptions of hazards and protection measures they take

The second objective of the OSH-LAS field study was to describe agriculture workers perceptions of common agriculture hazards and measures they take to mitigate risks that they

face while performing agricultural tasks. In this section we discuss people's awareness of the hazards discussed in sections 11 and 12, the main methods people use to mitigate hazards, where they go for medical treatment, and some of the underlying issues related to perceptions of and attitudes towards OSH hazards in the five study value-chains.

People's awareness of hazards

The town hall discussions were the main forum for probing people's awareness and perceptions of the hazards they face doing agricultural work. The Liberians who participated in these meetings, most of whom are farmers, are very aware of the hazards they face in the work they do. They know the kinds of injuries that are caused by each type of agricultural task and in each value chain node or activity, and they know that the consequences of being injured can be dire for themselves and for their families who depend on their labor. However, they are unaware of hazards that are outside of their cultural framework and some risky behaviors are so common that no one notices them. For example, there was a lack of awareness regarding the potential damage to children's cognitive development that can happen when children inhale the toxic gasses that are released during charcoal burning. In addition, a lack of recognition that Liberian children everywhere carry and use sharp bladed cutlasses while wearing only short pants and open toed sandals. The conclusion is that these behaviors are ingrained enough into community practices to be overlooked as potential risky behaviors.

Factors that interact with hazards to increase risk of injury

Informal estimates by OSH-LAS study participants suggest that 60% - 80% of all agriculture and value chain related injuries occur when people are drinking. Drinking alcohol while working in kuus is an old practice, and still today most kuus expect to be supplied with alcohol, along with food, by the farmer for whom the work is being done. The kuu boss or queen decides when the alcohol will be given out, but distributions usually start in the morning and go on every hour or so for the rest of the day. People who work at sugar cane mills have a reputation for drinking and professional rubber tappers also have a reputation for being alcoholics. Some commercial rubber farmers will not provide protective gear to their tappers because when they provided it in the past, tappers have sold it for alcohol. There were no descriptions of drinking in other contexts, and people actively said that drinking while burning charcoal is very unusual.

Although alcohol was the most frequently mentioned factor that interacts with hazards to increase the risk of injuries, people also said that sleep deprivation, worry about personal and family needs, depression and hunger also prevent them from focusing on their work, and this lack of mental clarity is dangerous. Sleep deprivation was mentioned in every town hall meeting as a serious problem for charcoal burners.

Preventive measures people take to reduce their risk of being injured

Participants in town hall discussions were asked what they do to prevent injuries. Over and over, the answers were the same: cutting out alcohol consumption while working, and using “Personal Protective Equipment” or PPE (people commonly use the acronym PPE to refer to any protective gear worn on the body). Other than refraining from drinking alcohol during kuu work, PPE is the main recourse people have to protect themselves from injuries. PPE includes loose rubber boots, eye goggles, gloves, long pants and long-sleeved shirts that are all available in markets throughout Liberia. Most Liberians wear open toed sandals, short-sleeved shirts, and sarong, dresses, skirts or pants for women and pants or shorts for men, so PPE is distinct from everyday clothing.

Based on observation during the field study, use of rubber boots is fairly common, but by no means universal. With the exception of motorcycle helmets, there were no instances observed where people were obviously using other PPE clothing, but that may be because articles such as goggles or gloves are only worn when people are actively working. Women in the one all-female town hall meeting buy heavy denim pants and long-sleeved shirts especially for swamp rice farming. But they also only wear socks tied up over their pant legs (to prevent leaches) when they work.

In the motorcycle sector, PPE consists of helmets, long pants and shoes that cover the feet. Based on several observational counts of motorcycle boys idling at the motorbike stations in Kakata and Ganta towns, at any given time approximately one to two thirds had helmets on their heads or on their bikes, and most had on long pants and appeared to be wearing shoes; but it is uncommon to see motorcycle passengers wearing helmets or covered shoes.

Use of PPE is a personal choice that requires a cash investment. Some people may not have money to buy PPE, or they have to use their money on other things, for example food for basic survival. Others may choose to ignore risks and not purchase or use PPEs because they are badly designed and get in the way of their work, which appears to be the case with the women farmers in Yarsonnoh who do their swamp work in socks.

In several town hall discussions people were asked why some people use PPE and others do not. Answers were consistent: since the expense of PPE is borne by the individual, most people are not motivated to use PPE until they themselves have had a serious injury or accident. For example, one woman purchased and started to use goggles for rubber tapping only after falling bark had seriously injured one of her eyes. In other stories, people only started to wear boots after they had had a serious cut or puncture wound on their feet.

Seeking help for injuries

Beginning with the first county stakeholder meeting in Kakata, and then in virtually every town hall discussion, participants in the ARCH – OSH field study talked about where they go for medical help for injuries or illnesses that are too serious to heal by themselves. Rural Liberians who are injured during the course of their work appear to have a range of options, including traditional bone setters and herbalists, western clinics and hospitals and a category of itinerant traders called “black baggers” who move from market to market selling a wide assortment of



Photo: Most town hall meetings witnessed at least 10 to 20 participants who came with injuries or illnesses.

western and indigenous medicines. How frequently and under what circumstances these different options are used was beyond the scope of this study to determine, but in general the choice appears to be based on several factors. These include convenience, cost, type of injury and who in the area has a reputation as the best healer.

Several individuals avowed their faith in traditional bone setters, who from informant

narratives do appear to have remarkable skills. Good bone setters are especially sought in situations where people are crushed by trees or logs, or sustain broken bones from falling out of trees. However, informants recognized that traditional bone setters and herbalists are not effective with injuries involving deep cuts or puncture wounds, where infections and blood poisoning are serious risks. With this type of injury people will try to go to the closest urban clinic or hospital, either public or private depending on their financial means and the available options. Although there are clinics in rural areas, feedback from informants suggests that rural clinics are often without trained health workers or medicine. Informants in every community were very familiar with malaria, bilharzia, schistosomiasis and tetanus, and named these diseases by their western names. As with deep cuts and puncture wounds, people seek western medicine when it is available, but most informants also had relatives or neighbors who died because these conditions went untreated.

Charcoal burners across the study described a flu-like malaise which they experience after they have been burned charcoal, which they call “thick blood.” Charcoal burners try to protect themselves from “thick blood” by drinking oil before they fire an oven, which is of doubtful efficacy. More to the point, several elderly women said that they spend most of the money that they make from selling charcoal on medicine from black baggers, in an effort to ease the pain in their bodies.

Passivity around improving OSH conditions in non-concession agriculture

Another important topic probed during town hall discussions was whether or not people *proactively* talk among themselves about the dangers of their farming and value chain work, both in order to teach younger people about the dangers; but also to identify new or improved farming practices that would be less dangerous. Answers to the first question were ambiguous. Yes, people do talk about dangers among themselves, but it is usually after someone in their community has a serious accident. It was not clear if elders try to educate young people about dangers in farming, or try to teach safety to post-puberty adolescents, who are starting to engage in adult tasks for the first time. The impression from participant narratives is that there is no widely available system to train people of *any age* about safety measures in the five study value chains.

When probed to see if people ever *proactively try to identify new ways of doing things that are less dangerous*, answers appeared to be no. For the most part people *do not* proactively try to identify new ways to do tasks in order to reduce the risks of injury. Two examples of this are danger during land clearing from falling trees and danger while harvesting oil palm in the bush. People could reduce the risk of being hit by falling trees just by developing safety protocols to make sure that everyone is out of the way before a tree is cut. In palm harvesting, people work alone and some are not careful to make sure their climbing harness is in good condition before they climb. Informants observed that even a public awareness campaign to encourage boys to work in pairs and to raise awareness about the importance of checking climbing equipment would reduce injuries from palm harvesting.

The question of *why* people do not try to modify or adapt their farming and value chain production practices to reduce the risks of injury is beyond the scope of this study. But the OSH-LAS research team did ask OSH-LAS study participants if anyone else has spoken to them about the OSH hazards in their farming practices. The vast majority said that the OSH-LAS research team was the first time anyone has *ever* asked them about the hazards and injuries they experience while working in agriculture. To the best of their knowledge, neither donors nor GOL MDAs have shown any interest in these issues. Furthermore, most of the study participants, especially those who were well informed, said that there are no GOL laws or regulations to improve the safety of the agricultural labor force.

The exception to the pattern of silence in regard to safety issues is in the motorcycle sector. Informants in Kakata described a program which teaches boys about the risks of motorcycles and emphasizes good safety practices. But as the informant pointed out, after the boys complete the program there is nothing to force them to use the safety measures they learned, so some backslide.

Lack of regulation and enforcement of OSH standards

Some of the best informed and most thoughtful participants in the OSH-LAS field study pointed to the lack of government regulation in the area of OSH standards for the agricultural labor force particularly in the non-concession agriculture. They pointed to this gap in three crucial areas:

- Lack of training or professional standards for agricultural workers
- Lack of standards for equipment used for agricultural and value chain tasks
- Free availability of dangerous chemicals on the open market

They further pointed out that the lack of leadership of the society creates an environment where the devaluation of human life is commonplace, and where no one is held accountable or tasked with responsibility to improve the situation. There are no laws or regulations to hold anyone accountable for their own safety or for the safety of their unpaid family workers, for the safety of people working in kuus, or for the safety of their employees; nor are there legal consequences if people are injured. As a result, whatever safety measures that are taken, are up to the individual person.

At this point in time there is no way to estimate the burden of injury, morbidity or mortality in Liberia that is caused by unsafe and hazardous conditions in agriculture, nor is there any way to estimate the social and economic costs of agriculture related injuries, morbidity and mortality. This absence of data contributes to the invisibility of OSH hazards in agriculture as an issue. Although data on the incidence of different diseases and conditions is collected at public clinics and hospitals, public health data management systems are not designed to link it back to the cause of the sickness or injury as it may relate to agriculture [35]. Furthermore, because many people do not even go to public clinics or hospitals, and because rural communities do not have to register deaths with public hospitals, health sector data alone would only capture a partial picture of the health burden on Liberians caused by OSH conditions in agriculture [35].

14. The situation of 16-17 year old youth in relation to non-concession agriculture sector

The third research objective of the OSH-LAS study was to deepen insight into the situation of 16 and 17-year-old adolescents in relation to agriculture sector work. Previous research

conducted by the ARCH project found that there are fewer 16 and 17-year-old adolescents in rural communities in rubber growing areas than would be expected in comparison with their overall percentage of the national population. It's important to note that adolescents can legally leave school when they are 15 and the legal working age is 16. However, 16 and 17-year-olds are still protected by Liberian child labor laws. This creates a complicated situation where large employers, particularly concession companies, are unwilling to offer any type of limited employment opportunities for 16 and 17-year-olds, citing legal concerns even though adolescents this age are able to work as long as their conditions adhere to child labor laws. As a main objective of ARCH is to better serve rural adolescents with age-appropriate agro-based livelihoods programs, it was important for this study to assess the extent to which rural employers are discriminating against 16 and 17-year-olds due to the above-mentioned concerns.

The OSH-LAS study's findings on how 16 and 17-year-olds engage in agricultural and value chain tasks are described in Section 12 of this report. In terms of the original research question, people in Liberia do hire 16 and 17 year-olds for all kinds of agricultural and value chain tasks. With the exception of the large rubber concessions, neither precise chronological age nor Liberia's child labor laws appear to factor into ways that this age-group engages with agricultural work. Sixteen and seventeen-year-olds work as employees, as family labor and in kuus. The main reason that older adolescents are under-represented in rural areas is because they migrate to the urban centers where education, jobs and social services are concentrated (pull factor) in an effort to escape the low returns and backbreaking drudgery that still characterizes agricultural work in Liberia (push factor).

The rest of this section contains contextual findings from OSH-LAS study informants on adolescent movements between rural communities and towns. It also recommends ways to improve the agriculture-based livelihoods and prospects of 16 and 17 year old adolescents who remain in rural communities.

Background on Liberian adolescents

The ARCH program's baseline data on 16 and 17-year-olds reflects a well-documented trend of adolescent rural to urban migration [10, 19, 20]. Data from Liberia's 2010 Labor Force Survey (Table 10) indicate that children from birth to 9 years of age are more prevalent in rural areas than are children 10 years and older. Although the difference in percent of population by age group between rural and urban has not been tested for statistical significance, the pattern suggests that children begin migrating sometime after they are 10 years old [10]. Based on OSH-LAS study narratives, children are likely to begin migrating after their status has shifted from young to post-pubescent child, or sometime around the age of thirteen years, plus or minus one or two years [16,17].

Table 10. Distribution of population by age (percentage)

Age	% of Urban Population	% of Rural Population
0-9	26.3	33.6
10-14	13.7	11.3
15 - 19	11.3	8.1
20-34	24.7	20.4
35-64	22.9	26.0

Source: Source: LISGIS Labor Force Survey, 2010 [10]

Both adults and adolescents who participated in the ARCH-OSH study described push and pull factors drawing teenagers into urban centers. Production in Liberia's non-concession agricultural sector is still based on hand tools with little or no mechanization, so labor productivity is very low for backbreaking work. The drudgery and low returns to labor typical of primary production and processing stages of the five study value chains (which, along with two or three other value chains remain the main economic activity in rural areas) is the main push factor driving adolescents to migrate to urban centers, even though they lack meaningful skills for employment [16, 17].

According to informants in several town hall discussions, parents also push their teenage children away because they lack modern parenting skills. Parents want their children to be educated and to take advantage of new economic opportunities in town, but at the same time they need their children's labor at home and worry that their children will misbehave. This

tension between old and new realities can cause friction at home which pushes some teenagers away.

In terms of pull factors, teenagers in OSH-LAS focus groups said that they move to towns (often with parental approval and support) to continue their education, to earn money and to expand their social life. Schools and social programs for youth in large towns such as Kakata and Ganta have books and computers that are not available in rural schools. City jobs pay better than what is available in rural communities, principally agriculture. Finally, there are video parlors, a main entertainment draw which have not yet made it to rural communities.

Another finding from the OSH-LAS study focus groups is that adolescents move back and forth between rural communities and towns on a fairly regular basis. Teenagers living in town often return home for short periods to help out, or permanently because life in town becomes too difficult. All of the 16 – 17 year old boys and four out of the five girls in the OSH-LAS focus group discussions in Flumpa had lived in Ganta, but had returned to Flumpa. The girls had had babies while living in Ganta and moved back home because they needed help with their infants. One of the boys returns to Flumpa when his school in Ganta is on break to help his father with farming; the other boys had returned permanently because life in town hadn't worked out for them and because their parents needed their help with farming.

Food wholesale and retail jobs performed by adolescents in urban centers

The OSH-LAS study focused mainly on rural-based agricultural activities, but towns are also critical bulking, wholesaling and trading hubs in Liberia's food processing and food distribution systems. The urban-based motorcycle transport sector exemplifies this, but teenage boys also work as porters, collect and bulk agricultural output for wholesalers, and transport goods between the daily markets that rotate between rural communities. Adolescent girls work in petty food retail as street vendors or as petty market traders and they also work in the growing peri-urban and urban restaurant sector.

Recommendations for agro-based adolescent livelihoods

The recommendations in this section are informed by conversations with the informants for the OSH-LAS study from town hall meetings, focus group discussions, and one-on-one interviews.

➤ Provide life skills training for adolescents and their parents

To begin with, rural adolescent boys and girls need a strong foundation of life skills on which to build effective agro-based livelihood and business skills. Rural adolescents urgently need counseling on sexuality and reproductive health, and they need to be mentally prepared for what they will encounter if they go to live in an urban center. Parents of adolescents need help

with parenting skills. Even something as simple as facilitated discussion groups at the local school where parents could talk through their frustrations and fears would be helpful.

➤ **Provide diverse business skills training for adolescents**

Liberian agriculture is full of opportunities for adolescents, but only if they have basic business skills and enough discipline to save money for long-term goals. In addition to life skills, adolescents need to know how to maintain business and financial records, and how to form savings clubs and save money in a disciplined way. These foundational skills will put adolescents on a path where they can invest in assets like motorcycles or freedom mills for pressing palm oil, that are able to generate significant income.

➤ **“Professionalize” kuus – empower adolescents to sell their labor and to save**

OSH-LAS study informants told about a group of adolescent boys who formed a kuu to help each other raise money to purchase motorcycles. The kuu continued until every boy in it was able to purchase his own motorcycle. The story contains a powerful idea for helping adolescents build strong modern agro-based livelihoods. Business training clubs could evolve into professional kuus, where boys and girls sell their labor and save the proceeds to invest in real, long-term assets that can significantly multiply incomes.

Business training clubs should bring in skilled adult mentors to work with adolescent boys and girls to identify practices which improve the safety of the basic agricultural and value chain tasks discussed in this report, and to train adolescents on how to conduct agricultural and value chain work in a safe way – according to high standards.

Given gender sensitivities and differences in boys' and girls' roles in agriculture, it may be necessary for boys and girls to be in separate groups for life and business skill training and to form separate kuu / savings groups.

➤ **Identify value chain niches that boys and girls can target for selling their labor services and/or for building their own businesses and investments**

Value chain niches that are able to support and grow new livelihoods have a few important characteristics. First, end demand for the final product or service is strong enough to absorb new entrants and increased production without negatively impacting prices. Second, price points in the value chain – the cost for producing and the price received for the product or service at each stage of value addition – are such that new entrants can gain business and earn profits by being competitive, i.e., there is margin for improved efficiency and arbitrage. Third, innovations exist or can be developed in the way a process is managed that increases the

productivity of labor. Examples are use of motorcycles versus head-loading or use of freedom mills versus hand processing of palm oil.

Although a further, more technically oriented business assessment is needed, demand for charcoal is very strong and growing not only in Liberia, but throughout the region. Price points have to be assessed, but current production practices are so primitive and environmentally destructive that even small innovations could yield large improvements in efficiency and safety. Transport of agricultural goods is also a sector with very strong demand. There may be a lot of room for innovation in ways that motorcycles or even bicycles can be used to transport agricultural goods, both for technical innovations such as attaching light wagons to motorbikes or bicycles and for innovations in ways transport businesses are organized. For example, hubs could be established in rural communities to take charcoal to urban centers so that rural charcoal producers have more power in their transactions with urban traders. Adolescents would need to be trained in a wide variety of skills, such as how to build safer charcoal ovens, motorcycle and bicycle mechanics, welding and metal working.

Demand for oil palm is also strong and robust, both in Liberia and regionally. The explosive growth of large international oil palm plantations as well as commercial and smallholder oil palm farms means that there is going to be demand and need for skilled, professional support services for this growing industry. Analyzing this industry and identifying niches where adolescents can be trained could be very promising.

PART Four - Findings on steps being taken and barriers preventing Liberian organizations from addressing hazardous conditions in agriculture

15. Organizations working to improve safety and steps they are taking

Other than efforts by Winrock International to assess and document the occupational safety and health situation in Liberia's non-concession agriculture sector, there are no known Liberian organizations or development partners putting the issue of the safety and health of the informal agricultural labor force on the table for discussion [16,17]. An expert informant, who has worked closely with the Ministry of Agriculture for 25 years, could recall no instance in his experience where the occupational safety or health of the informal agricultural labor force surfaced as an issue for consideration.

"Since my close association with the Ministry of Agriculture, which began in the early 1990s, I vividly recall attending agriculture coordination meeting at the MoA where issues and problems confronting the agriculture sector are extensively deliberated. During that entire time, no concerns [of the occupational safety and health of agricultural labor] have ever come on the lips of the various actors.

Recently during the Rubber Master Plan formulation in 2009-2010, which secretariat I headed, that brought together all the main actors consisting of concessions, large Liberian rubber farmers and the smallholders themselves, none of us ever even considered this cardinal [IE: extremely important] issue ⁸."

16. Barriers preventing progress

According to expert informants from GOL MDAs and the University of Liberia, there are three fundamental barriers preventing action to improve the occupational safety and health of the non-concession agricultural labor force. The first barrier is lack of general openness and disclosure throughout Liberian society about the real hazards and health problems faced by agricultural workers on farms every day. The second barrier to change is the fact that non-concession agriculture is dominated by poor people with little formal organization to press for reforms. As a result, the state's attention is focused on foreign owned concessions, and even there, occupational safety and health issues are not fully addressed as evidenced by two recent accidents, one at the Sime Darby Plantation Liberia Inc. (a Malaysian oil palm concession company) involving an explosion at its chemical plant and the other at the Liberian Agricultural

⁸ An interview held with Franklin Philips, Assistant Professor and Plant Pathologist in the College of Agriculture and Forestry, University of Liberia.

Company (a rubber concession company owned by Liberian national elite and foreign investors), also involving a chemical explosion. In both cases workers covered by formal contracts were injured (and in the case of the Liberian Agriculture Company, four also killed) due to negligent failure on the part of the company to maintain the safety of its equipment [37, 38].



Photo by Lukas Olynyk

Photo: A participant in the ARCH MFS program wearing OSH headgear.

The third barrier preventing action to improve the occupational safety and health of non-concession agricultural workers is poverty itself. Liberia is one of the least developed countries in the world, ranking 175th on the UNDP Human Development Index out of 187 countries [39]. It is also a post-war country where corruption is considered endemic. A majority of Liberians experience extreme poverty exacerbated by the civil war, which massively destroyed development infrastructure, human resources, social cohesion and people's trust in one another. Most young people in Liberia today have limited education and lack technical skills for decent employment, a situation that also reflects the long-term impacts of the civil war.

Under these conditions, where people's basic food security cannot even be guaranteed, the need for protection at work is considered, even by the stakeholders themselves, less important than opportunities to survive at all. As a result, there is not enough concrete action to address the safety

and health needs of non-concession agriculture workers. Even though the GOL (in the Decent Work Bill) set the minimum wage for unskilled and skilled workers at US\$3.50 and US\$5.50 respectively, the law is not relevant to rural producers and processors who use family labor and unskilled workers without formal contracts.

However, the two recent accidents at Sime Darby and at the Liberian Agriculture Company have triggered the awareness and sensitization of the Liberian Government, specifically the Ministry of Agriculture, regarding occupational safety and health issues in the agriculture sector. Going forward, the topic will be on the table in the agriculture coordination meetings organized by Ministry of Agriculture, where discussions on finding means of reducing hazardous conditions in *all* of the agriculture value chains will take place. The Ministries of Labor and Health, the

Environmental Protection Agency, and other government MDA's are also key stakeholders in improving the safety and health of Liberia's agricultural workers, and will be included in coordination meetings where these issues are addressed.

17. Recommendations

1. The Government of Liberia, with significant support from civil society organizations, should be encouraged to engage in national dialogue and conferences in order to craft an OSH policy for each agricultural value chain, particularly for the non-concession agriculture sector. With time, dialogue should also be extended to other sectors that include OSH-related hazards, including forestry, mining, construction and the motorcycle-transport sector.
2. NGOs, INGOs, and other civil society partners should be encouraged to adopt alternative livelihood strategies that explicitly recognize OSH hazards and seek to reduce or eliminate them.
3. Promote community awareness and sensitization so that agriculture workers will be educated to adhere to OSH policy and standards to be developed by the government and its development partners.
4. The Government of Liberia should establish an autonomous body or lead agency with the mandate to monitor and regulate OSH standards in Liberia. This autonomous body or agency should draw on the expertise of civil society and OSH professionals to establish a national OSH index in line with international standards. Furthermore, it will monitor and report on the level of compliance with OSH standards on a yearly basis.
5. The National Legislature should be encouraged to enact OSH laws that will address the safety and health needs of the poor farmers who use their own labor and family for production and processing of agricultural products (non-concession agriculture workers).
6. An OSH accountability summit on OSH standards and policy review should be hosted by civil society groups and development partners annually to further strengthen OSH implementation processes in Liberia.

These recommendations were reviewed and operationalized by stakeholders at the ARCH sponsored OSH-LAS validation workshop held in Liberia in January 2017.

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