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NON-TIMBER FOREST PRODUCTS: An Ethnobotanical Survey and Value Chain Study

May 2013

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People, Rules and Organizations Supporting the Protection of Ecosystem Resources (PROSPER)

NON-TIMBER FOREST PRODUCTS: An Ethnobotanical Survey and Value Chain Study

(Contract Deliverable 2a, Sector surveys and analyses for selected forestry and agricultural value chains - NTFPs)

May 2013

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ACRONYMS

ACDI/VOCA	Agricultural Cooperative Development International and Volunteers in Overseas Cooperative Assistance
AGRHA	Action for Greatest Harvest
ASNAPP	Agribusiness in Sustainable Natural African Plant Products
BDS	Business Development Services
BOTPAL	Botanical Products Association of Liberia
B2B	Business to Business
CFMB	Community Forest Management Body
CU	Cuttington University
FAO	Food and Agriculture Organization
FDA	Forestry Development Authority
FMC	Forest Management Committee
FTI	Forestry Training Institute
GACP	Good Agricultural and Collection Practices
GHP	Good Handling Practices
GOL	Government of Liberia
GOP	Grains of Paradise
LFSP	Liberia Forestry Support Program
LRCFP	Land Rights and Community Forestry Project
MOA	Ministry of Agriculture
NGO	Non-Governmental Organization
NTFP	Non-Timber Forest Product/s
PEPE	Productivity Enhancement and Production Expansion
PROSPER	People, Rules and Organizations Supporting the Protection of Ecosystem Resources
RU	Rutgers, The State University of New Jersey
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

This ethnobotanical and value chain study was commissioned by USAID's People, Rules and Organizations Supporting the Protection of Ecosystem Resources (PROSPER) to explore what kind of non-timber forest products (NTFP) are in the forest areas of the PROSPER project and recommend specific value chains for development under the five-year program. This work builds upon the USAID-funded Land Rights and Community Forestry Project (LRCFP), which initiated the commercialization of *Griffonia simplicifolia*. This project led to the export of this Liberian NTFP and generated over US$80,000 in revenues for beneficiary communities between 2010 and 2012.

The objectives of this study were to (1) identify the most commercially viable Liberian NTFP in two counties (Nimba and Grand Bassa), and (2) to evaluate their associated value chains in order to develop a strategic approach for the successful development and strengthening of local and export markets to support livelihoods in PROSPER-supported communities. Organizations such as Botanical Products Association of Liberia (BOTPAL), Nature Conservation Research Center (a leader in developing community protected areas as a means of economic development and resource conservation), and Flora and Fauna International (e.g., through assistance with the certification of a community-managed natural forest) can stimulate the collection and marketing of NTFP in Liberia. To address the objectives set out by PROSPER, an ethnobotanical survey and value chain study were conducted in September 2012 in Lower Nimba (Dialah, Tappita, Old Yourpeah, Toweh and Sehzueplay) and Grand Bassa (District 3, Barcoline; District 4, Bold Dollar) counties. Research consisted of desktop research and field interviews with key stakeholders (collectors, service providers, development organizations, producers, processors, traders, wholesalers and retailers), and representatives from public institutions. Information was captured on utilized plant species, production/wild harvesting and post-harvest related issues, demand characteristics, market requirements, existing supply sources, logistical constraints, infrastructure limitations and supply gaps. Follow-up discussions with international buyers aimed to ascertain interest, commitment and their requirements to purchase Liberian NTFP. Focus was given to those NTFP used and valued by the above-listed communities and to those with greatest market potential and thus income generating opportunities.

The ethnobotanical survey was conducted by Rutgers University in concert with Agribusiness in Sustainable Natural African Plant Products. It revealed the existence of some 51 NTFP products which communities use, and with some also traded and sold. Bush pepper – also known as West African black pepper (*Piper guineense*) – was the most cited and used by the interviewees (12% out of the total 159), followed by bitter cola (*Garcinia kola, 9%*), country spice (*Xylopia sp., 7%*), bush cherry (*Maesobotrya barteri, 6%*), bush yam (*Dioscorea sp*., 5%), bush peanut (*Ricinidondron heudelotii, 4%*), walnut (*Cola edulis, 4%*), bitter root (*not determined, 3%*), calpocalyx (*C. aubreviller, 3%*), monkey plum (*Parinari excelsa*, 3%), rafters and round poles (*Xylopia sp.*, 3%), dura palm (*Elaeis guineensis*, 3%) and makore (*Tieghemella heckelli*, 3%). Results from the survey showed that NTFP can indeed be commercialized and provide real income-generating opportunities to communities, particularly to those with little access to other options and residing in remote forests. The development of the NTFP sector through utilizing neglected indigenous natural resources can contribute to and complement ongoing activities that support food security. However, as with other specialty agricultural crops and products, there will be some degree of price fluctuation and variation in market demand, each impacting the level of profitability and the value chain.

A final list of the five NTFP with the most promising market potential was established using a matrix of criteria including market demand, economic, social and environmental considerations, and value chain entry obstacles1. Specifically, the (1) ability to sustainably collect the NTFP from the forest; (2) ability to

[1] These criteria were measured using a scale to evaluate the market demand, impact potential and intensity of obstacles that hinder the development of that sector.

develop and implement realistic and practical strategies that would mitigate destructive collection practices and ensure the preservation of biodiversity; (3) utilization of Liberian indigenous plant resources, and the selection of plant products that could complement rather than replace ongoing crop enterprises; (4) activities that can provide additional income streams and not compete with or replace the cultivation of foods for household food security, i.e., consumption and/or sale; (5) activities in which Liberian women can be equally involved; and that (6) NTFP collection can be accomplished in conformity with the community forest management bodies' (CFMB) rules and regulations governing the use of community forests.

From the selection criteria matrix, griffonia (*Griffonia simplicifolia*), grains of paradise (*Aframomum melegueta,* GOP), bush cola (*Cola nitida)*, bitter cola (*Garcinia kola*) and West African black pepper/bush pepper (*Piper guineense*) value chains are recommended for development under PROSPER. The value chains for bush cola and bitter cola are very similar; as are parts of the value chains for grains of paradise and West African black pepper. Each of the above-listed Liberian NTFP is recommended based on its income generation potential. A strong commitment by a leading global buyer of griffonia willing to come to Liberia, coupled with interest by perfume and fragrance and spice companies facilitate a market-first approach with these products. Importantly, each of these NTFP can be produced/harvested in an environmentally sustainable manner to supply commercial volumes for domestic, regional and overseas markets. Each requires many of the same inputs, technologies for drying and product preparation and handling, and none compete with the production of cassava, oil palm, cocoa, or other crops. All the communities visited reported the potential and their interest to produce high volumes of the NTFP, though the procurement of larger volumes will take a carefully constructed approach and requires time. Products would need to be aggregated across the communities to reach critical masses when export markets are targeted. Strategies to reduce the cost of business and transportation are critical. With these issues addressed, development of NTFP value chains have the potential to also serve as epicenters to attract greater volumes that can be collected in other Liberian counties and thus the impact scaled-up and replicated by additional communities.

By analysis of critical constraints to the development of the selected NTFP, specific recommendations are provided to strengthen the value chain. To support the sustainable commercialization of NTFP within PROSPER-assisted communities in Liberia, it is suggested focusing on:

1. Productivity Enhancement and Production Expansion: Technical assistance is needed to improve skills and efficiency of participants in the collection and production of NTFP and in the application of Good Agricultural and Collection Practices (GACP) and Good Handling Practices (GHP).
2. Entrepreneurship and Human Capital Development: Basic and innovative extension mechanisms such as adult education, focus groups in communities, and experiential learning approaches should be employed to build local expertise and human capacity in forest stewardship and to develop microenterprise skills, in order to successfully create, establish and maintain a vibrant NTFP industry. Capacity building should be geared toward women and youth and yet inclusive of others. Our initial earlier success in the export of griffonia demonstrates the willingness, eagerness and success that trainings carefully timed and delivered lead to active engagement and participation by many community forest members.
3. NTFP Market Chain Development: Collectors and processors, agents and in-country buyers need to be better informed and linked to markets and consumers. Leading Liberian buyers and traders should be trained in regional and export market readiness. This can be accomplished through trainings in Liberia and short market study tours in Ghana. The inclusion of Liberia NTFP in food and trade shows in the USA (SupplySide, Natural Products Expo), Europe (BioFach, VitaFoods[2])

[2] One of the NTFP recommended here – *Aframomum melegueta* – has indeed been previously presented at VitaFoods, Geneva, rasing considerable interest in 2007.

and East Asia could rapidly provide exposure and visibility to the selected NTFP and increase market linkages and trade. Samples of the top NTFP should be collected in each PROSPER area, dried, and then sent to Rutgers for chemical analysis, development of product specification sheets and subsamples distributed directly to potential private sector buyers and manufacturers. Liberian NTFP product specification sheets developed by Rutgers as part of PROSPER should start with griffonia and West African black pepper. Communication with such companies provides valuable market intelligence and engages the private sector early on as active actors and partners in this process, as is now being developed with a major griffonia buyer. Some buyers will purposefully partner in such development projects to gain access to new supplier(s) and regions. Others are motivated by social justice components of their business and thus are supportive of PROSPER as it focuses on forest preservation and empowerment of women. Many companies are driven by product pricing, reliability of supply and quality. Such market intelligence can strengthen the efficiency of the Liberian sector and encourage BOTPAL, other trade organizations and private sector groups to ensure that their collector groups adhere to GACP, specifically quality (safety) and sustainable management practices.

4. An Awareness Campaign for those in the government and public sector involved in forest conservation and community forest management and customs officials: With a primary focus on timber and mineral exploitation, biodiversity and conservation, many of those involved in regulating and protecting forests in Liberia (forest rangers, game wardens, environmentalists, customs officials) are not familiar with NTFP. Those teaching the newer generation of forest rangers, park wardens, guards, environmentalists and conservationists (e.g. at the FTI and CU) are also not trained in NTFP and are largely unaware of the economic value and potential in using indigenous plants of the forest. This creates a gap in understanding about how this historically informal sector in Liberia can be developed and formalized. Such leaders need training in NTFP.
5. Increased value addition through vertical integration: Vertical integration can be achieved through processing (drying, sorting, cleaning), packaging (simple to more complex) and marketing by the forest communities to meet local, regional and international demand.
6. Improvement in Product Quality: Collectors, brokers, and processors need to understand the importance of understanding what is meant by high quality and in ensuring high quality of products that are aimed at regional and international markets as a way to open market windows, add value, increase market demand, receive higher prices and secure repeat buyers for their products. All players and actors along the value chain need additional training in drying, cleaning, sorting, and how to improve product quality.
7. Facilitate the development of an Industry Code of Conduct and Trade Standards: Adopting and implementing quality assurance methods and mitigation strategies to ensure sustainable harvesting that protects the NTFP are relevant strategies that are used to attract international buyers and investors. This includes developing the in-country expertise to test, screen, and monitor the grades and standards of botanicals and medicinal plants.
8. Revolving credit and/or creative pre-financing schemes needed: Almost no banks, micro-finance institutions, NGOs, or saving and credit groups in Liberia provide credit at reasonable conditions that would foster private NTFP-based enterprises. Facilitation of public/private sector microfinance schemes to provide and make innovative microfinance services or a revolving credit scheme accessible to rural and peri-urban NTFP-based enterprises are needed. Involving both private Liberian companies and foreign buyers with the right ethics which can and are willing to pre-finance part of the purchase of NTFP, or the establishment of a revolving fund to meet the upfront cost of procurement with a marketing/trade group, is recommended.

SECTION 1: BACKGROUND

1.1 INTRODUCTION

The Upper Guinea Forests of West Africa extends from Guinea and Sierra Leone through Liberia, Côte d'Ivoire, and Ghana to central Togo and Benin and is considered a regional hotspot for biodiversity. Nearly 50% of Liberia's land cover is categorized as forest, and the largest block (43%) of the Upper Guinea Forests remains within its borders. Liberia's forests contain a significant amount of biodiversity with over 2,900 different vascular plants (Taplah, 2002; Deshmukh et al., 2009; GeoVille & Metria, 2011), providing habitat for many endangered, threatened and vulnerable plant and animal species.

Forests have been increasingly recognized as reservoirs of valuable biological resources other than timber. The term non-timber (or non-wood) forest products (NTFP) emerged as a group of products derived from these various forest resources. NTFP have been defined as goods of biological origin other than wood, as well as services derived from forests and allied land uses (FAO, 1995). Traditional societies possess a wealth of knowledge accumulated as a result of interactions with the natural world. Communities have used this knowledge to use a wide variety of products for their daily needs. For instance, in Liberia, NTFP are used by Community Forest dwellers and they include living animals, bush meat, rattan, bamboo, nuts, seeds, roots, mushrooms, and medicinal plants, among others. As community forests are being managed by the users themselves, it encourages them to use sustainable harvesting techniques. Indigenous knowledge can play an important role in the rural economy of Liberia. Utilizing this knowledge for economic growth through the commercialization of NTFP may help conserve local traditional botanical knowledge, encourage those living in the forests to better protect their resources and thus support the cultural survival of traditional peoples themselves (Taplah, 2002; Cotton, 1996).

The global natural products industry that includes NTFP among many others botanical products, has been valued at about US$ 65 billion per annum and continues to grow. This figure suggests many potential opportunities for increased trade in natural products (Ariyawardana et al., 2009). NTFP have been sorely undervalued in part because in contrast to the timber and mineral sectors, there is no main industry that speaks for and supports this sector, local government regulations on collection, sales and trade are limited, enforcement even less, and government agencies simply rarely track such trade (Adelaja et al., 2003). Much of the NTFP trade is normally informal without detailed statistics collected that reflects the real economic value and volume of trade that is involved. Programs such as PROSPER can stimulate and catalyze the successful procurement of NTFP by intermediaries such as traders, wholesalers, retailers, to facilitate the development of new industries. Environmental friendly sustainable harvesting methods can be a requirement imposed by international buyers upon collectors, thus providing significant incentive to protect the forest's natural resources and the regional and local biodiversity. These programs can induce the private entrepreneurs to capture profits by satisfying local and/or international demand for NTFP, leading to the long-term self-sustainability of the sector. West Africa's natural products industry is constrained by many factors, including the lack of technical, infrastructure, and financial resources necessary for promoting efficient industry development (Adelaja et al., 2003). Particularly, lack of appreciation for economic potential, ignorance of the importance of NTFP to rural societies and general lack of knowledge on NTFP hindered the provision of sufficient and adequate policy direction to develop proactive management programs for NTFP in Liberia (FDA, 2006). Once these constraints are addressed, natural products have the potential to contribute to local, regional and international sales as has been done in Ghana and other sub-Saharan African countries. Although domestic markets can provide a relevant economic base in natural product trade in other West African countries (Govindasamy et al., 2007), due to low population and weak purchasing power in Liberia, regional trades need to be stimulated as a major vehicle for economic growth and trade.

Several studies have shown that NTFP can contribute to household food security by providing food, medicines and raw materials for enterprises, as well as commodities for trade. Liberia has a long history of the use of NTFP by forest dwellers. To ensure continued sustainability of NTFP in Liberia, the key is to focus on the promotion of biodiversity conservation, community-based management, natural resource governance, and poverty reduction (Deshmukh et al., 2009). Most of the NTFP harvested in Liberia come from wild sources, the natural forest, other wooded land and trees outside forests with little efforts being made to cultivate them (Taplah, 2002).

A recent study conducted in the Sapo National Park recommended that current harvesting methods should be explored and developed in a manner that fosters sustainable production of NTFP (Manvell, 2011). The authors also suggested the examination of the market chains of the NTFP exported out of the region, notably bush pepper (*Piper guinensee*) and country spice (*Xylopia aethiopica*). Yet, actual market requirements, market expectations, regional and national market demands were not addressed nor were indications provided as to how this could be accomplished. The successful commercialization of NTFP and in particular botanicals, spices and medicinal plants requires a purposeful strategy with strong linkages to an existing marketplace, a clear understanding of market expectations and ways to ensure an adequate supply of consistent, well defined, high quality products (Adelaja et al., 2003). In Central Liberia, particularly Nimba, several NTFP are commercialized and are sold in local, national and regional markets. Production of bush pepper (*P. guineense*) in Nimba is well-known. There is a healthy network of traders, as the demand for bush pepper is high in Côte d'Ivoire, Guinea, Mali, and Senegal, where it is traded and then consumed as a spice (Deshmukh et al., 2009). Liberians and other neighboring West African countries routinely use bush pepper as a spice and flavoring in their traditional cuisine. Thus, development of a regional marketing thrust would be of interest given the strong demand and shortage of supply in local regional markets.

Prior work under LRCFP, Liberia Forestry Support Program (LFSP) and its collaborating partners (including ASNAPP and Rutgers University) demonstrated the feasibility of exporting griffonia to generate sources of income and in collaboration with other programs. Under the leadership of ASNAPP and other LRCFP partners, a pilot study with griffonia was established which led to the successful export of a container of this medicinal NTFP to Ghana. Following a rapid assessment of medicinal plants in the Nimba and Sinoe Counties, several West African spices and medicinal plants were identified that have potential to be commercialized in regional and international markets. LRCFP and partners conducted awareness and sensitization campaigns on the economic importance of *Griffonia simplicifolia* and mobilized over 200 collectors and agents. Commercial purchases were undertaken for the 2009/2010 campaign and at the end of the season 700 kg of griffonia seeds were mobilized from Nimba with collectors providing on average 5-25kg. The following season (2010/2011), a total of 7,750 kg of griffonia seeds valued at $55,000 were mobilized representing a 10-fold increase compared to the previous season. Despite all the challenges and obstacles faced, the exportation of a container of griffonia from Monrovia was a major success. *The collectors and forest community members were satisfied with income earned. All the actors paid along the value chain, and the final buyers were pleased with the quality and quantity of that first export shipment of a medicinal plant from Liberia*. Although the cost of procurement from the collectors was $2.30/kg., due to initial exploration and scouting costs, total cost of procurement escalated to $7.09/kg. As the private sector steps in, total procurement cost per kg will decrease once regional links are established for exports. At the same time, issues relating to transportation and access to capital remain as a challenge to market development. While financing mechanisms are available, collectors or local initiatives may not qualify for them. The Liberia Forest Support Program (LFSP) was able to by-pass this issue through the establishment of a revolving fund managed under the responsibility of AGRHA. It showed that griffonia could be traded with Côte d'Ivoire, and reflects a historical trade of griffonia seeds with its neighbor. Exporting to regional markets is feasible as there is market demand, provided there is a revolving fund to meet the upfront cost of procurement.

The goal of this report is to identify the NTFP with most commercial potential, and to make recommendations on how to strengthen value chains to develop local and export markets in the communities supported by PROSPER.

1.1.1 OBJECTIVES OF THE REPORT:

i. Collect traditional knowledge on Liberian Non-Timber Forest Products (NTFP) related to their uses and identify new or emerging NTFP;
ii. Estimate the availability of NTFP in the forest, and assess their harvesting and processing practices;
iii. Identify constraints along the value chains, and design interventions to address them;
iv. Provide technical and market information on a variety of NTFP and their demand on the regional and world market;
v. Provide guidance and recommendations on how to harvest NTFP sustainably according to world market standards without jeopardizing the level of biodiversity currently present in the community forests and other forest areas from where NTFP are harvested;
vi. Develop a generic map for the NTFP in Nimba and Grand Bassa PROSPER communities within Liberia, depicting key activities, actors and populated with available information on production, trade and marketing activities;
vii. On the basis of the targeted PROSPER communities in Nimba and Grand Bassa within Liberia, identify critical constraints to NTFP value chain development, including key challenges and opportunities; and
viii. Provide recommendations based on the key challenges to the sector development.

1.1.2 STRUCTURE OF THE REPORT

The report has been organized into four sections. Section 1 focuses on the background, objectives, approach and methodology. Section 2 focuses on the Ethnobotanical Survey. Section 3 describes the value chains selected and draws the conclusions and recommendations for upgrading NTFP value chain. Supportive and detailed data can be found in the Appendices (I-VIII).

1.1.3 APPROACH AND METHODOLOGY

Two teams were used for the survey, one focused on conducting the ethnobotanical survey and the other on the value chain. The survey team visited four communities in Lower Nimba (Dialah/Tappita, Old Yourpeah, Toweh and Sehzueplay) and two communities in Grand Bassa (District 3, Barcoline and District 4, Bold Dollar) from September 15 through October 11, 2012. Ethnobotanical data were collected through structured interviews (Appendix I). Individuals were interviewed, separately and in their local language(s)[3]. The value chain study focused on interactions and interviews with key actors in the selected value chain. The value chain approach and limitations of this study are provided in Appendix I. The following actors were interviewed:

a) Key stakeholders including service providers (e.g. transport owners) and development organizations working in the same field;

b) Public institutions including the government (Ministry of Agriculture, Trade and Commerce Ministry, FDA and any others that will be relevant based on the field work);

[3] At each site, and prior to any interviews, permissions to conduct the interviews were first agreed upon by the community leader. The purpose and objectives were first explained to the community leader, who was shown the survey itself. It was then read out loud to the leader to ensure that each question was understood and that the questions were acceptable to be asked. Only after each community leader indicated that they clearly understood the purpose of the survey, the approach that was to be used, the questions that were going to be asked, and the future use of the survey, the leaders signed the informed consent letter and then initiated the interview process.

c) Local operators within the NTFP industry including producers, processors, traders, wholesalers & retailers in the traditional market, supermarket chains and exporters;

d) Non-Financial service providers including Business Development Service (BDS) providers, NGOs, Financial Institutions including commercial, rural and agricultural development banks.

SECTION 2: ETHNOBOTANICAL SURVEY

For the ethnobotanical survey, thirty-four interviews were conducted with female (45%) and male (55%) members of the communities. In Lower Nimba, 55% of interviewees were male while in Bold Dollar the majority were females (67%). In Barcoline, the majority of interviewees were males (75%). Informants from Lower Nimba and Grand Bassa counties listed 159 entries and 51 individual NTFP, with each person providing information on about five NTFP (Table 1) with which they use. Of the 51 NTFP, bush pepper (*Piper guineense*) was the most cited and used by the interviewees (12% out of the total 159), followed by bitter cola (*Garcinia kola, 9%*), country spice (*Xylopia sp., 7%*), bush cherry (*Maesobotrya barteri, 6%*), bush yam (*Dioscorea sp*., 5%), bush peanut (*Ricinidondron heudelotii, 4%*), walnut (*Cola edulis, 4%*), bitter root (*not determined, 3%*), Calpocalyx (*C. aubreviller, 3%*), monkey plum (*Parinari excelsa*, 3%), rafters and round poles (*Xylopia aethiopica*, 3%), dura palm (*Elaeis guineensis*, 3%) and makore (*Tieghemella heckelli*, 3%) (Table 1).

For analysis, NTFP were categorized into clusters according to their origin and/or processing or applications. These clusters include: spices (6% of the 51 NTFP identified in this study), medicinals (48%), colas and edible fruits (12%), nuts and edible oils (18%), indigenous vegetables and mushrooms (12%) and building materials (14%). A group of unrelated NTFP comprised of beverages, heating, dyeing, fish bait and ritual uses (4%). Ten NTFP exhibited more than one use, notably country spice is used as a spice, medicinal and building materials and *Raffia vinifera* is used as a beverage, medicinal and as a building material (Table 1). Percentages of citation for each NTFP were broke down for each community visited (Table 1).

Following discussions are based solely on the responses by the informants and analysis about volumes and value chains are discussed later when ranking the potential NTFP in Liberia. A limiting factor in such an approach is that many of the communities report only those plants that they use and were largely unaware that several of their indigenous trees, shrubs and vines have commercial value and are already traded in the regional and international markets.

2.1 SPICES

Results of the survey showed that spices are an important category of NTFP because spices were among the most cited NTFP by local communities. Bush pepper (West African black pepper) was the most cited product, while country spice or *Xylopia aethiopica* was also commonly used. One of the problems with current harvesting practices of country spice is that they are destructive and have involved cutting down the whole tree to collect not only fruits, but the stems/trucks for use as poles in construction (Table 1).

2.2 BUILDING MATERIALS

An additional category of building materials was also widely mentioned by community members including plants use for rafters, round poles and thatching (leaves of various plant species used for roofing). The most important is *Xylopia aethiopica* (country spice) mentioned by 3% as a source of rafters and round poles. NTFP used for thatching were also mentioned by 1% of people surveyed (Table 1). Though rafters and round poles come under timber products and is not a focus, interventions on the sustainable collection of leaves for thatching under an agroforestry model can have dual economic and environmental benefits.

2.3 COLAS AND EDIBLE FRUITS

This category was also cited as one of the most used NTFP by the informants. Although the most cited NTFP category may not have the greatest market potential, any change in income relating to this category will still positively impact members of Community Forests. The most cited product after bush pepper was bitter cola (*Garcinia kola*, 9%) as one of the most used products by the communities, followed by bush cherry (6%), walnuts (4%), makore (3%) and monkey plum (3%) (Table 1). For bitter cola, there is a regional market, as its seeds are actively traded through West African countries (Mali, Guinea, Nigeria, Ghana, and Liberia). The frequency of citation of bush cola, walnut and bush cherry suggests these products are known and likely used in the communities. As the selling prices of each were also reported by those interviewed, that demonstrates that these products are not only used locally, but are commercially traded. Increased production of these products as reported by the interviewees could lead to further local income generation and trade. However, trade margins may be compromised due to the geographical remoteness of the communities, thus rendering successful long-distance trade unprofitable for the lowest priced NTFP.

Table 1: List of NTFP from Lower Nimba and Grand Bassa based on their frequency of citation by informants

	Common name	Botanical name	Category	Dialah/Tappita	Old Yourpeah	Toweh	Barcoline	Bold Dollar	Total number	Total (%)
1	Bush pepper[1]	*Piper guineense*	Spices	37[3]	21	21	5	16	19[4]	12
2	Bitter kola	*Garcinia kola*	Colas and edible fruits[2]	20	13	20	20	27	15	9
3	Country spice	*Xylopia aethiopica*	Spices. Building.	45	9	9	9	27	11	7
4	Bush cherry	*Maesobotrya barteri*	Colas and edible fruits.		33	11	22	33	9	6
5	Bush yam	*Dioscorea* sp.	Indigenous vegetables and mushrooms	50	25	25			8	5
6	Bush peanut	*Ricinodendron heudelotii*	Nuts and edible oils		29	57		14	7	4
7	Walnut	*Cola edulis*	Colas and edible fruits	14	14	29		43	7	4
8	Bitter root	*Not determined*	Indigenous vegetables and mushrooms	80				20	5	3
9	Calpocalyx	*Calpocalyx aubrevillei*	Nuts and edible oils	40				60	5	3
10	Monkey plum	*Parinari excelsa*	Colas and Edible Fruits	20			60	20	5	3
11	Rafter, roundpoles	*Xylopia aethiopica*	Building materials				60	40	5	3
12	Dura palm	*Elaeis guineensis*	Nuts and edible oils	25	25		25	25	4	3
13	Makore	*Tieghemella heckelli*	Nuts and edible oil	25	25	50			4	3
14	Griffonia	*Griffonia simplicifolia*	Medicinal	33		67			3	2
15	Rattan	*Laccosperma* sp.	Building materials	33	33			33	3	2
16	Wolor	*Beilschmiedia manii*	Nuts and edible oils	67	33				3	2
17	Abrura	*Chlorophora regia*	Medicinal		50		50		2	1
18	African nutmeg	*Pycnanthus angolensis*	Medicinal	100					2	1
19	Cola	*Cola gigantea*	Medicinal					100	2	1
20	Dahoma	*Piptedenisatrum africanum*	Medicinal		50	50			2	1
21	Ketere	*Solanum* sp. (an edible nightshade)	Indigenous vegetables and mushrooms	50	50				2	1
22	Bush mango	*Irvingia gabonensis*	Nuts and edible oil				100		2	1
23	Mangrove	*Rhizophora* sp.	Unrelated (heating, dyeing)				100		2	1
24	Mushroom	Not determined	Indigenous vegetables and mushrooms	50				50	2	1
25	Palm wine	*Raffia vinifera*	Building. Unrelated (Beverages).	100					2	1
26	Tali	*Erythrophleum arborensis*	Unrelated (spiritual)					100	2	1

1. Also known as West African black pepper. 2 Alternatively used as a medicinal. 3. Percentage of citation for each community in relation to total number of citation of each NTFP[4]

Table 1: NTFP from Lower Nimba and Grand Bassa, continued.

	Common name	Botanical name	Category	Dialah/ Tappita	Old Yourpeah	Towe h	Barc oline	Bold Dollar	Total numbe r	Total (%)
27	Thatch	Palm trees and *Stachyothyrsus stapfiana*	Building materials				50	50	2[2]	1
28	Azoge	*Sacoglottis gaboniensis*	Medicinal	100[1]					1	1
29	Bamboo stick	*Raffia vinifera*	Building materials				100		1	1
30	Bread fruit	*Atrocarpus* sp.	Indigenous vegetables and mushrooms				100		1	1
31	Bush cola	*Cola nitida*	Colas and edible fruits	100					1	1
32	Bussia	*Bussea occidentalis*	Nuts and edible oils					100	1	1
33	Candle tree	*Canarium schweinfurthii*	Medicinal	100					1	1
34	Chicken pop	*Areliopsis tabonensis*	Medicinal	100					1	1
35	Coconut	*Coca nucifera*	Colas and edible fruits				100		1	1
36	Diospyra	*Diospyros sanzamimika*	Medicinal					100	1	1
37	Frake	*Terminalia superba*	Medicinal			100			1	1
38	Grains of Paradise	*Aframomum melegueta*	Spices	100					1	1
39	Iroko	*Chlorophora regia*	Medicinal		100				1	1
40	Kaya	*Khaya grandifolia*	Nuts and edible oils	100					1	1
41	Oboto	*Mammee africana*	Medicinal	100					1	1
42	Oil bean tree	*Parkia bicolor*	Medicinal. Unrelated (fish bait)	100					1	1
43	Palm cabbage	*Elaeis guineensis*	Indigenous vegetables and mushrooms	100					1	1
44	Pampena	*Albizzia adiantifolia*	Medicinal		100				1	1
45	Butter tree	*Pentadesma butyracea*	Medicinal	100					1	1
46	Reef	*Bombax vulgaris*	Building materials				100		1	1
47	Sterculia	*Sterculia trancanga*	Medicinal	100					1	1
48	Thornly tree	*Bridelia grandis*	Medicinal					100	1	1
49	Uapaca	*Uapaca heudelotii*	Nuts and edible oils				100		1	1
50	Vitex	*Vitex micrantha*	Medicinal		100				1	1
51	Voacanga	*Voacanga africana*	Medicinal		100				1	1

1. Percentage of citation for each community in relation to total number of citation of each NTFP (2). Informants listed 159 entries and 51 individual NTFP.

2.4 INDIGENOUS VEGETABLES AND MUSHROOMS

The indigenous vegetables and mushrooms are a unique category that is used for food security and income generation. Many indigenous vegetables were available at the local markets, providing income to sellers and improved health and nutrition to those consuming these products. The most important vegetables reported include bush yam used by 5% of interviewees which is an edible tuber (like cassava), bitter root (a young shoot, 3%), ketere (1%), *Atrocarpus sp.* (an introduced species, 1%) and palm cabbage (1%). Ketere is a local edible nightshade which is one of the more popular African indigenous vegetables. Nightshades *(Solanum sp.)*, among the most popular and profitable vegetables in Africa, are African indigenous vegetables traded across West and East Africa (National Research Council, 2006). Production of nightshades have been promoted by the AVRDC-The World Vegetable Center (Taiwan, Tanzania, Mali and Cameroon) because of their popularity, ease of production by rural communities to generate additional income while increasing consumption of nutritious vegetables at the family and community levels (Yang and Ojiewo, 2013, Yang et al. 2013). Mushrooms were mentioned by only 1% of respondents as being used as edible NTFP (Table 1). While only 2% of the respondents mentioned ketere, this fresh market vegetable (which is consumed by millions in Africa and Asia and distinct from the 'deadly nightshade'), can be easily grown, prepared and consumed locally, sold and traded in local markets. This and other indigenous vegetables can also be dried, packaged and sold in larger markets including Monrovia as is being done in rural regions of Kenya, Tanzania and Zambia. The same techniques described elsewhere in this report for drying and packaged would be employed with indigenous vegetables.

2.5 NUTS AND EDIBLE OILS

Another important category includes the nuts and edible oils with the most reportedly used NTFP being bush peanut, calpocalyx (3%) and dura palm (3%), followed by makore (3%), bush mango and wollor (1%). Others used to a lesser extent in the areas surveyed included bussia and kaya (less than 1%). In this category there was one species mentioned from which seeds were used as fish bait (1%) (Table 1).

2.6 MEDICINALS

In the survey, many respondents mentioned that several NTFP (48%) are used medicinally. Many NTFP have more than one use, and those with multiple uses often included a traditional medicinal application. Bitter cola was commonly reported as an aphrodisiac though it is also used as a food (appetizer). Other commonly cited medicinal NTFP were bush pepper and country spice. Many NTFP with medicinal uses were mentioned only once (1%), suggesting that these plants were important for local residents to satisfy their health care needs (Table 1). Although the focus of the survey was to identify what products are being currently used by local communities, some products of value and interest in the regional and international marketplace were also identified. Examples include griffonia, African nutmeg (a.k.a kombo) and voacanga. Each of these are cited (Table 1) but only mentioned by few of those interviewed because these plants, while internationally traded, are not part of the traditional Liberian pharmacopeia. Voacanga and kombo butter are products also exported from West Africa.

SECTION 3: NTFP VALUE CHAIN DESCRIPTION AND ANALYSIS

The NTFP industry in Liberia is informal and as such there is a lack of data to determine its impact on the economy. There is probably no way to ascertain the exact number of particular NTFP from communities and government forests all over the country. The NTFP analysis was therefore done based on a community survey that was drafted and pretested in the field, along with the consultant's experience and knowledge of the industry. Potential volumes in the wild were estimated based on the feedback provided by the participants during the focused group discussions. Data gathered and analyzed were based on information from six communities.

Estimated total potential volumes[4] of NTFP for the communities visited, based on the focus group discussions of communities showed that dura palm was abundant in the wild followed by country spice (Xylopia), walnuts, bush cola (*Cola nitida)* and bush pepper (Fig. 1). The survey results show the major NTFP that could be annually collected from the wild/forest from the six communities, when aggregated together (Fig. 1). Among the listed NTFP, the ones with higher volumes include dura palm (168 MT), Xylopia (country spice, 99 MT), walnut (63 MT), bush cola (57 MT), bush pepper (55 MT), bush mango (48 MT), griffonia (40 MT) and bitter cola (37 MT). The potential volumes that can be collected from the forest with initial support and available market[5] shows significant metric tonnage for the listed NTFP across various sites. During the surveys color photographs of the specific botanicals were used to help confirm a plants' identity. For communities that did not record any volume for some of the NTFP, it is likely that the NTFP are not found or were not recognized from the photographs. Dialah (184 MT), Bold Dollar (117 MT) and Barcoline (126 MT) were communities with the highest total volumes of the itemized NTFP, with dura palm, country spice, bush cola and bitter cola exceeding 10 MT in terms of potential production from single communities.

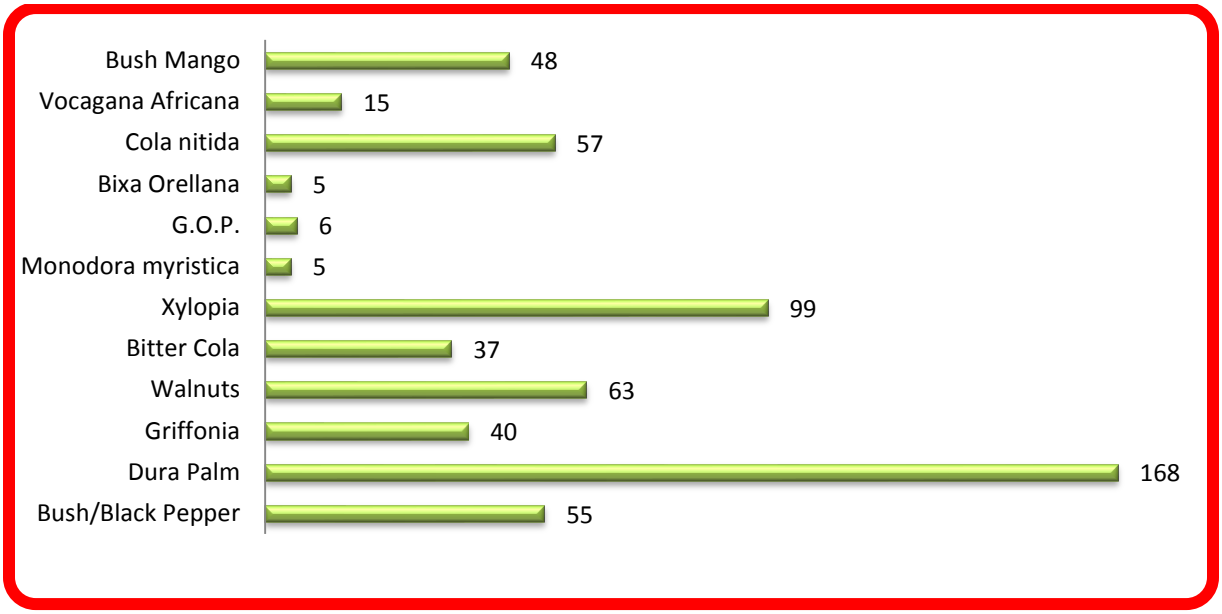


Figure 1: Total potential volumes of NTFP from the communities visited (in metric tons).

3.1 MATRIX FOR VALUE CHAIN SELECTION

Key criteria to ensure successful implementation of NTFP projects were used to score existing NTFP for their commercialization potential in the selected communities. These criteria can be broadly classified as

[4] This was compiled by summing up the estimated volumes from all communities visited during the focused group discussions.

[5] Support includes an organized mobilization campaign done on time beginning long in advance of the collection season, prefinancing or creative microfinancing or revolving loan system. This support ensures each actor along the value chain gets paid upon delivery of the product once its found to be acceptable, and to ensure it is private-sector driven with support from an organization such as PROSPER to provide the framework and initial outreach support. Support also includes continued training of the forest community members and those in the public and private sector that could provide additional technical assistance as needed. Volumes needed for local, regional and international market vary but for exports shipped out of Liberia, volumes of 7-12 MTs are needed (density and weight/product varies) for single or mixed loads of each NTFP kept separate.

milieu relevance, impact potential and value chain entry obstacles[6], many of which are discussed in detail below. The overall ratings for the various NTFP are presented in Appendix II. The selection criteria matrix used is defined below. Scores assigned to the factors were based on the interviews, data generated and the experience of the technical team. This matrix indicates the ratings based on the above mentioned criteria for the selected NTFP. The summary of the scores of the various NTFP is listed in Table 2.

3.1.1 Criterion 1: Milieu

The milieu criterion was measured using five factors relating to the market environment for the listed NTFP. These factors were potential for growth of value chain; availability of product in critical mass; NTFP found in over 50% of communities; regional/international market; presence of development actors who support the value chain (Appendix II). The overall objective of the milieu criteria is to capture the environmental settings of the community as well as production and the marketing environment through a ranking system. Each of these five factors was given a rank of between 1 and 5, based on interviews, data generated and the experience of the technical team for each NTFP in question. A rank of 5 indicates that the crop has the most potential and a rank of 1 indicates that the crop has the least potential under the listed criteria. Potential for growth of value chain factor captures the ability of the collector or the producer to secure consumer dollars along the value chain. Availability of critical mass factor assesses the ability to supply consistent quantity to buyers to make the trade profitable to all parties involved. The factor relating to regional/international market assesses the ability to market the products regionally and internationally. The factors relating to the presence of development actors (such as FDA and BOTPAL) who support the value chain assess the available resources to improve the value chain for the crop in question. Once these five factors are assigned a rank of between 1 and 5 for each crop, an average of these factors' rank was taken to obtain the overall rank for the milieu criterion. The milieu criterion was assigned a weight of 4 compared to a weight of 3 for the criteria relating to impact potential and value chain entry obstacle criteria, because the five factors that contribute to the milieu criterion are given more importance, based on the interviews, data generated and the experience of the technical team. The final index for the milieu criterion was derived by multiplication of the average rank with the assigned weight (Appendix II).

3.1.2 Criterion 2: Impact Potential

This criterion was used to assess the potential impact of the NTFP by any proposed intervention. The three factors that contribute to the impact potential criterion are potential for positive impact on the community, potential for positive gender impact, and potential for high self-employment. Similar to the milieu criterion, each of the factors was assigned a rank of between 1 and 5, based on interviews, data generated and the experience of the technical team for each NTFP in question. Again, a rank of 5 indicates that the crop has the most potential and a rank of 1 indicates that the crop has the least potential under the listed criteria (Appendix II). The factor relating to potential for positive impact on the community captures the increased revenue potential to the communities and thus improving the standard of living of the communities. The NTFP with higher prices with minimal collection time or production time would get a higher score under this factor. Potential for positive gender impact factor assesses the impact on women. For example, in some crops such as grains of paradise, women will be able to harvest the fruits without having to climb on trees or use special instruments to harvest products at the top of the trees. In such a scenario, this factor would get a higher score indicating a high impact on women. Similarly, the factor relating to potential for high self-employment captures the ability to use more labor to reap the benefits of value addition. Once these three factors were assigned a rank of between 1 and 5, an average impact potential rank was derived from the three contributing factors towards impact potential.

[6] An estimated measure of the intensity of obstacles that hinder the development of that sector

Since the impact criterion was assigned a weight of 3, to obtain the overall index for this criterion, average ranking was multiplied by 3 (Table 2).

3.1.3 Criterion 3: Value Chain Entry Obstacle

As with all agricultural and agro-forestry enterprises, the NTFP industry also involves risk, especially for the collectors, due to possible unstable demand for the products, the need to be paid upon delivery of product, and research findings which could impact the products use. The factors used to assess this criterion were level of production risk; level of business risk; and level of investment (Appendix II). Level of production risk assesses the collection risk as well as the production risk. For example, drought can negatively impact some crops more than others and if environmental stresses reach a critical point, significant yield loss can result. Unlike the other two rankings for the milieu criterion and the impact potential criterion, a higher ranking for the level of production risk means a higher risk obstacle for the value chain entry. Similarly, for the level of business risk and level of invest risk factors, the ranking needs to be lower for the crop to be chosen as a priority for further exploration. For example, if a crop requires a higher investment capital and has a low chance of being successful (business risk factor), that crop will be given a higher risk rank. Similar to potential impact criterion, value chain obstacle criterion was also given a weight of 3 based on the interviews, data generated and the experience of the technical team.

The average of the milieu and the impact potential criteria ratings was compared against the lowest scores for the Value Chain Entry Obstacle criterion to identify NTFP with greatest commercial potential (Table 3). Bush pepper, bitter cola, country spice, dura palm, griffonia, bush cola and GOP were the crops that scored 12 points and above for the milieu and the impact rating. Of these, bush pepper, GOP, bush cola, bitter cola and griffonia scored below 10 for value chain entry obstacle. These have greater impact potential and are also relatively easy to develop as they have limited entry obstacles (Table 2).

Table 2: Overall value chain ratings for the sixteen most cited NTFP

	Criteria			
NTFP	**Milieu Rating**	**Impact Rating**	**Average of milieu and Impact Rating**	**Value Chain Obstacle**
Bush cola	17.60	12.00	14.80	8.00
Dura Palm	16.80	13.00	14.90	10.00
Griffonia	16.80	12.00	14.40	9.00
West African black pepper/bush pepper	16.80	12.00	14.40	9.00
Grains of Paradise	16.00	12.00	14.00	8.00
Bitter cola	15.20	12.00	13.60	7.00
Country spice	15.20	11.00	13.10	11.00
Walnut	15.20	11.00	13.10	8.00
Bush cherry	12.80	13.00	12.90	10.00
Bush mango	12.80	9.00	10.90	8.00
Bush peanut	12.00	11.00	11.50	8.00
Bush yam	11.20	12.00	11.60	10.00
Calpocalyx	10.40	9.00	9.70	8.00

Makore	10.40	7.00	8.70	8.00
Wollor	10.40	7.00	8.70	8.00
Bitter root	8.00	8.00	8.00	8.00

3.2 SELECTED NTFP

Based on the criteria used for the NTFP selection matrix which includes market demand, as well as the team experience and knowledge of the industry, bush pepper, griffonia, bush cola, bitter cola and GOP are recommended for selection and development for these regions in PROSPER. Each of these recommended NTFP exhibit the potential for income generation and can be successfully procured in an environmentally sustainable manner and at levels sufficient for sustainability and to meet market demand. Each of these NTFP can be produced to supply commercial volumes for domestic, regional and overseas markets. Disaggregated potential volumes of the top 5 recommended NTFP by each of the communities visited are illustrated in Fig. 2, with average prices in US$/Kg received by communities visited presented in Fig. 3.

Table 3: Comparative volumes of NTFP by communities visited in Lower Nimba and Grand Bassa (Potential and current production volumes, trip data and transport fares).

NTFP	Old Yourpeah	Dialah	Toweh	Sehzue play	Bold Dollar	Barco line	Total (MT)
Bush Pepper (MT)	1	25	10	9	5	5	55
Griffonia	10	5	15		10		40
Bitter cola	0.5	0.15	4	12	15	5	37
GOP		0.2			6		6
Bush cola	5	35	12			5	57
Production potential (MT)[1]	65.50	183.6	75	31	117	126	
Actual production (MT) (Griffonia)	1.6 MT(Lower Nimba)						
Bush pepper	0.05	0.2	0.1	0.1	0.2		
Distance in Km to main urban center [2, 3]	73 km	22 km	43 km	-	82 km	20 km	
Trip time to urban center [4]	3h 40m (25.3)	49m (27.3)	2h 50m (23.8)	-	2h 40 m (30)	1 h (19.3)	
Transport fares per 'rice size' bag (US dollars)[7]	3.2-5.7	2.1-2.9	3.2-5.7	2.6-3.8	2.5-3.5	2.1-2.5	

[1]Including NTFP from Fig. 1. [2]Distance from Tappita in Lower Nimba. [3]From Buchanan (Grand Bassa). 4-Time (moving speed average in km/h) during the rainy season using 4x4 pickup trucks.

Reported current production figures are much lower than the values for what could be gathered annually which were aggregated by estimations provided by those involved in sales of that NTFP. For example, in Tappita 1.6 MT of griffonia were aggregated during the campaign 2011-2012 which falls below the

[7] These estimates include the use of the motor bikes to the major market centers (Tappita for Lower Nimba and Buchanan for Grand Bassa). These are relatively higher than using trucks but are the most preferable due to bad roads. Trucks are used after goods are collated at the market centers. One rice sized bag weights approximately 50 kg.

expected production cost of 30 MT for the whole Lower Nimba (Tappita area). The actual production for Bush pepper for this area is 0.45 (most of the sites varied from 0.05 to 0.2 MT) instead of 45 MT. To reach more of an area's potential, it is imperative to design interventions such as more buying stations, pre-financed supply chains by buyers, pre-orders by international buyers with some amount of advanced payment based upon agreed pricing and defined quality requirements. These interventions would increase the production to at least 50% and generate substantial volumes for beneficiary communities. **Teaming up with one or more griffonia buyers, processors and manufacturers such as BannerBio Nutraceuticals (China), one of the largest global buyers of griffonia seeds (this company has provided a letter of intent to purchase Liberian griffonia, Appendix IV, section D) will facilitate driving the market-first approach**. This company purchase 200MT/year and as of 2012-2013 season purchase price was **$5.00-$5.50/kg** of griffonia seed. The challenge to team up with such a company is to mobilize large quantities while ensuring quality and traceability.

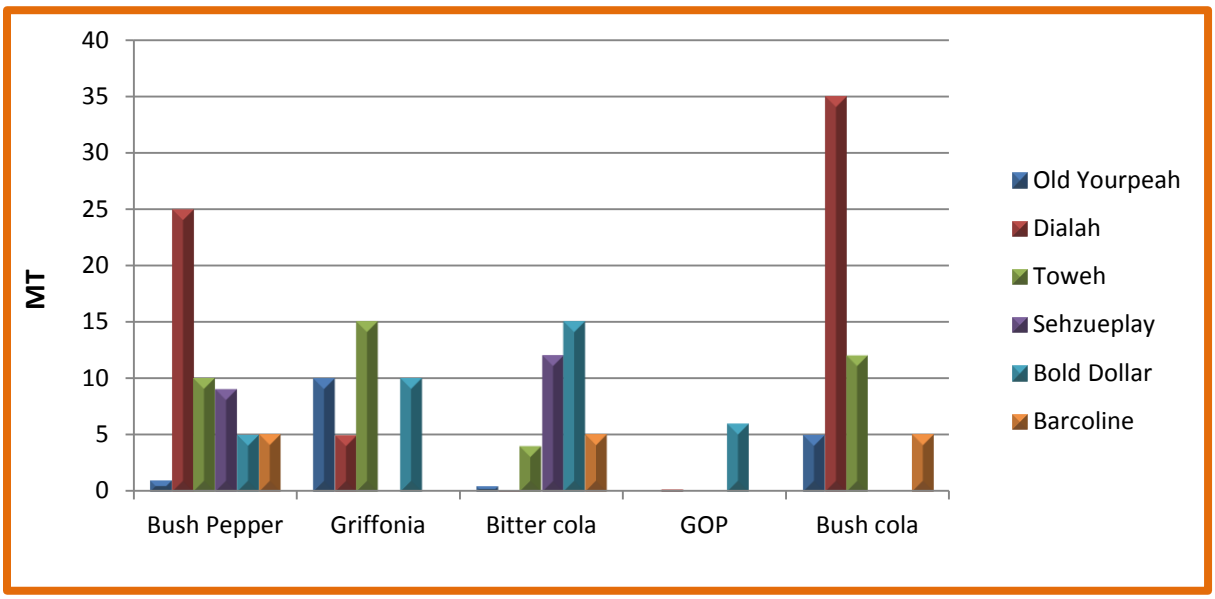
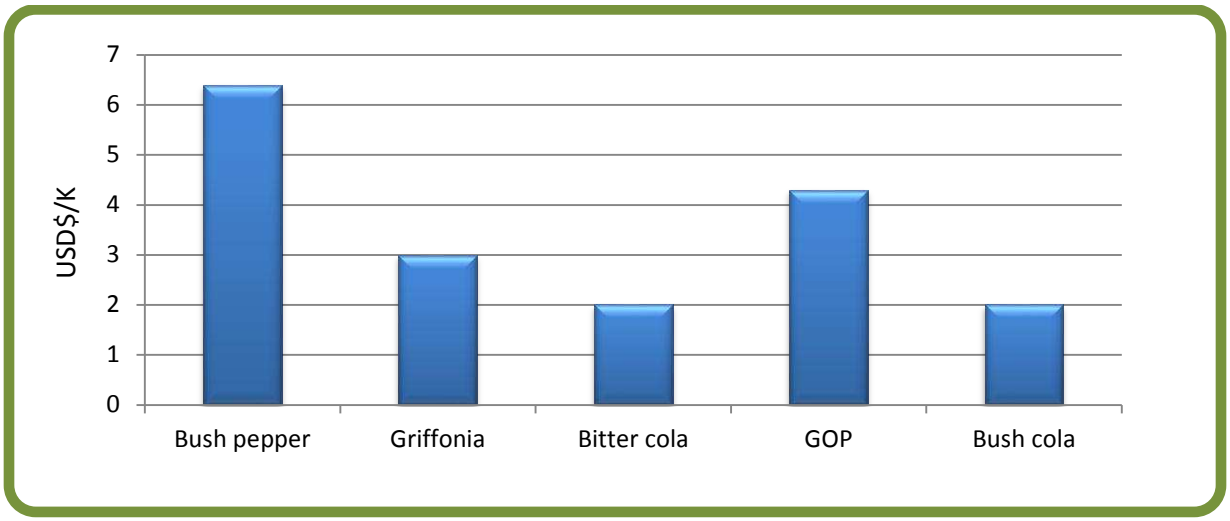


Figure 2: Potential volumes of top five recommended NTFP from each of the communities visited (in metric tons)

Figure 3: Average prices of top five recommended NTFP received by communities (in US$/Kg)



Without a firm commercial regional or export market, with established buyers and entrepreneurs/exporters/importers most Liberian NTFP would simply be left to decay rather than being collected and sold. Transportation costs are higher for the communities away from urban centers. Within Lower Nimba, Old Yourpeah and Toweh have higher transportation costs ($3.2-5.7 per rice size bag, 60 kg) than Dialah ($2.1-2.9), as these former two are more than 40 km from Tappita with bad road conditions. A similar situation was also observed for Bold Dollar ($2.5-3.5) in contrast to Barcoline ($2.1-2.5) (Table 3).

3.3 VALUE CHAINS FOR SELECTED NTFP

The value chain describes the full range of activities which are required to bring a product or service from conception, through the different phases of production that may involve a combination of physical transformation and the input of various producer services, delivery to final consumers and final disposal after use. The value chain involves many different actors or players at each step and the organization and functionality of a value chain affects the efficiency and strength of the commercialization efforts.

Due to the nature and similarity of the constraints for the sites visited, the value chain analysis has been organized around the recommended NTFP. Not surprisingly, in many cases, sufficient data was not available in the communities for each NTFP. The value chains have been analyzed according the three main categories identified in the ethnobotanical portion of this report including medicinals (griffonia), spices (GOP and bush pepper) and colas (bush and bitter colas). Supply chain considerations, actors, characteristics, functions, challenges and opportunities for the selected NTFP are listed in Appendix III. An overview of the NTFP value chain in Liberia is illustrated in Fig. 4. Although the value chains do vary based on the products, a generalized value chain is presented here and will be discussed in details at the product level.

3.4 GRIFFONIA: VALUE CHAIN DESCRIPTION

Griffonia *(G. simplicifolia)* is a vine thriving in the Guinea forest in the countries of Ghana, Côte d'Ivoire and Liberia (Kim et. al. 2009). The vine climbs to trees reaching heights of several meters (up to 10-20 m). The plant is adapted to a wide range of agro-climatic conditions. It is common in the coastal plains, in the high forest (uplands and lowlands) and secondary forest.

Griffonia is one of the most established commercial medicinal plants in from Ghana, the leading global supplier of this botanical. Griffonia seeds contain high levels of the 5-Hydroxytryptophan (5-HTP) a precursor of serotonin (Kim et al. 2009). Griffonia is the natural and commercial source for 5-HTP. Griffonia is used in western medicine/health care market to treat depression, insomnia, migraines headache and attention deficit disorder. It is also used as an appetite suppressant. The product is widely available and sold in the USA as a dietary supplement, where it can be purchased in most supermarkets and drug store outlets nationwide (WalMart, CVS, GNC and others). Companies marketing griffonia-based products with 5-HTP are listed in Appendix V along with prices and photos' of the final products that are in the USA marketplace.

Griffonia pods (left) and dried seeds (right)

The griffonia value chain starts with the identification of the collectors and acquisition of specific inputs such as harvesting implements and bags. Collectors, agents and subagents manage the collection and mobilization of griffonia seeds that are then sold to processors to aggregate volumes. Activities such as cleaning, drying, sorting, grading, and packing are often performed by the processors and larger agents. From there, seeds reach regional and international markets through agents and exporters (Fig. 4).

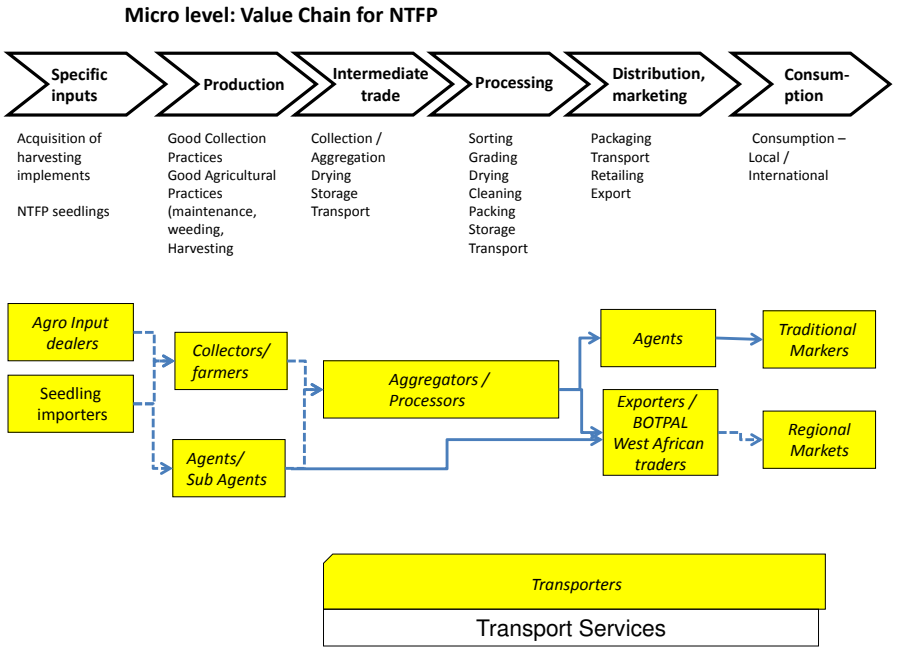


Figure 4: Value chain of NTFP in Liberia including functions in the communities visited.

3.4.1 Specific Input Supply

Input supply is a function of the availability from the agro-forestry dealer's side and demand from the users, collectors/farmers. This function is performed by agro-dealers around the country by developing agro-dealer networks. Agro-dealers are motivated by profits through margins and volume of sales.

Currently, griffonia is collected from the wild either from the forest floor or by using traditional and unsustainable methods due to unavailability of appropriate harvesting tools such as sickles for harvesting the hanging pods on tall trees. Regular sacks and equipment such as scales are usually not available. Communities visited in Lower Nimba indicated the nearest input stores were located in Sacleapea, Tappita and Ganta, a 3-5-hour drive from communities. Although the situation was similar in Bold Dollar and Barcoline, it was much easier to access an agro-input store as roads were in better condition and major cities were closer to Buchanan. These stores could hold appropriate tools for use by these communities when fully adopted. In facilitating the logistics of acquiring input supplies such as sickles and bags for collectors, organizations such as BOTPAL could play a major role in providing such supplies/tools providing easier access at affordable or reasonable prices.

3.4.2 Harvesting Seasons and Methods

As with many fruit-bearing NTFP, griffonia seeds are available during the dry season (December-May, Table 4). The development of the NTFP industry including **griffonia could provide an additional income generating** activity for these communities during their off-season or periods of less farming activities, could improve their ability to purchase food using the cash generated from the sale of NTFP, thus enhance food security and reduce poverty.

Table 4: Monthly availability (green squares) of griffonia (*Griffonia simplicifolia*) for the value chain study.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Griffonia												

Harvesting of griffonia seeds is done either by collection from the forest floor, by cutting down vines/trees, and/or plucking of fruits. Many of the interviewees noted the use of unsustainable harvesting methods for griffonia such as cutting down vines/trees in communities that indicated its availability (Old Yourpeah, Dialah, Toweh, Sehzueplay and Bold Dollar). Although some sustainable harvesting training has been conducted in the region, participants at the time of this survey indicated they had not undergone any form of training on sustainable harvesting of NTFP and did not understand the importance of sustainability since it grows in the forest naturally.

3.4.3 Collection

Griffonia harvesting is largely done by collectors, hand picking the seeds from the forest floor, in and/or near the communities visited. Collection of griffonia has not been consistent in the sense that only some communities visited in both Lower Nimba and Grand Bassa were involved in the collection process. This is not surprising given that the original pilot project under LRCFP was the first time many became familiar with griffonia. The volumes that have been collected in these communities were based on the quantities demanded. While some of the communities (Old Yourpeah, Dialah and Toweh) have traded griffonia over the last three years and longer, others did not, although each indicated that they had the potential to produce large(r) volumes. Communities that traded in this NTFP on a more regular basis were the ones that physically border with neighboring countries like Guinea and Côte d'Ivoire. While under PROSPER, only a few areas are targeted for development, knowledge that additional volumes could be procured in non-PROSPER regions can still assist facilitate international trade and the development of this sector and could further encourage companies to invest and purchase products in Liberia (e.g BannerBio).

The potential production of griffonia by all communities where PROSPER operates is 40 MT per season. Toweh can potentially produce 25 MT, followed by Old Yourpeah with 10 MT and Dialah with 5 MT.

Bold Dollar in District 4 will be able to produce an additional 10 MT. Field visits to all sites did not show any field cultivation of griffonia through propagation and planting. As this sector grows, griffonia from additional regions can be brought into this area which could serve as a center of collection.

In the 2009/2010 griffonia season, BOTPAL successfully mobilized 7,750 kg of seeds. Of the total quantity mobilized, Zor community accounted for 20% (1,800 kg), Tappita and its surroundings accounted for 18% (1,665 kg) and the remaining 62% (5,673kg) came from Karnplay and other parts of Grand Gedeh (ASNAPP ARD 4 Report, 2011). Old Yourpeah, Dialah, Toweh and Sehzueplay aggregate their supply in Tappita. These communities therefore accounted for the 1.6 MT produce from Tappita. No data was provided on griffonia for the Grand Bassa Communities as respondents indicated the last trading activities were about five years ago.

3.4.4 Intermediate trade and processing

Griffonia is traded in small quantities by both volume and weight (sold in buckets, cups, kilograms, among others) by collectors. Collectors and agents (also known as wholesalers) process griffonia by relying on traditional methods in which they manually extract the seeds from the pods and dry the seeds to some extent before selling to subagents within the communities. Women and children are mostly involved in the extraction of the seeds. Drying can take between 4 and 8 days before it is picked up by agents.

Subagents are mobilized on behalf of Ivoirians or buyers from Guinea. They in turn serve regional and international markets. These agents bag the NTFP in modified polypropylene sacks also known as 'rice bags' in different weights varying from 40-80kgs. For communities in Lower Nimba, they obtain their bags from Ganta from Monday to Saturday or on market days from Tappita and community markets centers, while those in Grand Bassa purchase from Buchannan. All sites visited were unaware of the presence of BOTPAL as a purchasing association indicating that BOTPAL or other buying marketing groups need greater visibility and integration into this industry. Having private companies such as BannerBio Nutraceuticals willing already to come to Liberia during the next season (2013-2014) and set-up an operation will greatly enhance the mobilization, procurement and purchasing of Griffonia seed. Given this company also trades in other West African NTFP, successful relationship with griffonia may possibly open up additional market opportunities for other Liberian NTFP. .

As griffonia is mobilized in small volumes from one community to another, the operational cost per kg becomes high as the agents have to trek long distances with their motorbikes to procure small volumes for the day. The nature of the trade also requires constant access to money to pay for goods collected. Sometimes, the cost can be as much as $100 -$180 per bag in the field. Any delay in immediate payments to collectors can hamper the procurement of sizable dried seed volumes to be generated for export. To facilitate exports, agents or BOTPAL members need about $50,000 to cover the cost of procuring a container load (12 MT) for exports. Due to this high capital involvement ASNAPP played an important role in effectively managing a micro-financing scheme for the 2010/2011 season. This highlights the previously described need for revolving credit, partial advance payment for products by the buyer and other creative financing mechanisms.

3.4.5 Drying

Collectors and sub-agents dry griffonia to moisture content levels (15-20%) that prevent speedy deterioration during the short time the products are expected to be with them. Drying is done either on the forest floor, in a village/hut on the bare floor, cemented floors (for rice) and on mats, tarps or raised platforms. A large proportion of participants interviewed indicated they dried their produce on the bare floor or mats directly laid on the floor without any protection from the sand particles and household animals that walk on them. Such unacceptable traditional handling approaches can be easily and rapidly changed/improved. The most simple drying systems can be (and have been) built at no cost other than

labor using local materials (palm fronds, raffia) gathered at the collection site. Materials include a variety of plants including bamboo covered with mats or other plant leaves to hold products off the ground and with vines as rope to provide additional stability. Such basic drying systems have been demonstrated and introduced into Nimba County (Zor and Gba) by ASNAPP and Rutgers University under LRCFP. A key point in drying systems is to keep the product off the forest floor and out of contact with the soil. ASNAPP and Rutgers introduced a more sophisticated drying rack (a table, 2m wide x 6m length x 1.5m height) in Nimba County using wood, coated wire netting (wire gauze) that was tightly fitted against wooden frames (similar to a window screen for larger and cleaner drying) and gave several workshops and trainings on how to build and use these drying racks. These models, used in other countries for drying spices and other products are size adjustable. Such tables at these sites would cost $60-$150 depending upon size. Use of racks does increase the quality of the product and allows for a more consistent product to be bulked together. These same 'tables' can be used to wash and clean the NTFP and sort and dry the product prior to bagging. The drying table was built as a demonstration unit at the ARD headquarters in Nimba County and not in one of the communities where those involved in the collecting could have seen and replicated building such units. Such drying tables can be covered by a roof (at additional cost), and forced air dryers used in cassava processing and with other foods can also be used for griffonia and other NTFP, though at higher costs. As a result of LRCFP campaigns, beneficiary communities found that they could build their own drying system off the ground simply with local materials, and thus at no additional cash expense except for their time and labor.

The reduction of moisture content of the seeds leads to a lower weight. Therefore the collectors receive lower revenue, as the moisture content goes down. Collectors and sub-agents are thus reluctant to dry to the acceptable moisture content (<10%). Processors then have to dry again to moisture levels low enough (less than 10%) to avoid seed deterioration during storage. To eliminate the issues relating to moisture content, on a trial basis, BOTPAL has now introduced the use of moisture meters to measure the moisture content before procurement. If successful, such technologies can be recommended to increase the efficiency while procuring griffonia seeds. Moisture content is critical for exporting using containers to preserve the seeds sufficiently during transit. In some cases, collectors may opt to sell griffonia seed at higher moisture levels to Côte d'Ivoire traders.

3.4.6 Storage

The study revealed different ways of storing griffonia by collectors. Dried seeds are stored on the bare floor where they are often stored with other products which can result in contamination. These storage practices reveal the general lack of knowledge by those involved on the appropriate storage (short and/or longer term) requirements for griffonia. The very basic and poor storage conditions and practices have a significant impact on product quality and eventually the prices received and market demand for those products. Failure to adhere to good storage practices will lead to the deterioration of griffonia seeds as the seeds will re-absorb moisture and grow moldy. Sometimes, depending on the location, temporary houses might be available for the storage of griffonia. If available, it is recommended that such temporary houses be converted to warehouses with the provision of scales and pallets during the purchasing season.

3.4.7 Transport

Liberia is a country with very poor road infrastructure. This situation has resulted in the domination of the transport sector by motorcycles which cost more than twice the amount required to transport the same goods over the same distance by trucks or cars. Goods are mainly transported to market centers using motorcycles, sometimes supported by trucks to other major market centers or neighboring countries. Transport fares are high due to frequent vehicle breakdown coupled with unofficial fees charged at every police/immigration barrier. Communities in Lower Nimba (Old Yourpeah, Dialah, Toweh, and Sehzueplay) were the worst affected by the road system compared to communities in Grand Bassa (Bold

Dollar and Barcoline). Therefore, it is recommended that aggregation points be established based on the volumes of supply and the locations so that trucks can be used to haul large volumes from the aggregation point to reduce costs.

3.4.8 Distribution, Marketing and Consumption

Griffonia is harvested mostly upon existing market demand when and if collectors are made aware that buyers/agents will be coming to purchase. For example, there has been no trade for the past two years in communities in Lower Nimba and for over seven years in Bold Dollar. Communities learn of market demand with the influx of buyers from other counties or neighboring countries. While access to these remote sites is clearly challenging and results in increased transaction costs, it is market price and volume demand that is the prime driver in mobilization of collectors and industry engagement. Ease of access does influence whether buyers visit one area or another to procure products as well as their frequency of visits. A driving force is the amount of product that can be procured at one given site at a time. Thus, effective and strategic campaigns to mobilize collectors and to organize the movement of products out of a community or area are so important. NTFP harvested from the communities are sold by the collectors to the subagents who represent the agents. Product volumes at this level may be from cups of ½kg to 5kgs. The agents are mostly pre-financed by other agents to ensure the supply of the quantity required. The prices are usually set by the buyer to the agent who works backwards to set price for subagents, taking into consideration the mobilization cost. The subagents are sometimes paid on a commission basis.

3.4.9 Quality requirements

Quality assurance of griffonia seeds is important because it provides information on the processing of the seeds and ensures griffonia will meet the buyer's expectation (Kim et al. 2009). Properly processed seeds are dark brown and the endosperm (visible when seeds are split) is typically bright yellow/green. Seeds should be whole and intact, and contain low amounts of foreign materials (0.5% by weight). Foreign materials are easily spotted as griffonia seeds are large (1.5-2 cm), common foreign materials include botanical dust, as well as sand and earth which indicates that seeds were dried in the bare ground.

The most critical quality control aspect is moisture content which should not exceed 10%. Seeds improperly dried can become moldy which lowers the value of the final product. Before exporting, seeds should be checked for moisture as seeds can decay during transportation to the industrial consumer. The minimum amount of 5-HTP has been set to 12%, although some buyers accept 10% or above. Reports prepared by Rutgers for LRCFP showed griffonia seeds from Liberia contained higher levels of 5-HTP (>16%). The reports also showed that moldy seeds contained lower levels of 5-HTP. The assessment of quality can be performed in-country as the equipment required is easy to procure. It is recommended that the testing of the 5-HTP levels be performed at local research institutions. Tools to measure seed moisture are available and easy to use. Seed moisture needs to be tested both during drying, to identify when the seeds have reached the appropriate moisture content for bagging, and periodically during longer-term storage to ensure the seeds have not absorbed moisture that could lead to mold and seed deterioration. Griffonia product specifications are provided in Appendix VI.

3.4.10 Gender considerations

Women are usually involved in the collection and processing of the seeds at the initial step in collection. As such, griffonia market development can support gender integration and equity strategies in the PROSPER program by providing opportunities for women to earn income and develop entrepreneurial skills.

3.4.11 Nature of the Industry in Liberia

The griffonia industry in Liberia is young and growing. Unlike the other selected NTFP, it is not used locally or in the sub-region although it has a regional market. LRCFP introduced and established a national body (BOTPAL) to oversee the purchases of griffonia in order to introduce GACP and standards into the trade. BOTPAL currently has a strong base in Upper Nimba and parts of Lower Nimba. Purchasers sometimes face some competition from non-Liberians who come in to buy the product. Some buyers come into Liberia and promise to pay the highest prices but may turn out unreliable. Based on references and experiences, a list of buyers can be developed to promote exports of griffonia (Appendix IV). BOTPAL can be strengthened and expanded recognizing that the development of an export market takes time, diligence and an adherence to working with the buyers. The collectors are paid cash by BOTPAL for their product. BOTPAL gets reimbursed later by the buyer/exporter. Strengthening BOTPAL-buyer relationships may help resolving the bottleneck for BOTPAL by having to upfront cash, once buyers/exporters are comfortable enough to step in. External financing will be required to a lesser degree. Working with BOTPAL and selected international buyers will allow Liberia to establish successful and sustainable harvesting practices and systems of GACP (WHO 2003). Working with selected buyers will help establish consistent quality upon which collectors can focus. A more complicated issue is what constitutes a fair price or even a comparative price relative to other commodities and options available. Fair prices need to result in a profit to the seller (a collector, farmer, agent) which would also be acceptable to the buyer(s). Thus, what constitutes a profit is not a kg price being higher or lower in product or another (e.g. griffonia vs. oil palm vs. cassava vs. cocoa). Rather, profits are reflective of input costs, risks, time, and in reality the options available to those members of the forest community engaged in collection at particular times of the year. NTFP described in this report can generate income while protecting and preserving the integrity of the forest. Such positive social and environmental impacts need to be considered when considering profitability and comparison to other income generating opportunities. For example, if short-term sales can be achieved but at a cost of biodiversity loss and forest degradation as has been observed in some areas of palm oil production which exists usually in areas where there had been forest trees, factoring in costs vs. profitability becomes more complex (Rice, 2012).

3.4.12 Market Outlook

Griffonia is largely traded on the international market. It is exported to Asia (e.g. China) for the extraction of 5-HTP and later exported to the USA and Europe for final processing and refining of 5-HTP into dietary supplements. USA does not import raw griffonia seeds at this time. Ghana currently exports over **2,000MT** of griffonia annually to Europe and Asian markets. An estimated 30 – 40% of this quantity comes from neighboring countries like Côte d'Ivoire and Liberia for re-exporting. The FOB price has ranged from **$ 3-8 per kg** for the past eight years. Based upon discussions with industry, at present the market does not appear to be saturated or near saturated. A list of some of the companies that purchase griffonia seeds is attached and lists of USA companies marketing griffonia and 5-HTP are shown in Appendix IV-V. A letter of intent to purchase griffonia from a new buyer now willing to come to Liberia and develop this country as a new source, is attached to show purchase commitment of a Chinese company, BannerBio Nutraceuticals, Inc. The company processes **200 tons** of seed annually, international prices for griffonia at the end of the production season was **$5-$5.50** (Appendix IV D).

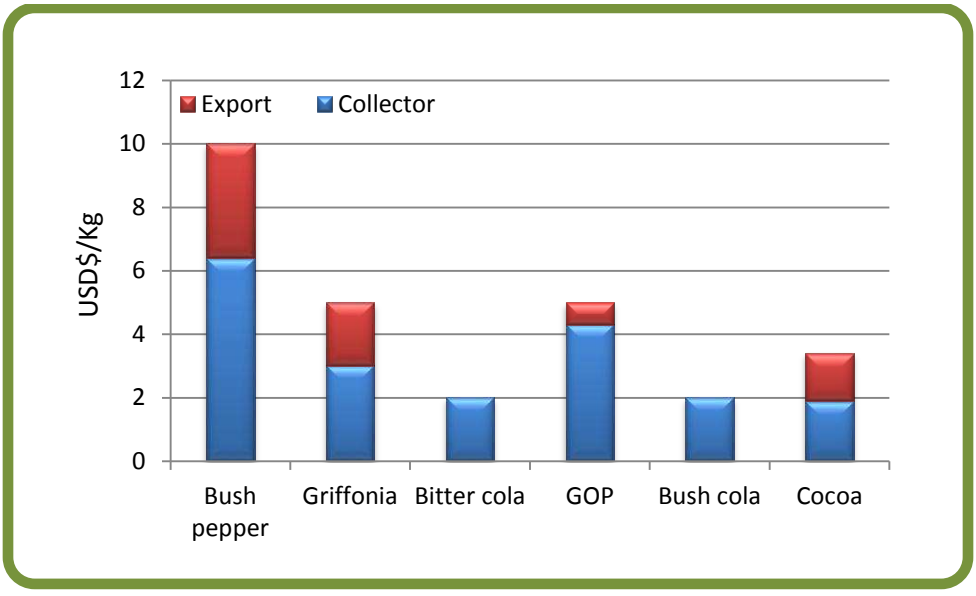
Collectors received $3 dollars while the current export price is $5 (Fig. 5). The critical harvestable volume for griffonia is approximately 12MT of product that fit into a 20ft container load. The associated cost for preparing a container load for export is usually high considering the logistical and infrastructural difficulties in Liberia. To justify investment by the private sector, an exporter should aim to reach at least 12MT container for these products to reduce the unit cost for the mobilization and export operations.

When comparing critical and potential volumes, , there is generally not enough volume of NTFP at any one site to commercialize, let alone to fill a shipping container. Therefore, it is necessary to aggregate the

products amongst those contributing communities to achieve volumes to make the trade successful. As can be seen from the tables and figures, aggregated potential volumes from all communities exceed current sales indicating there are ample indigenous plants that can provide far more product into the market (Table 2 and Fig. 2). A major challenge is to efficiently aggregate all the production volumes, given the poor infrastructure such as the road system and the absence of large trucks to haul the products.

In comparison, for another commodity, cocoa, Liberian farmers received $2/kg in 2009 while the export price was $3.4/kg (Fig. 5). Despite all the production, maintenance and post-harvest costs incurred, farmers are still able to make reasonable margins, by producing an agricultural commodity like cocoa which is also dependent on world prices. NTFP are supplementary/additional forestry based commodities that complement, not replace, farmers' existing income sources. In Liberia, for palm oil (2009 figures), the local average price was $3.9/gallon while international prices were $2.4/gallon (Anonymous, 2009, IndexMundy, 2013) with a similar trend observed for September 2012, $5.8/gallon and $3/gallon for local and international markets respectively (IndexMundy, 2013, Anonymous, 2012). Prices received for griffonia and other NTFP need to be considered as additional income generating activities. Not only do such NTFP help preserve the forest while providing cash to those living in the forest but in the cases reported, the prices received per kg appear similar to other reported agro-forestry enterprises, some of which involved far greater input costs. The NTFP sector empowers forest community members, however remote, however small, to become engaged in a commercial activity that relies on the preservation of their forest. Yet even if the prices/kg of NTFP received were lower and not higher (though the examples used in this survey found the NTFP to be equal and higher), the NTFP comes as additional income with little to no input costs, suggesting an even higher 'profitability' for at the community and collector level. Those interviewed found NTFP to be profitable and were keen on continuing and expanding.

Figure 5: Community and export prices for the five recommended NTFP as they compared with cocoa (October 2009 data for Liberia) (in US$). Export prices for bitter and bush cola were not provided.



3.4.13 Recommendations

To increase volumes of griffonia seeds harvested several measures are needed, starting with the provision of appropriate harvesting tools and collection bags/sacs. Early notification of the communities to

imminent demand is important. Some international buyers are showing interest in Liberia because of the expected increased quality due to the ongoing and prior interventions. International buyers, when considering purchasing from a new source (e.g. country), have greater confidence when they know there is a strong technical team specializing in natural products that can serve to provide extension, outreach and training and communication. A science-driven model serves to generate market interest. It is recommended that capacity building on GACP of griffonia to be done for all the communities visited, particularly on sustainable collection. Training should be provided on quality requirements of seeds to ensure that collectors are producing quality seeds and that agents have the tools to assess quality and maintain quality throughout the chain. Because drying is one of the most critical steps to achieve quality, introduction of low cost drying systems should be encouraged. Additional hand-held electronic moisture meters should be provided to agents to check moisture at aggregation sites and before exporting, as it was done during the LRCFP.

Some of the communities that did not indicate any volume available at the beginning will likely become involved with collection as purchasers will drive community members to find it in the wild. Although, there is potential to collect griffonia seeds in all the visited communities, volume generated from Bold Dollar and Barcoline will be minimal in the first year, but steady rise should be expected the following years as members become fully aware of the benefits obtained from the previous years.

For the international trade in griffonia, buyers expect exporters, agents and local traders to have the financial wherewithal to purchase at least a container load (e.g. 8- 12 MTs of seeds or more) and ship it before payment is made to the consigner. Buyers in Ghana normally pre-finance all their operations from their own cash or use the Letter of Credit (LC) received from the buyer to access loans at a discounted rate. BOTPAL does not have the capacity to access loans from bank due to the small volumes they are currently handling. Moreover, loans will unnecessarily increase their cost of operations. This situation puts additional focus on the need to establish close links between BOTPAL and international buyers, so that the latter can begin to help overcome the absence of sufficient pre-finance.

Due to the high cost of interest rate in Liberia, it may be necessary to identify creative ways to support the association financially for at least a period of 3-4 years with soft loans and/or grants from buyers so they are able to generate enough cash to be able to solely mobilize a container or generate enough volume to reduce their operational cost and access their own credit facility. BOTPAL membership should expand to extend their operation throughout the whole country, as a way to increase supply and volumes. Yet, individual members of BOTPAL may consider concentrating their operations to reduce costs, increase volume and increased efficiency. Finding means of pre-financing, micro-loans and adherence to contractual orders and cash flow is critical with the emergence of most new industries as is the ability to attract and maintain the interest of several wholesale buyers of griffonia seed. Development of a revolving fund could also be useful tool.

3.4.14 Mitigation measures

As some communities may utilize unsustainable practices such as cutting down the vine to harvest the seeds, there is a need to introduce control measures (Appendix VII). Several strategies can be implemented:

- Provide training in sustainable collection of griffonia and other NTFP to all the players in the value chain (collectors/gatherers, subagents, and agents and others involved in the business of buying).
- Establish a tracking system to be used by BOTPAL to document the collection sites. Require signed and named affidavits from collectors stating that the NTFP product was harvest according to sustainable methods.

- BOTPAL should work in concert with FDA to conduct periodical inspections of collection sites to ensure that the sustainable practices are followed.
- Determine sustainable harvest levels by conducting yield studies to know the quantity of NTFP that is produced naturally either per vine or area. Support these activities by conducting studies in permanent plots on seedling regeneration that will be re-inventoried bi/annually to monitor long-term effects of collection on natural regeneration. Decisions can be made if collection levels brought generation below replacement levels. For the medium term and considering the potential volumes, it is also important to consider supplying seedlings to augment the supplies in the wild as a mitigation measure.
- Have griffonia seedlings available in a nursery to foster forest preservation through cultivation. Establishment of such nursery at FTI and CU can serve as training sites for FDA and others.
- Establish monitoring sites in the collected areas as well as in a forest preserved area. Specific recommendations on monitoring and mitigation plans for griffonia, bush pepper and other Liberian NTFP have been drafted and submitted to PROSPER earlier for consideration.

3.5 SPICES: VALUE CHAIN DESCRIPTION

3.5.1 Grains of Paradise (GOP)

The seeds of *Aframomum melegueta* are known as grains of paradise (GOP), melegueta pepper or guinea pepper. It is a spice native to tropical West Africa. Botanically related to ginger, turmeric and other spices, in the 13th century, traders from West Africa carried this spice across the desert to sell in Tripoli and later to Italy.

Aframomum melegueta bears fruits at the base of the plant. Seeds (grains of paradise) are dark brown/red and small (3mm).

The Italians called it "Grains of Paradise" because of its high value, and the secrecy of the country of its origin. GOP is a small brown seed (2/3 mm) with a white endosperm, it is characterized by spicy and woody aromas, and the taste is sharp and pungent. The aroma and flavor comes from the seed containing some of the same chemical constituents found in ginger. GOP has many medicinal uses and has been used as a spice for several centuries though today is almost unknown in the western world (Juliani et al., 2008; Peter, 2000). Interest by spice and flavoring companies in developing new products has led to a renewed interest in this spice- and limited amounts can be found in the US marketplace. In the United States, the spice is best known as a flavoring base in several beers- including Samuel Adams, Boston Lager, Anheuser-Busch and other microbreweries around the world, and more recently the spice is sold by itself in specialty stores in the Western world.

3.5.2 Bush Pepper or West African Black Pepper

Bush pepper *(Piper guineense)* Schum. and Thonn. is locally known as West African black pepper, Ashanti pepper, Guinea pepper, Bush pepper and Guinea cubebs. It is locally known by many names including Zember (Mano), Lan (Gio), Sanapuaway (Kru) and Sanipanpan (Sapo). Bush pepper is a climbing perennial plant distributed throughout West Africa that can reach up to 12 meters high, and is usually found in high forest areas where it has prominent nodes and clasping roots. Flowers are white and minute which produce fruits borne on short, hanging spikes. Berry-like fruits are green when unripe and

become red at maturity. Bush pepper is used as a seasoning in food preparation to enhance food acceptability. Bush pepper from Liberia has a great potential to be commercialized as a unique and new spice for local, regional and international markets, as it is a mild and highly aromatic spice (Simon et al., 2012; Juliani et al., 2013). US and European spice fragrance manufacturers have expressed interest in this product.

3.5.3 Value Chain Description for Selected Spices (Bush Pepper and GOP)

3.5.3.1 Specific Input Supply

Many of the agro-forestry inputs that are needed for harvesting from the wild can be purchased locally. Such inputs include cutlasses, sickles, curved serrated blades, and poles which are needed to ensure sustainable collection practices. Scales and sacks/clean bags are also needed. Grains of Paradise was not found at all sites but was identified in sizable populations in Dialah and Bold Dollar sites (Table 3). In Ghana, GOP has been introduced into cultivation and works well under shade from cocoa and/or other tree crops. GOP is harvested using simple sharp knives or cutlass. Cutlasses and knives are readily available from in the agro-input shops in the cities as mentioned in the griffonia value chain.

3.5.3.2 Harvesting Seasons and Methods

As with many other fruit-bearing NTFP, the spices are also available during the dry season. Bush pepper is available from January through May, while GOP has a narrower window of availability from January to March in the targeted counties (Table 5). As with the griffonia value chain, the development of these products should be viewed as alternative and additional income activities for individuals during the off-farm season thereby ensuring food security and reducing poverty by providing cash flow during a time where families often have no other alternative income generating activities.

Table 5: Monthly availability of bush pepper and GOP for the value chain study

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bush pepper												
GOP												

The bush pepper berries are visible when hanging from the vines but too high to easily reach. As a consequence, collectors are tempted to either cut down the vine or cut down the tree to gain access to the berries which is an unsustainable and destructive harvesting technique. Few Liberians climb trees using ropes to harvest berries. Some reported that they harvested the berries directly from the floor after the berries had fallen. Collectors can harvest pepper berries in a nondestructive and sustainable manner by using poles with curved serrated blades to cut the pods hanging from the vines and then place into a collecting bag or onto the ground from where they are manually collected. This technique was introduced at a pilot-scale by ASNAPP and Rutgers under LRCFP where it was easily learned by participants. Sufficient samples need to be collected and cleaned, graded, sorted, analyzed by Rutgers and then distributed to a range of perfume and fragrance companies as well as spice firms.

3.5.3.3 Collection and Production

The collection of bush pepper has largely been similar for the communities visited in both Lower Nimba and Grand Bassa. The volumes that have been produced in the communities have been based on the quantities demanded by the buyer and the offer price. All communities visited have the potential to produce up to 55 MT (Table 3). Dialah has the potential to produce the highest of 25 MT, followed by Toweh (10 MT), Sehzueplay (9 MT), Bold Dollar and Barcoline (5 MT each) with Old Yourpeah being the least of 1 MT. Only Dialah and Bold Dollar recorded possible quantities of GOP from the wild of approximately 6 MT.

Old Yourpeah, Dialah, Toweh and Sehzueplay all indicated some level of trade of approximating 50kgs, 200kgs, 100kgs and 100kgs respectively within the past three years. Bold Dollar also indicated close to

200kgs was mobilized in 2011 with no data recorded for Barcoline. No appreciable trade was recorded for collectors or respondents in all communities visited. Small volumes were however traded in the various market centers. Traders either purchased produce from collectors in small clusters or from neighboring Côte d'Ivoire.
Both of these spices can be introduced into cultivation and would be adaptable ecologically and agro-forestry to fit well into the traditional polycultural crop enterprises found in each community and county. Costs of producing these crops from nursery onward have not been established. As both spices can be commercially produced, additional quantities needed by the market could be provided both by wild indigenous growing populations and materials begun in local nurseries and transplanted into community fields. We did not notice any cultivation of these spices nor a history in the production of these high value crops in Liberia as one finds in other West African countries. We see this as a real opportunity when coupled with appropriate training and capacity building and recommend next steps to develop a draft crop budget and then raise seedlings and introduce this NTFP into a site as a pilot trial to grow and market the harvested seeds.

3.5.3.4 Drying
Both GOP and bush pepper are dried on tarps on the floor without protection or on the bare floor. Only few use raised platforms in some of the communities visited in Lower Nimba. Drying of GOP takes longer as the whole fruit need to be dried approximately 14- 18 days, whereas, bush pepper could take 4-10 days depending on weather.

Drying should be done on raised platforms and never on the bare ground. Fresh products should be dried thoroughly to obtain a moisture level of 10% or less. Drying should be done preferably by the collectors as they are the first to receive the fresh product. All the players in the value chain should be trained in GACP including hygienic handling practices. We observed improved drying and cleanliness conditions only in communities that received training as part of the prior project by ASNAPP and Rutgers in concert with LRCFP. There is significant need for improvement in the areas of harvesting and post-harvest handling.

Additionally, GOP may have to be further processed once dried by pounding in a mortar to obtain the seeds from the fruit. In contrast, bush pepper berries need to be separated from the stems and then sorted.

3.5.3.5 Intermediate trade and processing
The processing of spices presents some challenges as during collection, drying and processing (sorting and bagging) it is essential to follow hygienic practices to prevent microbial contamination and ensure safe handling techniques. Collectors should wash their hands while handling the berries and seeds and prevent the freshly collected product to be in contact with soil, earth and other debris. Even the bags and other containers into which the products are placed need to be clean and free of contaminants.

Bush pepper and GOP are traded in small volumes (buckets, cups, kilograms, among others) by collectors to Fulani's in producing communities as well as traders on the local market. Bush pepper is dried directly after harvest and sold. GOP is dried in the pod and sold, or seeds are extracted from the dry pod before selling to traders or exporting. A visit to the markets showed various retailing outlets for these products. Some itinerant traders such as the Fulani's and people from neighboring countries also purchase large quantities of bush pepper for export. This was evident in the Lower Nimba communities as they were closer to the borders and therefore cross border trade was easier. However, a larger proportion of traders indicated that Côte d'Ivoire was their main source of supply for the Liberian market and that they would prefer to get locally produced material as it could reduce their transaction costs.

As with griffonia, polypropylene sacks also known as 'rice bags' are used for bagging GOP and bush pepper.

3.5.3.6 Storage

Different storage methods were reported for bush pepper and GOP. Both NTFP were either stored by placing polypropylene sacks with the content on the bare floor or hanged in the kitchen above the fire where some of the smoke and fire can engulf the products. The storage conditions and practices now used have a significant impact on product quality. This has, however, not been a major problem for the regional market but could be a challenge when accessing foreign markets. It is imperative to install means of quality control to ensure compliance with market requirements. Storage in the kitchen, while convenient, led to the products absorbing smells and aromas thus reducing the value of the product and rendering it unacceptable for the international market due to "contamination".

3.5.3.7 Transport

The challenges relating to transport of GOP and bush pepper are similar to those of the griffonia value chain as mentioned earlier. GOP and bush pepper are mainly collected and transported during the dry season and thus some of the troubles with poor road conditions are lessened. Transportation from the counties either into Monrovia and/or overland for trucking into neighboring countries is expensive and requires proper planning.

3.5.3.8 Quality requirements

Quality variation in Liberian bush pepper: whitish and moldy peppercorns (left), less moldy (center) and higher quality with most of peppercorns dark brown (right).

Sensory evaluation is one of the easiest ways to determine spice quality. Seeds should be whole and the color of the bush pepper berries should be black, or blackish brown. Whitish, greyish tints are associated with poor drying conditions leading to mold. Harvesting seed that has been too long on the ground can also lead to this discoloration even with proper drying. Moldy and improperly dried products can lead to the accumulation of high levels of aflatoxins, a condition not acceptable to international buyers. Berries showing some levels of decay will have moldy aromas. For GOP, the seeds should be whole and the color brown, reddish/brown, with no sign of mold growth and should be free from foreign odors (moldiness). Spices should contain low levels (<0.5%) of foreign materials (stems, stones, soils/dirt, non-plant debris, extraneous materials and others) and botanical dust. Some of the samples analyzed by Rutgers showed lower levels of microbial load and aflatoxins (Juliani et al., 2011). The cleanliness of each NTFP is a prime initial quality factor. International markets require spices and botanicals to have low microbial load (Appendix VI). Harvesting the seeds from above the ground, rapid and proper drying, improved cleanliness and dry conditions during storage all can mitigate against aflatoxins.

3.5.3.9 Distribution, Marketing and Consumption

The markets for both GOP and bush pepper are active all year round as both NTFP are popular and used in cuisine consumed locally and in the sub-region (ECOWAS). Bush pepper is traded in small volumes (25 kg in polybags) in the various markets in Liberia and in much larger volumes by agents in neighboring countries (1-2 tons), suggesting that local to international markets can be expanded. Preliminary market examination with spice traders and companies in the US confirm market interest.

3.5.3.10 Nature of the Industry in Liberia

The spice industry has existed for long although informally without major or registered and legalized buyers. Both GOP and bush pepper have existing sub-regional markets. BOTPAL plans to include in its line of products GOP and bush pepper for purchase when they secure orders. Fragrance industry in the US has expressed interest in the Liberian bush pepper from Nimba County in part because of its unique sensory profile. Currently, no Liberian agricultural or industrial association has included spices, botanicals and other NTFP in their portfolio. Thus, to date, much of the regional trade is conducted by non-Liberians.

3.5.3.11 Market Outlook for GOP

Grains of paradise is largely traded in the sub-region (Togo, Nigeria, Guinea and Ghana) yet there already exists international trade for this product both for use as a spice and flavoring agent in the beverage industry in the US, South Africa and Europe (e.g. England and France). This NTFP has also been in high demand for the past several years due to its new applications in foods and more recently in cosmetics. Ghana currently has not been able to supply quantities requested by companies in South Africa, USA and France. The demand unfulfilled is in excess of ***500 MT*** annually with FOB price ranging from ***$ 4 - $ 7 per*** kg while collectors received $4.3/kg (Fig. 5). Examples of a few companies that purchase GOP are listed in Appendix IV.

3.5.3.12 Market Outlook for bush pepper

Bush pepper has a market both in the sub-region and internationally. Several populations of this spice are known, with wide variations in aroma and flavor found across the regions. Besides being used as black pepper locally, this spice is also being blended with the more traditional black pepper of India, *Piper nigrum*, because of its close similarity. Bush pepper (*P. guineense*) found in the sub-region comes from Nigeria, Guinea and Ghana.

Liberian bush pepper already has a niche market in some foreign and West African markets. It is purchased locally by the Fulani's for the sub-regional market. Different spice companies have approached ASNAPP to supply small volumes of Liberian bush pepper for its unique aroma characteristics distinguishing it from other sources of bush pepper. Total quantity demanded by these buyers average around **6 MT** per year priced at about **$5 FOB per kg**. This spice however attracts close to **$10 per kg** in neighboring Guinea and other West African countries. This discrepancy may be due to the small volumes. However, for international trade, where very large volumes are involved, the price drops much lower to about $4-5 /kg. Collectors currently are earning about $6.4 per kg for the small volumes that enters into local and regional trade (Fig. 5). As for griffonia, the threshold volume for these two spices is 12MT or what fits into a 20ft container. A company in Nigeria has expressed interest in purchasing large quantities of this variety at competitive price from ASNAPP. A list of companies that purchase bush pepper is listed in Appendix IV.

3.5.3.13 Recommendations

The natural populations of GOP appear to be limited in overall harvest potential and were not found in all the targeted communities of PROSPER. Given the suitability of this spice for cultivation, production should be encouraged as it would contribute toward income generation in all the communities and assist with bringing the product to the market. Training is required in GACP and cultivation techniques for GOP in Bold Dollar and Dialah. Next to cultivation, seedlings can be placed in the wild to enrich the native populations or introduced into agroforestry settings, as this species thrives well under the shade of other cash/staple crops. Communities should be supplied with selected planting materials to ensure adoption of high yielding and commercially acceptable varieties. Some communities could develop nurseries for NTFP and other commercial crops as a micro-enterprise and create a local source of planting materials, which is currently lacking in Liberia. As spices in Liberia have been processed without following good production, processing and hygiene practices, we recommend that capacity building on GHP and quality control for all PROSPER communities be a focus in commercialization efforts.

Capacity building on GHP for bush pepper is equally needed. Capacity building on GACP for bush pepper is necessary to ensure the sustainable production of this variety in the wild. This should take place in all communities and be geared towards women and youth. Communities should be encouraged and supported through technical assistance to trade these NTFP locally and regionally. This would help to ensure supplementary income as well as the development of a more entrepreneurial approach to agro-forestry and cottage level industries involved in processing. Spices could thus be sold sub-regionally and internationally.

For the collectors and producers to be market-ready for supermarkets and even for export, women and youth of the communities could now mobilize to collect, dry and prepare small packages of GOP and

bush pepper. These could be put for sale at local and regional markets or sold to the vendors and traders at these markets. Vendors interviewed in the Sanniquellie and Red Light markets for example reported that these spices did not come from local sources or from Liberia but rather from Côte d'Ivoire. Vendors for example at the Red Light district indicated they drive to Côte d'Ivoire and back all the time to purchase most of the products they later offer for sale in Monrovia. Vendors were asked if they'd be willing to purchase at least these local Liberian spices and they responded affirmatively and were interested. Their interest was largely economic. Any such products that they could purchase locally could likely be bought at the same price they were now buying from Côte d'Ivoire. They indicated it was desirable as it would save them time and space in their vehicles to purchase other products and some of the spices were moldy and problematic (we assumed this to be unclean but in some cases was not defined). Replacement of imported NTFP with locally procured GOP and bush pepper would be one of the first steps toward realizing the quality and market linkages with the supermarket. A concerted effort to display and show Liberian spices to wholesale buyers and those that make purchasing decisions in supermarkets and other outlets can be done in concert with BOTPAL and other agents.

3.5.3.14 Mitigation measures

The same strategies recommended for griffonia can be implemented for GOP and bush pepper to ensure that the collectors are applying nondestructive and sustainable harvesting techniques. One important measure is to conduct outreach campaigns and trainings to collectors and agents, to create knowledge and understanding as to why NTFP should be harvested in a sustainable manner. Harvest assessments by conducting yield and regeneration studies will help to determine whether wild collection exceeds natural regeneration, and if it does, then collection levels can be reduced in certain areas. Working with buyers requiring sustainably harvested Liberian NTFP is a strong incentive to support a process that facilitates the implementation of sound sustainable collection practices. Developing public policies in concert with forest communities in sustainable harvesting of Liberian NTFP can be an additional tool and approach in creating processes and conditions that support sustainable harvesting practices.

3.6 COLAS: VALUE CHAIN DESCRIPTION

3.6.1 Bitter Cola

Bitter cola is the seed of the fruit of a multipurpose tree (*Garcinia kola*) with many uses among Liberians. Bitter cola was the second most used product according to the ethnobotanical survey (Table 1), reflecting the medicinal, nutritional and cultural values of this product. Bitter cola is used extensively in West Africa for the treatment of various diseases, though the most frequent use is as an aphrodisiac ("man power" as locally known in Liberia).

3.6.2 Bush cola (*Cola nitida*)

A tropical tree from West African rainforests, bush cola is best known for its caffeine-containing seeds, known as cola nuts. The tree is related to cocoa. Raw seeds are chewed as a stimulant (as they contain caffeine) and have a bitter taste. Cola nuts are used in a variety of local ceremonies and also to produce cola nut extract, which is an ingredient in soft drinks. The closely related species *Cola acuminata* is also sometimes known as cola nut, and its seeds are used in the same manner.

3.6.3 Value chain description for the selected Colas (Bush and Bitter Cola)

3.6.3.1 Specific Input Supply

Colas are harvested only from the wild as there was no mention of any cultivation during the visit. Simple tools are needed for their collection including long poles with a sickle in the end, ropes, and knives. Tools are readily available locally in the agro-input shops as stated in the griffonia value chain (Fig. 4).

3.6.3.2 Collection
Collection of Colas has been similar in the communities visited in Lower Nimba and Grand Bassa as they are also locally consumed. All communities visited indicated the presence of bitter cola with a potential production of 37 MT. Bold Dollar, Sehzueplay and Barcoline were among the communities supplying largest amounts (12, 15 and 5 MT, respectively) (Table 3). The potential production of bush cola in PROSPER communities is 57 MT, with annual volumes of this NTFP estimated to be 5 MT in Old Yourpeah, 35 MT in Dialah, 12 MT in Toweh, and 5 MT in Barcoline (Table 3). Regarding current production volumes, no data was provided for the colas for the various communities although they existed.

3.6.3.3 Harvesting Seasons and Methods
The production season for the colas appears to extend into the major production seasons for the main food crops in Liberia (Table 6). Thus, the production and in particular any cultivation of the colas is likely to affect labor and other requirements for producing other food crops.

Table 6: Monthly availability of bitter cola and bush cola for the value chain study

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bitter cola												
Bush cola												

Colas are generally harvested manually by plucking by hand or using simple harvesting tools like sickles on a long pole. As fruits drop they are collected from the ground. Few collectors climb trees using ropes to get to the pods and harvest. Knives are used to split open the pods to extract the colas.

3.6.3.4 Intermediate trade and processing
The colas are traded in small volumes in clusters of five nuts or more by traders in the local market. For the local markets, bitter cola nuts are sold fresh but for the sub-regional and international markets the nuts must first be dried. Drying must be done in a way that does not change the color and taste. Several drying techniques such as sun drying, shade drying, and oven/force air drying are used. Sun drying is the most popular method used mainly among those whom we interviewed but this method is not accepted internationally. The application of this method has not been a problem as most of the colas are consumed locally or in the sub-region. Shade drying is recommended which takes about 4-5 days.
In bush cola, the testa undergoes a process of retting, which uses heat and moisture to encourage microbial activity which then accelerates the breakdown of the fruit in order to more easily extract the individual nuts. The colas are rotted by keeping the nuts on bare ground (with occasional moistening) and covering with jute bags for 3-5 days. The nuts undergo retting and turn black. The nuts are then soaked in water for a day after which they are skinned, rinsed and collected in baskets to drain off. Defective and infested nuts are removed before curing the nuts in flat baskets for 3 days. Nuts can be exported either fresh or dried (Asogwa et al., 2012) but in reality successful export will require drying. As colas are food products (raw or processed), hygiene practices as described for spices need to be followed to ensure food safety to obtain a product with a low microbial load. The specifications for bitter cola are provided in the Appendix VI, though there are few legally binding international specifications for the colas and for most NTFP. The African Herbal Pharmacopoeia does include this and the other NTFP (Brendler et al., 2010).

3.6.3.5 Storage
The nuts are usually stored in baskets or jute bags. The storage baskets are sometimes lined with black polythene followed by layers of fresh leaf materials and cola nuts. Baskets are kept indoor at room temperature. Fresh whole nuts are then preserved in this way for a long time.

3.6.3.6 Transport
The challenges noted for the griffonia value chain are applicable for the colas. The cola value chains are, however, additionally faced with challenges of transportation during the first 4-5 months of the year. This is the rainy season during which the roads are in very bad shape in Liberia (Table 3). Improvements in transportation or new strategies are needed if colas are to be exported through Free port to foreign markets during this time period.

3.6.3.7 Distribution, Marketing and Consumption
Market for the colas exists year-round as they are consumed locally and largely in the sub-region (Ecowas). Pods are sold to retailers, who buy directly through door-to-door approaches or in village markets. The retailers in turn process, sort and package the nuts in large baskets or bags and sell to wholesalers, who export the produce to neighboring countries and Europe.

3.6.3.8 Nature of the Industry in Liberia
Colas are traded in three stages: unprocessed wet nuts; bulk of processed nuts; and retail in both unprocessed and processed nuts. Bush cola is one of the main commercial species traded worldwide, whereas bitter cola is mainly of local and regional trading importance. The colas both have existing regional markets. BOTPAL members have been involved in the purchases of the colas to trade with neighboring Guinea for some time now (5 MT).

3.6.3.9 Market Overview: Bitter Cola
Export figures for Liberia where not provided though collectors received $2 per kg (Fig. 5). In Nigeria, the export price of bitter cola ranges from ***$17 - $30 per kg.*** Nigeria exports over ***10,000 MT*** annually. Bitter cola is mainly traded in the sub-region with little going further than West Africa. Wholesalers or traders do engage communities to mobilize these on their behalf when some minimum volumes can be found to justify their investment in the mobilization cost. For direct export, a 20ft container load of 20 MT is needed.

3.6.3.10 Market Overview: Bush cola
Bush cola is native to West Africa (from Guinea to Ghana) and has been introduced throughout the forested areas of West and Central Africa. Commercial crops are grown mainly in Nigeria, Ghana, Côte d'Ivoire and Sierra Leone and also to some extent in India, Brazil and Jamaica. The export price of bush cola ranges from ***$20 - $30 per kg*** for fermented nuts in Nigeria. This country produces over ***200,000 MT*** of nuts annually and exports only about 10% of the produce, the rest is consumed locally. Burkina Faso is one of the leading importers of bush cola in West Africa. No export figures were provided for bush cola. In Liberia, collectors earned up to $2 per kg. ASNAPP has been approached to facilitate the regular supply of cola from Liberia for partial processing in Ghana. The local price of bush cola is similar to that of cocoa (Fig. 5).

For bush cola, the margins appear small and this NTFP is not as high value product (based upon price/kg). Therefore to justify a mobilization campaign, increase efficiency, and still allow acceptable profit across the entire value chain, a higher volume of product is needed. It is estimated that a campaign to reach 30 MT of this NTFP should allow for that market segment to be developed. Bush cola has a more established market compared to bitter cola. A list of some of the companies that purchase bush cola and bitter cola is attached in the Appendix IV.

3.6.3.11 Recommendations
The commercial potential for both Liberian colas is very high. Therefore, we recommend that proactive campaigns be developed and conducted which focus on capacity building regards GACP with special emphasis on hygiene practices and drying. This is necessary to ensure that the collectors employ

sustainable methods of harvesting. Communities should be encouraged and supported to facilitate the trade of these NTFP regionally to improve their supplementary income.

3.6.3.12 Mitigation measures

In order to promote continuous and sustainable production of colas, the measures recommended for griffonia and spices are also applicable to these NTFP. As fruits are gathered either by collection from the ground or by plucking from trees, making current harvesting practices sustainable is reasonable because trees are usually not damaged. Training programs, coupled with awareness campaigns, requisite use of tracking forms, monitoring, public policies, and buyer preference and/or requirement to purchase only sustainably collected materials are a number of tools and approaches that can be used.

3.7 ROLE OF DONORS

Independent from greater and more serious challenges facing forest preservation from timber and mineral extraction and increased clearing of land for other development purposes, the activities of NTFP should still separately serve as a model for effective natural resources management. This led to the selection of the final five NTFP for the PROSPER communities. Donor resources are best utilized when donors/development agencies intervene in value chains with the potential to upgrade and the outcomes are in the public interest such as improved food security, poverty alleviation, and promotion of environmentally sound practices.

With the support from Tetra Tech ARD/USAID (Donor) that shouldered initial costs of awareness campaigns griffonia trade and collaboration from government (FDA), the confidence level of buyers improved and the risk level lowered for the 2010 purchasing season. For example, a regular buyer of griffonia in Ghana (ASNAPP trading partner) committed resources and invested over $55,000 in pilot test griffonia purchases.

The collaboration between agencies (Government, Donor, Private sector) which can lead to changes in public policy can facilitate the emergence and sustainability of new trade opportunities in the natural products subsector in the Liberian economy. The building of trust and confidence between all actors involved in the value chain is important and should not be underestimated. The actors and agencies involved in providing support services across the entire value chain are presented in Appendix VIII. Support service providers not only come from the GOL Ministries but from the private and other public sectors as shown. From credit and finance programs to marketing services to extension, FDA, Ministry of Trade and Customs, all have roles that can facilitate and strengthen the natural products sector in Liberia.

Donor funding is needed to address the critical development issues that when successfully addressed can attract investment from the private sector and government agencies. Donor funding should be sustained long enough to ensure that critical control measures have been implemented and stabilized.

3.8 SWOT ANALYSIS

An analysis of strengths, weaknesses, opportunities, and threats (SWOT) has been conducted for the *five selected NTFP* with respect to value chain functions such as input supply, production, processing, product manufacturing, and trade. The SWOT analysis was not done for each product in each community as most of the issues were found to be crosscutting (Table 7). The analysis reveals that the NTFP industry has a high potential to grow given the abundance of resources in the forest and demand for the targeted products. Prices realized for griffonia and other NTFP need to be profitable to those involved. Comparative value needs to be judged not only by price received/kg but by input costs and other factors. The NTFP prices/kg received in general compared favorably to other agro-forestry enterprises. Yet, even if/when NTFP prices/kg would be lower than for other farm-based products, additional income with little to no input costs would be generated for the community and collectors. Those found trading in NTFP described the sector to be profitable, however, neglected and insufficiently recognized and supported, but were keen on continuing and expanding.

Table 7: SWOT Analysis of the five Liberian Non-Timber Forest Products

	Input/Equipment supply	Collection/Production	Processing	Product Making	Trade
Strength	• Inputs (e.g. cutlasses, wellington boots, gloves, drying mats) are available locally. • Manufacturers of equipment with the ability to manufacture the desirable tools in the country (Go to Hell – Sickle) are available. • Use of similar tools for coffee and other commodity crops available.	• Abundantly available indigenous populations of griffonia, bitter cola, bush cola, bush pepper are found in the targeted community and government managed forests. • Expansion into additional regions and by additional communities possible given the presence of indigenous populations of the same NTFP elsewhere in Liberia.	• Long tradition of extraction of cola and to a lesser extent griffonia fruits/seeds from pods among some communities visited. • Drying of griffonia, bush pepper and GOP are relatively easier compared to bush cola. Potential entrepreneurs available to undertake primary processing and packaging of bush pepper and GOP for local open markets first the larger open markets in large villages and Monrovia	• Traditional ways of fermenting bush cola for the regional market.	• Increasing local, regional (bush pepper, GOP, colas) and international (Griffonia) demand for the selected NTFP. • There is a history of sub-regional trade in these Liberian NTFP; and a successful history of shipping a container of Liberian griffonia from the Monrovia port to Ghana where the product quality met international requirements and purchases were satisfied.
Weakness	• Little or no cultivation (Griffonia and GOP) to increase plant stands in the wild and decrease the pressure on the population in the wild. • No germplasm banks and/or nurseries yet established that can provide acceptable planting materials to communities. • Unavailability of appropriate harvesting tools to ensure sustainable harvesting	• Low volumes of GOP in the wild. • Lack of reliable data on potential sustainable yields from forests. • Poorly organized collection, no marketing strategy. • Production areas lack road access. • Lack of concern relative to sustainable harvesting practices	• Rudimentary methods of fermenting of bush cola. A lack of or inappropriate drying technologies leading to poor quality of product.	• No community groups identified in the communities undertaking processing or new product development from the NTFP. • Lack of product diversification. • Lack of storage facilities at different points in the value chain.	• Trading for colas is hampered by the poor road conditions as it is during the purchasing season . • Lack of trade standards for the selected NTFP in Liberia.

	Input/Equipment supply	Collection/Production	Processing	Product Making	Trade
Opportunity	• GOP and bush pepper can undergo primary processing and packaging (grinding bottles & paper packaging) to serve the local and regional markets targeting niche markets for example on the UN drive on Sinkor street.	• Possibility of cultivating GOP, bush pepper and griffonia on private farm land and community land. • Lessons learned in other countries where these NTFP were introduced into cultivation could be brought into Liberia.	• Possibility of using simple and less expensive tools and packaging materials improving quality of spun yarn using motorized charkhas, better extraction methods. • Improved drying technologies, storage facilities can be done using local and affordable materials. • Additional products from grading and sorting (e.g. griffonia) can be sold rather than discarded • Reduction of postharvest losses due to improved postharvest handling can increase profits to the collectors, farmers and agents.	• Possibility of PROSPER to support entrepreneurial initiatives (primary processing) aimed at moving collectors up the chain or closer to the markets. • Increasing awareness by the international community for these NTFP in a stable Liberia. • Improved quality control can lead to more consistent products	• Increasing demand for these NTFP. Griffonia for the pharmaceuticals and the nutraceutical/dietary supplement market; Colas and GOP for the beverage industry and GOP & bush pepper for spice and fragrance/cosmetic industries • Establishing identity through collective mark (logo) and accessing benefits of fair trade. • As local and regional trade increases, the Liberian sector becomes more ready for entering into the international marketplace.
Threat	• High cost of available input those are not easily accessible to the communities.	• Possibility of over exploitation beyond sustainable harvest levels • Inability to collect or export due to public policies that could limit or stop forest development activities including NTFP.	• Might lead to some destruction in forests due to increased demand raffia mats for drying the NTFP if the harvest of the raffia is not done properly.	• The delay in new product development can be a disincentive to the industry.	• Market for Griffonia is dependent on demands from the USA, Europe and Asia as there is no in-country processing or use for it. Thus making the market unstable though it has been traded for the past 30 years.

3.9 RECOMMENDATIONS FOR UPGRADING THE LIBERIAN NTFP VALUE CHAIN

Results from this study allow us to conclude that Liberian NTFP can indeed be commercialized and provide real income generating opportunities in a manner that utilizes rather than neglects Liberia's own natural indigenous plant resources, especially to those communities that have little access to other options and reside in remote forests and areas. The commercialization and development of this informal and under-recognized sector can be pursued such that the remaining intact forests are protected in an environmentally sound and sustainable manner (Table 8, Appendix VII). The commercialization of these NTFP is to compliment, not replace, ongoing commercial farming/forestry enterprises for cash and to provide food to the family and community. The NTFP sector is often neglected as government and public sector involved with forest conservation and community forest management are unfamiliar with the real commercial opportunities, the market for and value of their indigenous resources. With the dominance of the timber and mining sectors, and focus on forest protection and conservation, NTFP have been ignored and undervalued in Liberia even by those involved in regulation and protection of forests, commercial forestry and agriculture, and in training of future foresters, game wardens, environmentalists, etc. This creates a gap in understanding how this historically informal sector in Liberia can become developed into a more formalized and economically driven sector. An awareness campaign that is focused on the income generating benefits, the capacity building, teaching, training and strengthening of women's groups and the youth as well as those involved in public policy, could sufficiently overcome this issue.

The NTFP value chain constraints are identified according to the main categories of input supply, i.e., market access (contact with buyers), finance, organization & management, and technical capacity building. This framework provides the basis on which possible solutions can be identified. Considering their potential, *griffonia, bush pepper, GOP, bush cola, and bitter cola* have been recommended as the key and initial commodities/products for upgrading through a value chain based approach to benefit large number of resource-poor farm families in the remote areas. Most NTFP can be traded locally, only griffonia is not consumed locally. NTFP are not developed in the same manner as commodity crops but use models of high value niche crops in which purposeful marketing strategies lead to long term buyer relationships where the buyer often becomes a partner early on in the commercialization process.

The recommendations made below are to minimize risk, maximize commercial success for those involved in promoting natural products as a complementary income generating activity to supplement existing activities of farmers, collectors and processors in PROSPER assisted communities. The main objective is to sustainably (environmentally and economically) commercialize NTFP as to contribute to socio-economic development in addition to helping beneficiaries diversify their risks and over exposure/reliance on traditional sources of income and markets. We are recommending strategies and implementation programs that will permit successful NTFP extraction. Such extraction must be and can be done in an environmentally sound and conservative manner protecting both the targeted indigenous plant populations and non-targeted plants to preserve biodiversity. Care has to be taken to ensure beneficiaries' food security. Activities need to be planned such that there is a year-round source of income for participating communities. *ASNAPP and Rutgers have used this model successfully in communities where NTFP have been developed. Using intercropping system and cropping cycles, communities have been supported to add these crops into their current farming enterprises to generate supplementary income (which tend to be substantial because the natural products promoted are high value) whilst assuring food security.*

Eight key areas of upgrading have been proposed in this report for the promotion of the selected NTFP based on the challenges and opportunities identified and documented during the study, and are made alongside the recommendations for the specific value chains analyzed. Recommendations were also made bearing in mind the importance of having mitigation measures to ensure minimal destruction to the forest (Appendix VII).

3.9.1 Productivity Enhancement and Production Expansion

Technical assistance is needed to implement of Good Agricultural and Collection Practices (GACP) and Good Handling Practices (GHP). Hands-on trainings are to be geared towards increase of income for the collectors, protecting the forest, and create a stronger link between all in-country actors. Such an approach would also mitigate possible effects of over harvest of the forest resources and to ensure that sustainable collection practices are used and then monitored to gauge actual practices.

We recommend offsetting up NTFP nurseries at FTI and at CU where they could provide training opportunities for faculty, staff, students, and others involved in forest management. These nurseries themselves can, potentially become income generating for their respective institutions while supporting NTFP activities (Appendix VII). Should market demand for plantlets/seedlings arise, then small-scale commercial nurseries at the community level could be established. NTFP would become part of a range of plant materials offered to collectors and farmers as an income generating activity.

3.9.2 Entrepreneurship and Human Capital Development

Access to the international marketplace and understanding the needs of the international marketplace are the key bottlenecks affecting productivity in the NTFP sector. Afterwards, skilled human resources are lacking. Basic and innovative extension mechanisms such as adult education, focus group trainings at communities and experiential learning approaches that build local expertise and human capacity in good forest stewardship, and microenterprise development skills using NTFP are recommended. Capacity building should be geared toward women and youth and yet inclusive of others.

Establish a platform of extension service providers as to cover a wider area and engage the public sector. This activity should be facilitated by PROSPER and other programs or NGO's involved in NTFP.

Improved information sharing should be done through the use of community notice boards providing mobile numbers of advisory services (Technical and Marketing Information) with radio programmes, shows or announcements highlighting NTFP.

3.9.3 NTFP Market Chain Development

Producers, collectors, agents and in-country buyers need to be better informed, and linked to each other as well as to markets and consumers. Training for leading Liberian buyers and traders in regional and export market readiness is recommended and can be accomplished in-country, as well as through short market study tours in Ghana, and the inclusion of Liberia NTFP in food and trade shows worldwide (e.g. SupplySide, Natural Products Expo, BioFach, Vitafoods). These activities could rapidly provide exposure and visibility to the selected NTFP and increase market linkages and trade while 'cultivating' the entrepreneurial skills of those in the private sector. Liberian NTFP product specification sheets need to be developed and along with samples shown to international companies (Appendix VI). The promotion of market intelligence would serve to strengthen the efficiency of this sector as well adherence for BOTPAL and other trade organizations and private sector players to ensure its collectors groups adhere to GACP, specifically quality (safety) and sustainable management practices.

NTFP product mobilization is one of the biggest bottlenecks for producers and large buyers due in part to poor road and market infrastructure (e.g. warehousing, sheds, pallets). Municipal assemblies should support the development of public-private partnership investment in the modernization of the major market centres. Each market centre would have paved roads, sheds, warehouses, offices, parking areas, modern information communication technologies to facilitate market communication and serve the entire agricultural sector, into which NTFP is but a minor high value niche part. While such infrastructural improvement is beyond the scope of this study and PROSPER, advocating for such public/private works if achieved would overcome major barriers in most all food and agricultural products including NTFPs.

Lower Nimba, Upper Nimba and Grand Bassa should be supported in the development of two aggregation centres for NTFP bulking and storing to help reduce losses in the field and reduce field costs and to reduce transaction costs for buyers coming into the region. Use of cell phones to learn about market prices, market opportunities as well as problems and concerns should be one of the approaches to reach collectors and traders. Technical information and weekly radio addresses can be easily and rapidly developed as part of a campaign to inform, instruct and assist those at the community level, each to strengthen the commercialization process.

The NTFP that most strikingly lends itself to commercialization at this point is griffonia. There are significant volumes of it in the wild and there is some on-going mobilization and trade. Chain actors, collectors, agents, exporters have had some level of experience mobilizing good volumes for exports.

For Liberia to become a significant player on the international market, however, a series of targeted interventions will have to be put in place to build capacity of chain actors to become large volume suppliers.

1. BOTPAL needs to be streamlined, professionalised and resourced. The rules of engagement guiding the operations of members of the association will have to be clarified. BOTPAL could be seen as an association of independently operating agents who are responsible for their own business operations but come under the BOTPAL umbrella as a unit to sell their produce. Alternatively, there could be a professional management team (chief executive officer, finance and operations manager) installed which conducts BOTPAL's business on behalf of all members. In either situation, the modalities for sourcing funds, mobilizing products, selling and repayment will be specific and need to be outlines clearly. Who represents BOTPAL to the outside world? If BOTPAL is operating as a business entity, then it will have to be conscientious about record keeping, maintaining records of trading activities, financial transactions must pass through the bank and it needs to prepare some financial reports to buttress its business capabilities.

2. A robust and well monitored mobilization plan and strategy will have to be developed and implemented to substantially increase the volume of product mobilized from the wild. This plan will be developed in close consultation with BOTPAL, and more importantly, be monitored and enforced to ensure realization of targets. The plan will specify how funds will be disbursed, set targets for volumes to be realised per given period, determine quality that ought to be realized, demarcate operational zones, central warehousing facilities, modalities for periodic inspections and assessment of members' performance and consequences of non-compliance or low achievements to ensure that significant volumes of good quality products are mobilized during the season.

3. Market development will have to be graduated. BOTPAL needs to build capacity and scope in supplying significant volumes (up to 3 containers or 36MT per season) to either local exporters or buyers from Ghana before turning its attention to international buyers, where the room for error is very narrow and mistakes can be severely punished. An international buyer may not necessarily be interested in purchasing just 5MT of griffonia all the way from Liberia. Given the challenges in NTFP business in Liberia, BOTPAL needs to develop a comparative advantage that will deliver significant volumes of good quality griffonia at reasonable prices to attract buyer interest. The product is available, there isn't uncontrolled mobilization as happens in other West African countries, prices are fairly stable and BOTPAL can easily develop this advantage if it puts in place effective and efficient mobilization systems.

4. The other four NTFPs have potential but at this stage, are not ready for immediate commercialization given the low levels of product availability and even lower level of commercial trade in Liberia. They lend themselves for development because there is good on-going regional and international trade, however, investment will be required to develop these products. Initially, communities can be assisted to expand supply to domestic and regional markets, where the small available volumes can be easily absorbed. With experience and capacity gained, attention can then be focussed on international markets. Profiling these products by developing good spec sheets and sending samples to potential buyers

will help but cannot provide assured markets alone. Consistency in supply of realistic volumes, developed chain functions that will ensure delivery of high quality products and proof of existing capabilities are key requirements of international buyers. Most also tend to be large volume buyers who prefer to source products at relatively lower prices.

Taken together, for the purpose of true capacity building it is pertinent for local players all along the commodity chain to be trained and assisted over an extended period of time, in order to gradually overcome hurdles which so often in the past have caused frustration and ultimately led to abandonment of similar projects. Short-term or sporadic interventions will not achieve the results necessary to establish a sustainable NTFP industry or, for that matter, preserve the forests, if cash crops are the only alternatives. Fluctuation of supply, demand and therefore prices is not specific to NTFP related ventures, but rather imminent to all kinds of commodity trading. Sustainability can thus only be achieved by creating and carefully integrating an NTFP industry into existing livelihood preservation schemes.

3.9.4 Awareness Campaign for those in the Government and Public Sector involved in Forest Conservation and Community Forest Management

With primary focus on timber, minerals, forest protection and conservation, those involved in regulation and protection of forests, commercial forestry and agriculture, and in training are largely unfamiliar with NTFP. This creates a gap in understanding how this historically informal sector in Liberia can become developed into a more formalized sector. Griffonia, GOP, bush pepper, bush cola, and bitter cola are traded but largely ignored by national or county statistics, Awareness campaigns specifically developed for the FDA and customs and immigration officers who may assist in cross border trade will ensure clarity in the rules and regulations involved.

The FDA and MOA technical capacity should be strengthened relative to GACP for the selected NTFP. Technical Officers of AGHRA can be trained to acquire the requisite knowledge to provide the services or both ASNAPP and AGHRA can collaborate to provide the services until AGHRA staff acquires the requisite knowledge. Rutgers should provide technical backup to the FTI, the FDA and processors as well as to other public institutions such as the Ministry of Agriculture, College of Agriculture and Sustainable Development, Cuttington University and/or University of Liberia. This assistance should focus on capacity building relative to establishment of NTFP nurseries, and the requisite quality control procedures to strengthen the Liberian natural products sector. Such an approach leads to capacity building of current and future Liberian foresters, agro-foresters, nursery managers, and researchers that will address the food safety, quality control and environmental issues surrounding the sustainable procurement of NTFP.

3.9.5 Increased value addition through vertical integration

Vertical integration can be achieved through processing (drying, sorting, cleaning), packaging (simple to more complex) and marketing by the community forest participants to meet the local demand. The addition of such functions enables marginalized community members to potentially also get involved in the grading, sorting and packaging NTFP, rather than another group along value chain performing this task, and charging for it. Simple packaged products can be sold and traded locally, and in other village markets with the eventual goal of distributing such products into the open markets in Sanniquellie and Red Light markets in Monrovia as well through other agents and distributors.

Low cost partial processing facilities could be set up to support cottage level industries that will be driven by the private sector. PROSPER has the expertise in product development, test marketing and business plan development. The business plan could be financed by private entrepreneurs. This should involve private investors and / or communities that are in the business already with financing to be provided under realistic conditions (interest rate, repayment terms). BOTPAL and other agents and buyers could in many cases contribute to such advance financing.

3.9.6 Improvement in Product Quality

Players need to understand the importance of (high) quality for products targeted at regional and international markets as a way open a market window, to add value, drive market demand and receive higher prices for their products and repeat buyers. Players such as collectors, brokers, and processors, need to be trained further improving product quality. Those NTFP products consumed as food, (spices and colas) in particular need to safe for consumption. Trainings in harvest, postharvest handling and food safety need to be introduced, monitored using practical approaches that can be done in country with little external resources. This can be achieved through continuous quality control assessing the progress being made, and through training collectors, growers, research and outreach/extension personnel, processors, traders and their respective organizations.

3.9.7 Facilitate the development of an Industry Code of Conduct and Trade Standards

Quality assurance is needed if NTFP are to compete favorably in regional and international markets in Asia, US, and EU countries. Products need to be tested along the value chain and mitigation strategies implemented to ensure sustainable harvest protects the NTFP. This will consequently attract international buyers, and investors. Developing expertise to test, screen, monitor the grades and standards of botanicals and medicinal plants can be done in country and could contribute a sustainable mechanism of support. Such expertise can be developed at several institutions such as the FTI, FDA and Cuttington University. Chemical profiling and microbiological screening could prove more challenging to be established in-country, yet national labs that test other food products can be brought in for testing of NTFP targeted for export.

While the development of a sustainable harvest certification program is not the primary mandate of PROSPER, given the expertise, it could act as a facilitator to create and incorporate it into the marketing strategy as mandated by selected buyers. An Industry Code of Conduct once in place can serve as a voluntarily accepted mechanism to safeguard quality standards and ensuring sustainability of NTFP against presence of foreign materials, or exporting poor quality produce. The establishment of practical grades and standards (ones that can largely be visually done by collectors, processors and distributors in-country) for each NTFP coupled with the preparation of product specification sheets can provide confidence to buyers and increase market interest and demand.

3.9.8 Facilitate Innovative micro-financing schemes to support NTFP Based Industries

At this point, nobody in Liberia provides credit under reasonable conditions that would foster private NTFP-based enterprises. Facilitation of public: private sector microfinance schemes and access to innovative microfinance services for rural and peri-urban NTFP based enterprises are needed. Use of a private company(s) that can pre-finance the purchase of NTFP, the establishment of a revolving fund to meet the upfront cost of procurement with a marketing/trade group, or forward contracting are recommended.

Table 8: Roadmap for Implementation

Proposed Activities	Time Frame				
	Y1	Y2	Y3	Y4	Y5
Capacity building on GACP with communities and those providing support services to the collectors and producers					
Community mobilization and awareness campaigns including cell phone technology and radio					
Development and implementation of sustainable harvesting strategies and establishing monitoring sites in support of mitigation plans to ensure environmental sustainability					
Introduction of local and regional drying and storage systems					
Assessing mitigation plans					
Development of trade standards					
Performing Quality Checks and setting up of Assurance System					
Establishment of nurseries for GOP, West African Bush pepper and griffonia at FTI and Cuttington University					
Establishment of community nurseries as micro-enterprises					
Introduction of GOP and West African Bush pepper into cultivation					
Primary processing and packaging for the spices					
Capacity Building for Government agencies and educational organizations in support of developing in-country technical expertise, regional and national data capturing of collected and trade NTFP, assistance with cross border trade and forest stewardship					
Establishment of internship and training programs with FDA, FTI and CU					
Market readiness trainings and market study tour in Ghana for Liberians, and the inclusion of Liberia NTFP in food and trade shows in the USA (SupplySide, Natural Products Expo) or EU					
Market Linkage and Trade facilitation (B2B)					
Developing entrepreneurship and human capital development by establishment of extension/outreach services					
Expansion of NTFP in local and urban Liberian markets					
Expansion of griffonia trade for international markets					
Expansion of GOP, colas and West African Bush pepper trade in sub-region					
Expansion of GOP and West African Bush pepper from Liberia into international markets					
Expansion of beneficiaries in rural communities					
Strengthening the Capacity of BOTPAL					

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APPENDICES

APPENDIX I: METHODOLOGY

Ethnobotanical surveys

Ethnobotanical surveys to identify NTFP of Liberian plant origin were prepared and pretested weeks prior to the actual field study. The actual collection trip was conducted from September 15 to October 11, 2012 in Nimba and Grand Bassah Counties. The survey team visited three communities in southern Nimba (Dialah, Old Yourpeah, Toweh) and two communities in Grand Bassa (District 3, Barcoline and District 4, Bold Dollar). Due to the poor road conditions, one of the planned communities was not visited (Sehzy); instead interviews were conducted in the Tappita area.

Ethnobotanical data were collected through structured interviews. Individuals were interviewed separately and in their local language(s). At each site, and prior to any interviews, permissions to conduct the interviews were first agreed upon by the community leader. The purpose and objectives were first explained to the community leader, and then the survey itself was presented and read out loud to ensure that each question was understood and acceptable to be asked. Only after the community leaders indicated that they clearly understood the purpose of the survey, the approach that was to be used, the questions that were to be asked, and the future use of the survey, did they agree to the survey and sign the informed consent letter.

Each participant was asked the following demographical information (Name, Gender, Marital, Group Age, Ethnicity, Occupation, and Educational level). The participants, including both men and women, were at least 18 years old and were asked to first provide a list of NTFP they normally use and have the highest potential to generate income. For the NTFP, each participant was then asked to provide the following information:

1. Common name(s) of the NTFP;
2. Main uses;
3. Plant parts from which it is obtained;
4. Collection and processing methods;
5. Habitats where the NTFP grows;
6. Tools used to collect the NTFP;
7. Collection time during the year;
8. Gender of community members in charge of collecting, processing and selling;
9. The selling price (in Liberian dollars);
10. The degree of difficulty to collect each NTFP (easy, less than one hour walk; hard, one to three hours; very hard, more than three hours);
11. Population development (plant populations are decreasing, no change and increasing);
12. Estimate the available quantities in the forest (Low, less than one ton; Medium, one to three tons; High, more than three tons);
13. Threats affecting the NTFP; and
14. Strategies to increase their numbers in the forest.

Value Chain Approach

ASNAPP-Ghana undertook a desktop research and conducted field interviews with assistance from AGHRA Field staff. This study built on earlier value chain studies that have been conducted by ASNAPP in Liberia with support from ARD/USAID and ICCO. The value chain study was designed to collate perspectives of all actors within the NTFP value chain. The value chain study primarily focused on plant-based NTFP. The following actors were interviewed; a) Key stakeholders including service providers (e.g. transport owners) b) Public institutions including the government (Ministry of Agriculture, Trade and Commerce Ministry and FDA c) Local operators within the NTFP industry including producers, processors, traders, wholesalers & retailers in the traditional market, supermarket chains and exporters. d) Non-Financial service providers including Business Development Services (BDS) providers.

The Waterside market in Monrovia and various county markets were among the key markets to be visited. The team visited major Onion market centers in Tappita, Ganta and Waterside, as well the selected communities Old Yourpeah, Dialah, Toweh and Sehzueplay in Lower Nimba, and Bold Dollar and Barcoline in Grand Bassa. Data was collected from a sample of 166 interviewees, consisting of 115 male and 51 female respondents. The sample was distributes as follows: Old Yourpeah 23, Dialah, 55, Toweh 26, Sehzueplay 17, Bold Dollar 22 and Barcoline 43. During the visits, the team interviewed producers and traders. Observations, one-on-one and focus group discussions were held with key actors using open-ended questionnaires to generate qualitative data for analysis. The questionnaires were at some point abandoned and on the spot questions asked as follow-ups to the answers previously given. Questions were asked in English and the local languages for flexibility that allowed interviewees to freely express themselves. Where the local language posed a challenge to the team, the expertise of a local interpreter was sought to assist in the translation.

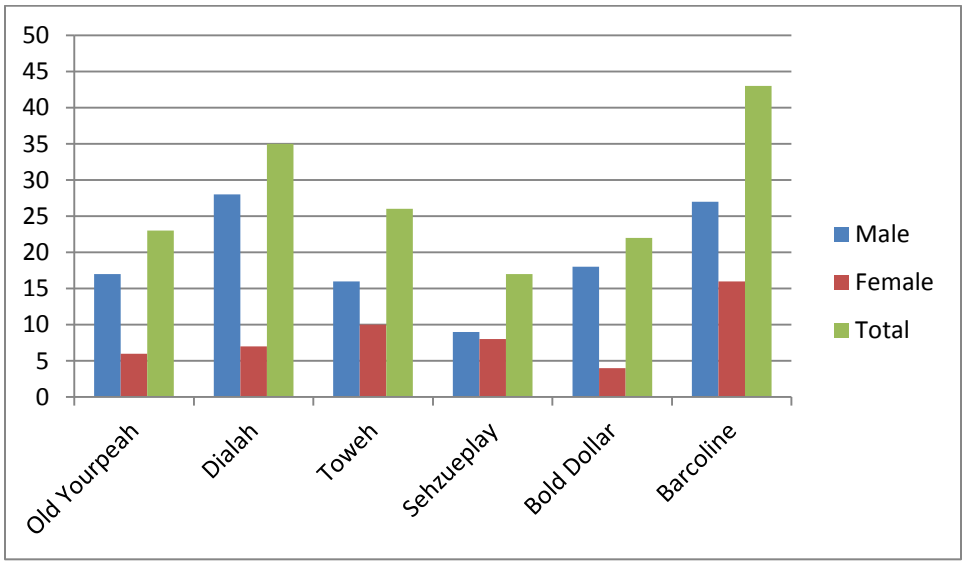


Figure 1. Sample size and gender of community members interviewed for the value chain analysis

Limitations of the Study

There has been limited number of studies relating to NTFP in Liberia and therefore secondary data is only scantly available. Primary data were collected by interviewing collectors, intermediaries such as sub-agents, agents, wholesalers and retailers involved in NTFP trade. Due to limited time availability and transportation/weather limitations during the study period, only 34 collectors were surveyed from the two counties, namely, Lower Nimba and Grand Bassa. To improve accuracy of the collected data for projecting to the population, a large sample with sufficient spatial distribution to be representative for the study area is needed. The reliability of the results could be improved in some areas if time and resources were available to improve the spatial coverage of the dataset. Most of the respondents kept minimum records leading to poor and limited data availability. Coupled with the limited grading of any products and non-use of standard units of measure (scale), it was difficult to get accurate records for the NTFP trade. National statistics are unavailable and no public records are kept on this topic relevant to the NTFP. Verbal data was therefore taken from groups of people to minimize the human error that was likely to develop due to loss of memory when interviewing just an individual.

As noted in the report, NTFP activities are mostly off-season, performed during the non-cultivable dry time of the year. Sales are often so sporadic that the collectors and other actors such as sub-agents, agents, etc., involved in the process may suffer from recall problems. In particular, data gathered from NTFP collectors are susceptible to recall problems, with respondents sometimes having difficulty remembering exactly how much NTFP they collected and when, over a certain time period, especially if this period is long and collection is irregular. One could use more accurate methods of data collection such as diary research to record all events with the details on a daily basis but that comes at a steep cost of money and time. Another way to check for accuracy of the data is through triangulation, which is a powerful technique that facilitates validation of data through cross verification from more than two sources. Data triangulation often involves cross verification through time, space and persons. During data collection interviews, some questions relating to topics such as income, age, diseases, etc., can be sensitive and the respondents may

provide biased answers for ulterior reasons. Especially when it comes to revenues and income, most respondents dislike discussing their income in public. When they discuss income, some respondents may overestimate volume, prices and income to impress the program, at the same time, some other respondents may underestimate these values to avoid issues relating to over-exploitation of forest due to unsustainable harvests. Thus triangulation of average volumes, prices and income relating to NTFP is very important to verify collected data. In future, and during the lifespan of PROSPER, we recommend that these surveys be repeated throughout the year, which may help to overcome recall problems and triangulate previously collected data and allow the expansion of the interviewed populations and actors involved in the NTFP sector. Additionally, this technique could capture seasonal variation in prices as well as quantities. The use of maps in surveys to indicate harvesting locations may facilitate the collection of more accurate data on harvesting locations, and enable modeling of combined location and distance choices to aid in the logistics of aggregating collected NTFP. Alternatively, forest surveys could be used to crosscheck collector's data on harvesting locations with an assessment of the level of resource degradation. However, this is only possible if there are visible signs of plant destruction or over-harvesting factors that have been recommended to implement within this project. This is an issue for the assessment of sustainability of NTFP harvesting, because different types of forest and woodland have different levels of sustainable threshold.

As can be seen from this analysis, accurate estimation of NTFP volume, prices and income is difficult, when many NTFP are not traded on regular basis and price information is hence unavailable. In addition, non-cash income as reported by collectors is likely to result in underestimation of total economic value of NTFP. Although the analysis suffers from data limitations relating to survey methods employed and valuation inaccuracies resulting from non-existent or limited markets, the estimated values are comparable to other related studies and should provide a solid base from which to build upon.

VALUE CHAIN QUESTIONNAIRE
MARKET ACCESSMENT QUESTIONNAIRE (CUSTOMS)

Name …… No ……..
Age…… Marital status……..
County……

What type of NTFP pass through this border post?
Cola ☐ grains of paradise ☐ fonia bla☐ pepper bitter col☐ other ☐ ☐

What are the volumes of NTFP that cross the border?

Kindly share the various forms of levies and taxes on goods that pass through the border

Do traders need permits for NTFP to cross the border? Kindly explain……
……..

A. BOTPAL

1. What is BOTPALs mission with the NTFP value chains development
2. What are some of your interventions/activities within the NTFP value chains
3. Who are the chain actors you work with in the NTFP sub sector (wholesalers, transporters)
4. Can you share their contacts for further interviews
5. Kindly describe the NTFP chain in Liberia
6. What are the various NTFP traded on the market and their major sources
7. What knowledge do you have on any of the NTFP value chains
8. What are the roles of key actors along the chain
9. What are the structure for decision making processes regarding price, quality among others
10. What information can you provide on any NTFP
11. What has been the volumes traded for the past 5yrs
12. What role has/does BOTPAL play with this specific chain
13. What are the major partnerships or collaborations that exist between chain actors that you are aware of. (eg between transporters and retailers)
14. Any specific contracts that you can share
15. Are the contracts formal with legal implications or informal
16. What are the formal mechanisms or checks to prevent breach
17. Any contracts between BOTPAL and Buyers of NTFP
18. Who are the major players within the industry
19. Are there NTFP 'queens' that we can talk to
20. Which players have major influence on prices
21. Who sets prices of NTFP
22. What is the current price of NTFP on the market per bag(50kgs)
23. Who are the major buyers of NTFP on the market (domestic, processors, hospitality)
24. Has the NTFP industry influenced national policies
25. What are the key constraints to undertaking your business
26. What will be the incentives for purchasing the NTFP
27. Will BOTPAL be willing to finance farmers or farmer groups for NTFP production? If not why, If yes, under what conditions?

B. Local Government Authority

1. What are your strategies or interventions to the NTFP markets in Liberia if any?
2. What are past, present and future business support services for market centers
3. Are there any legislation for markets or traders within the market centres
4. What form of security services does the local authorities provide for the various markets
5. Are there warehouses, storage or accommodation facilities at market centers and what are the charges? How many are they? Are they sufficient?
6. Kindly share the various forms of levies and taxes on trading at markets
7. How about permits? Kindly explain
8. Any tax exemptions for particular trading?
9. What are the key constraints to undertaking your business

C. Market Assessment (Wholesalers, Retailers, Market queens)

Name of Market ……..

Name of Interviewee……
Varieties of NTFP traded……

1. How many NTFP retailers/wholesalers are you in contract/partnership with
2. Which of the NTFP are preferred and why. Do list six of them
3. Kindly give the season of availability for the various varieties (Peak & lean season)
4. In your own estimation what can be done to improve upon the NTFP trade?
5. Where do you buy your NTFP from?
6. What price is the NTFP per bag (Cost price and selling price)
7. How much does it cost to transport the NTFP from the market
8. How long does it take to transport the NTFP for different seasons?
9. Do you face any challenges transporting your products to market centers
10. What are the various of NTFP sold in the market
11. What are the sources of these varieties
12. Which NTFP is most preferred. List the different end markets
13. Who are your major buyers
14. How many customers do you have per day/week
15. What are the quality grades of NTFP you sell
16. Who determines the price of the various grades
17. What are some of the quality checks you conduct on the NTFP
18. Do you use market information to assist you with price setting and expansion
19. If yes what information do you use
20. Where does the market information come from
21. Over the last 5 years how much has your business grown
22. What is your sales from the NTFP per day/week/month
23. What is your volumes from the NTFP per day/week/month
24. How much expenses do you incur per day/week/month
25. Do you pay rent for the space you are using
26. How about any toll, fee or tax
27. Is the fee fixed or charged per product/space
28. Is there a storage facility available the market to store you NTFP at the end of the day?
29. Where do you store your goods
30. How do you package the products to customers e.g. bags, quantities
31. What is the price per bag or price per kilo
32. Do you save with a financial institution?
33. If yes where. If no, why
34. Do you access loans from the financial institutions. Yes/No
35. If yes; What are the terms and conditions
36. What is the rate of interest on the loans
37. Where do you get financing for your business (inventory vs. fixed costs)
38. What are the terms and conditions
39. Have you insured your business
40. If yes, which insurance institution have you insured with
41. How much contribution do you pay per day/week/month
42. Do you receive any technical assistance from suppliers or other institutions e.g. gov't, banks
43. If yes, in what form
44. Do you have partnerships with other traders of the NTFP or farmers
45. What form of relationship exists
46. In your opinion, is this business profitable and in what ways can services be provided to make the trade profitable
47. Any list and contact information for input suppliers, as well as several small, medium and large buyers, associations, traders and processors
48. What are the key constraints to undertaking your business
49. Will you be willing to finance farmers or farmer groups for NTFP production? If not why, If yes, under what conditions?

Transporters

Name of Market: ……..
Name of Interviewee: ……..
Route: ……
Type of vehicle: ……..

1. Where do you pick the NTFP from
2. What quantities do you move per day/week

3. What is the price per bag of NTFP transported
4. What time of day do you travel and what is the duration of the journey
5. How much sales do you make per trip
6. How many trips do you make per day/week
7. How many times do you move NTFP from farm to the market
8. What are the key constraints to undertaking your business
9. Do get paid fully before transporting NTFP or are there any conditions/terms
10. How often do you transport other NTFP or other products
11. Is it easier or profitable to transport other products than NTFP?

Farmers/Collector

Name of Farmer: ……..
Community: ……..
Products : ……..
Acreage under cultivation/Quantity collected: ……

1. How do you access land/forest, do you own the land or lease
2. How much do you pay for the lease per month/year or for entering the forest
3. How much does it cost to prepare the land for cultivation
4. Do you have access to farm/harvesting implements
5. How much labor do you employ to assist in preparing the land
6. Where do you get your inputs from e.g. seeds/seedlings, irrigation etc.
7. Do you pay for the inputs
8. How much do you pay for the inputs, labor
9. Do you do any processing or sorting
10. Any list and contact information for input suppliers, as well as several small, medium and large buyers, associations, traders and processors
11. How many harvesting seasons are there for the Various NTFP listed
12. Where do you store your produce
13. Which of the NTFP are you able to store and for how long
14. What % of NTFP do you consume and % you sell
15. For how long do you store the NTFP before transporting to markets
16. What % of the harvested NTFP go bad
17. Are there any warehousing or storage facilities available
18. Do you pay for the storage facilities
19. If yes, how much and at what rate
20. What is the farm gate price for the NTFP for peak and low seasons?
21. How much sales do you make per season
22. How do you package the NTFP e.g. bag, box etc.
23. What is the means of measurement at farm gate e.g. bag, kilos
24. Do you sell directly to consumers or to retailers
25. Which markets are you key buyers
26. How many buyers do you have in total
27. How do you set your prices
28. Do you use market information to assist with price setting and expansion
29. From where do you get finance for your business
30. If banks, what are the terms and conditions
31. Are you able to meet the terms and conditions
32. Are you able to pay back the loan from the banks
33. Do you belong to a farmer group or association
34. If yes, contact information and mission of the farmer groups
35. Is the group able to access any form of inputs or finance
36. If yes, kindly explain
37. Do you receive any technical assistance from any NGO or institution
38. If yes, contact information and services provided
39. Do you pay for such services, kindly explain
40. What are the key constraints to undertaking your business

MOFA /Commerce Ministry

1. What are your strategies or interventions to the NTFP markets/farmers in the district
2. What are past, present and future business support services for market centers or farmers
3. Are there any legislation for markets or traders within the metropolis
4. Are there warehouses or storage facilities for farmers or traders
5. Are there any incentives or subsidies or extension support for farmers

6. Kindly share the data on NTFP production in the district
7. What are the key constraints to undertaking your business as a ministry
8. Can you share any agronomic and cost information for an ideal NTFP cultivation

Processors

1. What are the types of NTFP you prefer
2. Who are your key suppliers
3. What is your demand volumes per month/year
4. How regular/consistent is the supply of the NTFP

Supermarkets

1. What are the Types of NTFP you buy and sell
2. Which of the NTFP is preferred and why
3. Which of these sells quickly and why
4. What are the volumes traded?
5. What are the seasons of scarcity and abundance
6. Where do you get your supplies from? Liberia or imported, which country?
7. Would you prefer to buy the NTFP collected or grown in Liberia when well packaged?
8. What will be the price for delivering to your warehouse per kg

Agri Input sellers

Name: …….
Location: ……..

1. How many outlets do you have close the NTFP farmers/collectors? list them
2. What is the nearest distance to your shop
3. How many NTFP seeds and agrochemicals do you have for sale
4. Do you create awareness of your products to farmers and also have extension support services
5. Can you share any agronomic and cost information for an ideal NTFP cultivation

APPENDIX II: RATING OF VALUE CHAINS.

Relevant criteria for assessing promise of commercialization under Liberian conditions

Rating of value chains on relevant criteria											
Value chain	**Criteria**										
	Sub-sector criteria					**Impact criteria**			**VC Entry obstacle criteria**		
CROPS	Potential for growth of VC	Available in Critical Mass	NTFP found in Over 50% of Community	Has Regional / International market	Presence of development actors who support the value chain	Potential for positive impact on the community	Potential for positive gender impact	Potential for high (self) employment	Level of production risk	Level of business risk	Level of investment
Bush pepper	5	5	5	5	1	4	4	4	4	2	3
Bitter cola	5	5	4	4	1	4	4	4	2	2	3
Country spice	5	5	4	4	1	3	4	4	5	3	3
Bush cherry	4	4	4	2	2	4	5	4	4	3	3
Bush yam	4	4	3	1	2	4	4	4	4	3	3
Walnut	5	5	4	4	1	3	4	4	2	3	3
Bush peanut	4	3	4	3	1	3	4	4	2	3	3
Calpocalyx	3	3	3	3	1	3	3	3	2	3	3
Bitter root	2	3	2	2	1	2	3	3	2	3	3
Palm nut	5	5	3	5	3	5	4	4	2	4	4
Griffonia	5	5	5	5	1	4	4	4	2	4	3
Mango	4	3	3	4	2	3	3	3	2	3	3
Makore	3	3	3	2	2	2	2	3	2	3	3
Wollor	3	3	3	2	2	2	2	3	2	3	3
Bush cola	5	5	4	5	3	4	4	4	2	3	3
GOP	5	3	4	5	3	4	4	4	2	3	3

Note. 1 – being the lowest number in the range for the score. 5 – being the highest number in the range for the score.

APPENDIX III: SUPPLY CHAIN CONSIDERATIONS

Actors, characteristics, functions, challenges and opportunities

ACTORS	CHARACTERISTICS AND FUNCTIONS	MAIN CHALLENGES	OPPORTUNITIES
COLLECTORS	• Collect NTFP in small volumes and sell to sub agents and agents. • They are price takers and have minimum bargaining powers.	• Lack technical know-how on sustainable harvesting practices (e.g. black pepper and Griffonia). • Limited knowledge on Post Harvest Practices • Lack input such as harvesting aids, drying mats and bags/containers for dried products as agro input sellers are located in major cities and not close to the communities. • Delay in the transportation. • Lack service providers that can advise them on Good Agricultural and Collection Practices and other technical issues	• Integration of NTFP (Bush pepper & GOP) into agro-forestry and field settings as these plants are compatible with current crops/trees now grown and due to conducive agro-climatic conditions • Regional and local markets exists for some of the NTFP found (GOP, Bush pepper, Cola) • Perform primary processing of some of the NTFP such as the spices (bush pepper and GOP)
SUBAGENTS/BUYERS	• They serve as the first point of sale for the collectors in the community. • Live within the same village with collectors • Operate with minimum funds and buy in small volumes • Mostly pre-financed by the agents	• Lack consistent market information as trade is not stable; • Limited technical know-how on post-harvest handling; • Lack business management skills • Lack inputs also such as harvesting aids, drying mats, larger bags and containers for collecting products • They are frustrated by inconsistent market orders for particular NTFP such as Griffonia	• They can be developed as key buyers for the communities. • Businesses can be built around them to reduce the length of the supply chain for Griffonia and the bush pepper in particular • Can be trained as quality assurers and providers of technical support to collectors
AGENTS/BUYERS/ BOTPAL	• These are the central buyers of the commodities. • They pre-finance the sub agents and link the subagents, international buyers or exporters. • Often reside in the main towns and cities which serve as main aggregation centers and are financed mostly by exporters or international buyers (BOTPAL) • They travel to the subagents to pick their produce periodically	• Lack business management skills, technical know-how regarding post-harvest handling • They have difficulty in ensuring efficient monitoring and timely supply of goods by the subagents. • Lack storage facilities to hold products year round to meet market and consumer demands and capture higher prices when products are in short supply or need to be imported into Liberia • Their greatest challenges are price hikes. This is due to buyers in communities close to the border and others speculating on prices leading to market distortion	• Can be supported, trained and develop to become commodity traders and to access international markets.
RETAILERS	• They mostly sell at the market centers such as Tappita and Ganta • They sell in small quantities to the public on market days •	• Poor market infrastructure • Inconsistent supply of products • Seasonality of supply • Inability to get sufficient supply of some products to meet market demand • Inappropriate packaging material	• Expand markets with the supply of high quality product •
PROCESSORS	• No identifiable group or persons were engaged in the processing and	• Lack the scientific skills and facilities for processing and packaging of the NTFP	• There is apparent demand for these spices in

	packaging of GOP and Bush pepper for the local or regional markets	• Lack basic equipment • Lack the basic harvesting and post harvest skills • Lack the technical knowledge to develop product specification sheets to meet international market requirements • Several value-added opportunities can be achieved with the NTFP from processing into essential oils, oleoresins and other forms.	Monrovia
EXPORTERS/BOTPAL	• They finance the subagents/BOTPAL • Export large volumes to neighboring countries	• Loss of funds through non-compliance to terms of agreement • High commodity prices sometimes making them uncompetitive • Supply of poor quality goods • Erratic supply of goods • Disputes with subagents • Lack of standards and certification • Lack of international market expectations and requirements for trade • Lack of training on business skills	• Can expand markets with consistent supply of quality product

APPENDIX IV: LIST OF SELECTED BUYERS

(A) A list of selected commercial companies purchasing griffonia seeds.

Name of Company	Country	Address
Starlight Products	France	Starlight Products 129, Chemin de Croisset 76021 Rouen Cedex 3, France
Kruidendrogerij	Netherlands	Longobardenweg 13, Oss, Noord Brabant, Netherlands 5342 PL
LINNEA S.A.	Switzerland	Via Cantonale CH-6595 Riazzino (TI) Switzerland Tel: +41 (0)91 850 5050 Fax: +41 (0)91 850 5070 E-Mail: info@linnea.ch
M/s Laila Impex	India	Brindavan Colony, Agro & Agro Based Products & Commodities Vijayawada 520010 India
CHENGDU WAGOTT P'MACEUTICAL CO. LTD	China	Chengdu Wagott P'maceutical co. Ltd F5, Building A, Tianhe Incubator, Gaoxin Incubation Park, Southern Extension of Tian Fu Avenue, Chengdu

(B). A list of selected commercial companies purchasing West African spices (Bush pepper, Grains of Paradise, others).

Name of Company	Country	Address
Starlight Products	France	Starlight Products 129, Chemin de Croisset 76021 Rouen Cedex 3, France
Kruidendrogerij	Netherlands	Longobardenweg 13, Oss, Noord Brabant, Netherlands. 5342 PL.
LINNEA S.A.	Switzerland	Via Cantonale CH-6595 Riazzino (TI) Switzerland Tel: +41 (0)91 850 5050 Fax: +41 (0)91 850 5070 E-Mail: info@linnea.ch
M/s Laila Impex	India	Brindavan Colony. Agro & Agro Based Products & Commodities. Vijayawada. 520010. India.
CHENGDU WAGOTT P'MACEUTICAL CO. LTD	China	Chengdu Wagott P'maceutical co. Ltd F5, Building A, Tianhe Incubator, Gaoxin Incubation Park, Southern Extension of Tian Fu Avenue, Chengdu
Akowilson Trading and Farms Ltd.	Ghana	019 Obom Street Kasoa Ghana 00233 Ghana Phone 233 - 20020 - 9278
Samuel Adams Brewery	US	30 Germania St (between Marmion St &

		Brookside Ave) Boston, MA 02130 Neighborhood: Jamaica Plain (617) 368-5080
Brigdot Golden Heritage	Nigeria	Brigdot Golden Heritage NO 1 ILE TUNTUN JERICHO IBADAN oyo state Nigeria Tel: 234- 80540590- 40

(C). A list of selected commercial companies that purchase bush and bitter Cola.

Name of Company	Country	Address
Starlight Products	France	129, Chemin de Croisset. 76021 Rouen Cedex 3, France
Showtyme International Nig. Ltd	Nigeria	169, Ikorodu rd. Onipanu Lagos 23401. Nigeria.
Pejem (Nigeria) Company	Nigeria	1 Bello Osagie Avenue, Uselu, (P. O. Box 8975). 30001. Nigeria

D. BannerBio Nutraceuticals Letter of intent for purchase of griffonia from Liberia

BannerBio
invented by nature

BannerBio Nutraceuticals, Inc.
1/F 25th Building No 5 Kezhi West Road,
Hi-Tech Industrial Park, Nanshan District
Shenzhen 518067, CHINA
Tel 86-755-2650-4868 Fax 2650-4870

April 9th, 2013

Dr. Qingli Wu and Dr. Jim Simon
New Use Agriculture and Natural Plant Products Program
Rutgers, The State University of New Jersey
New Brunswick, NJ

RE: Our company's Interest and Support of Liberian Griffonia as a new country source of 5-HTP

Dear Drs. Wu and Simon,

We, BannerBio Nutraceuticals Inc ,a leading researcher and manufacturer of a wide range of botanicals around the world in trade. We are keenly interested in working with your group at Rutgers as we are aware of the quality of research and your outreach activities in botanicals, medicinals and other NonTimber Forest Products all over Africa.

After years of effort, we are one of the largest buyers and processors of Griffonia seeds in the world and a major processor of the Griffonia seeds into 5-HTP feeding the world. Also, we are one of the largest exporters of 5-HTP into the USA. We have had our own team of buyers stationed in Accra, Ghana, the lead exporter of this product. As the market demand for this product increases violently, we are actively seeking additional and new sources of Griffonia seeds.

Your earlier project in Liberia which focused on Griffonia has interested us as your one of the few groups that understands the link of quality to the product which is offered to the international market. Working with you, the promised high quality product would allow us to process the seeds far more efficiently, it is also convinced that the materials will not be adulterated and the samples shipped to us for evaluation will be representative of the large volume of griffonia seeds.

We need new sources of griffonia seeds, as long as their quality is acceptable and the price meets the international norms. It usually takes one or more seasons to collect sufficient griffonia seeds as raw materials, yet we are grateful to work with you to develop a partnership in developing Liberia as a stable new source of griffonia seeds.

Currently, the prices of dry griffonia seeds for export are $5.0-5.5/kg, and the prices have been fluctuated during this past year due to the increased demands. We can negotiate with you a firm price subject to international changes in case of any uncertain factors.

We purchase a large amount of griffonia seeds (more than 200 tons/year), for producing the world required 5-HTP.

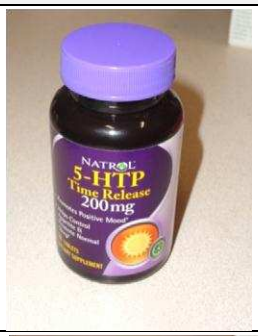
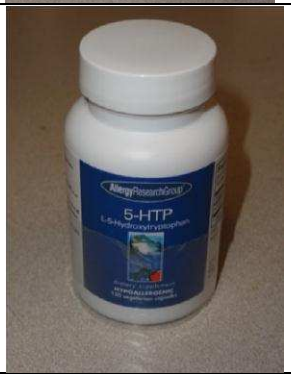
Please accept this letter as a formal statement of intent and interest to work with you and your group in facilitating the large-scale procurement of Griffonia under your supervision. Being with you, give us the confidence to move into a new country, which also reduces the risk for doing this by ourselves. We could meet each other in Liberia. You can lead the way for us to get a investigation about the areas in which griffonia seeds are collected. As we do work in many other African countries, we are worried about the poor road and facility conditions in Liberia.

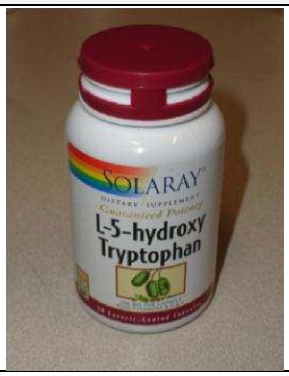
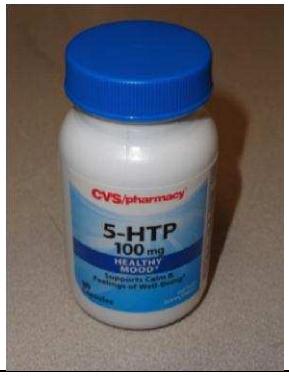
Yours sincerely,

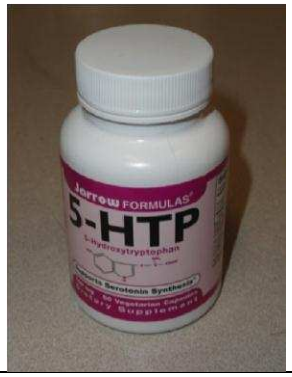
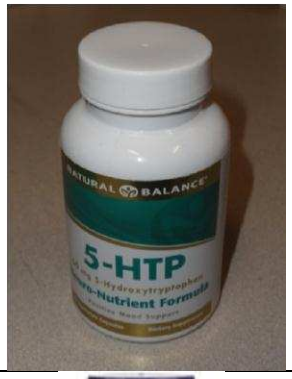
Xiaoyou Zhang
President, BannerBioNutraceuticals Inc.
1/f 25th Building No.5 Kezhi West Road
Hi-Tech Industrial Park
Nan shanDistrict
Shenzhen 518057 China
Tel: 86-755-26504868
Fax: 86-755-26504870
Email: xiaoyouzhang@bannerbio.com
Website: http://www.bannerbio.com/en/index.html

APPENDIX V: LIST OF MANUFACTURERS

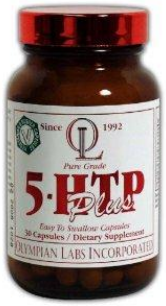
(D) Commercial manufacturers of griffonia products sold in the USA

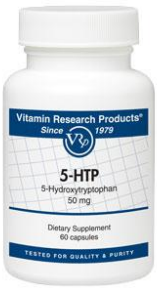
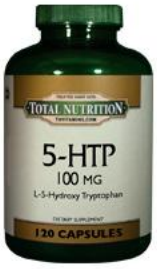
Company name	Address	Label Claims	Retail Price ($USD)	Photo
Natrol Inc	Chatsworth, CA 91311	Positive mood Appetite control Normal sleep	26.99 200mg 30 tablets	
Natrol Inc	Chatsworth, CA 91311	Lower anxiety Positive mood Appetite control Normal sleep	26.99 50mg 50 tablets	
Nature's way Inc.	Springviile, UT 84663	Positive mood Appetite control Gentile in stomach	11.99 50mg 50 tablets	
Allergy Research Group	Alameda, CA 94502	Claims formulation is of highest purity and free of any allergens.	36.49 50mg 150 capsules	

Company name	Address	Label Claims	Retail Price ($USD)	Photo
Solaray	Park City, UT 84060	Guaranteed to contain at least 98mg of 5-HTP Increases serotonin levels	18.79 102mg 30 capsules	
Rexall Sundown, Inc.	Boca Raton, FL 33487	Supports calm and relaxed mood	19.49 200mg 30 capsules	
The Vitamin Shoppe	North Bergen, NJ 07047	Supports positive mood	28.99 100mg 120 capsules	
CVS Pharmacy, Inc.	One CVS Drive Woonsocket, RI 02895	Supports calm and feelings of well being	13.29 100mg 30 capsules	

Company name	Address	Label Claims	Retail Price ($USD)	Photo
Jarrow's formulas - Superior Nutrition and Formulation	P.O. Box 35994 Los Angeles, CA 90035	Supports serotonin and melotonin synthesis	27.95 100mg 60 capsules	
Natural Balance	Englewood, CO 80112	Supports positive mood	16.99 50mg 60 capsules	
VitaGlo	3990 New Court Ave. Syracuse, NY 13206		33.99 200mg 60 capsules	
Vital Nutrients 5-HTP	5441 Palmer Crossing Circle Sarasota, FL 34233	Promotes healthy serotonin levels, sleep cycle, and appetite	45.70 100mg 60 capsules	

Company name	Address	Label Claims	Retail Price ($USD)	Photo
Ortho Molecular Products	1991 Duncan Place Woodstock, IL 60098		46.00 100mg 90 capsules	
BioGenesis Nutraceuticals	18303 Bothell-Everett Highway Suite 110 Mill Creek, WA 98012		35.00 50mg 120 capsules	
Healthy Origins 5-HTP	P.O. Box 12615 Pittsburgh, PA 15241		25.99 100mg 120 capsules	
Metabolic Maintenance			39.70 100mg 60 capsules	

Company name	Address	Label Claims	Retail Price ($USD)	Photo
Olympian Labs	21410 N. 15th Lane Suite 114 Phoenix, AZ 85027		23.62 100mg 30 capsules	
Higher Nature	Burwash Common East Sussex TN19 7LX	Apatite control Mood Control Fibromyalgia	46.03 100mg 90 capsules	
Rockwell Nutrition	Non listed	Apatite control Mood Control Fibromyalgia	36.00 100mg	
Griffonex	4961 Santa Anita Ave Unit #J Temple City, CA 91780		28.85 50mg 90 capsules	
Vitacost	130 Lexington Parkway Lexington, NC 27295		28.00 100mg 240 capsules	

Company name	Address	Label Claims	Retail Price ($USD)	Photo
Douglas Labs	112 Technology Drive Pittsburgh, Pennsylvania 15108, U.S.A.		50.50 75mg 60 capsules	
DrVita.com	6980 W. Warm Spring Rd, Ste 100 Las Vegas, NV 89113		17.08 50mg 120 capsules	
Vitamin Research Products	4610 Arrowhead Dr Carson City, NV 89706		20.97 100mg 60 capsules	
TNvitamins.com	Non listed		34.95 100mg 120 capsules	
Life enhancement products	Non listed		71.39 50mg 180 capsules	

Company name	Address	Label Claims	Retail Price ($USD)	Photo
Source Natural	Non listed		21.37 100mg 120 capsules	
Allstarhealth.com	5951 Skylab Road Huntington Beach, CA 92647		27.02 100mg 90 capsules	
Good 'N Natural	2100 Smithtown Ave Ronkonkoma, NY 11779		15.22 100mg 60 capsules	
3B Scientific Corporation	1840 Industrial Drive, Suite 160 Libertyville, IL 60048 USA		613.00/25g	
3B Scientific Corporation	1840 Industrial Drive, Suite 160 Libertyville, IL 60048 USA		1078.00/250 g	
Gencore BioPharma, Pvt. Ltd.	Plot No 103/1, IDA Phase II Cherlapally, Hyderabad AP 500051 India		285.00/25g	
Spectrum	14422 South San		4111.70/kg	

Company name	Address	Label Claims	Retail Price ($USD)	Photo
Chemicals and Laboratory Products	Pedro St. Gardena, CA 90248 USA			
Supplements4less			539.73/kg	
Brain and Body Supplements			410.00/Kg	
Herbstoreusa.com	P.O. Box 582, Walnut, CA 91788, USA;		705.95/Kg ≥ 98% Pure 5-HTP	Ships internationally
Ebiochem.com	Room 3E,3#,Youyou Century Plaza, No.428,South Yanggao Rd, Pudong, Shanghai, China		479.00/kg 99% pure 5-HTP from griffonia seeds	Ships internationally
Xian Changyue Phytochemisty	B-21801 No.70 Keji Road Hi-Tech Region Xi'an City ,P.R. China		100.00/kg 99% pure extracted from griffonia seeds	Price may not be accurate
Purebulk.com	1640 Austin Road Roseburg, OR 97471		620.00/kg (purity not specified)	Griffonia seed extract
Xiamen Top Health Biochem Tech.Co.,Ltd.			198/kg (purity not specified)	Griffonia seed extract
Health Supplement wholesalers	40 Hess Ln BLDG 1 Red Lion, PA 17356		557.80/kg 99% Pure	
Health Supplement Wholesalers	2331 East Market Street Suite G York, PA 17402-2861		9,989/25kg (purity not specified)	Griffonia seed Extract
Herbstoreusa.com	P.O. Box 582, Walnut, CA 91788, USA;		705.95/Kg ≥ 98% Pure 5-HTP	Ships internationally

APPENDIX VI: SAMPLE SPECIFICATION SHEETS FOR GRIFFONIA, BUSH PEPPER AND BITTER COLA[1]

Trade/Common Name Botanical name	Griffonia *Griffonia simplicifolia*	Bush pepper *Piper guineense*	Bitter cola *Garcinia kola*
Description	**Dried seeds**	**Dried fruits (peppercorns)**	**Fresh/dry seeds**
Color	**Black brown**	**Black brown**	**Brown, light brown**
Endosperm	**Bright green/yellow**		**White**
Damage seeds % (max.)	**0.5**	**N/A**	**None**
Botanical dust% (max.)	**0.5**	**0.1**	**0.1**
Foreign materials% (max.)	**0.5**		**0.5**
Moisture content % (max.)	**10**	**10**	**10 (dry)**
Total ashes % (max.)	**5**	**5.5**	**1**
Total insoluble ashes % (max.)	**1**	**1**	**1**
Chemical composition			
5-HTP % (min.)	**12**	**N/A**	**N/A**
Essential oils	**N/A**	**1.3**	**N/A**
Piperine content	**N/A**	**0.1**	**N/A**
Carbohydrates % (min)	**N/A**	**N/A**	**80**
Calcium % (min)	**N/A**	**N/A**	**2**
Polyphenols% (min)	**N/A**	**N/A**	**2**
Microbial load			
Total aerobic count (CFU/g, max)	**N/A**	**10^8**	**10^8**
Yeast/moulds (CFU/g, mas)	**10^5**	**10^4**	**10^4**
***E. Coli* (MPN/g, max)**	**10^4**	**10^2**	**10**
Salmonella (CFU/25g, max)	**N/A**	**Absent**	**Absent**
Aflatoxins (ppb, max)	**N/A**	**20**	**20**
Packaging (50kg)	**Jute sack**	**Polypropylene sack**	**Jute sack**

1. Currently, there are no international standards for these NTFPs but the Ghana Export Council developed national standard specification (in concert with Rutgers University and ASNAPP-Ghana) for use with exported griffonia to assist in strengthening this export product.

APPENDIX VII: MITIGATION AND MONITORING PLAN FOR NON-TIMBER FOREST PRODUCTS (NTFP)

Prepared by PROSPER[8] implementing partners Rutgers University, ASNAPP-Ghana, Tt/ARD and ACDI/VOCA.

Revision LRCFP ARD September 24, 2010, Second Revision PROSPER Tt/ARD August 2012
James Simon, Larry Amakuse, Nuah Bia, Sam Koffa Stephen Boadu, Rodolfo Juliani, Qingli Wu, Vaneska Litz and Peter DeWaard

This is the first Mitigation & Monitoring Plan (MMP) for the collection and harvesting of Non-timber Forest-based Products (NTFPs) in forested landscapes of PROSPER (People, Rules and Organizations Supporting the Protection of Ecosystem Services) pilot communities in Liberia. This plan seeks to provide guidelines to help the program address the potential adverse environmental effects and impacts of the thousands of people expected to collect and harvest a variety of NTFPs in the wild. Using two indigenous Liberian natural products – *Griffonia simplicifolia* (Griffonia) and *Piper guineense* Schum. and Thonn (Liberian or West African Black Pepper), this mitigation plan analyzes impacts associated with the collection and harvesting of Griffonia and Liberian Black Pepper, and describes environmental commitments and mitigation measures to reduce those practices with potential negative impact. The plan is designed to ensure that NTFPs can be procured from the forest without a significant impact on the environment, the biodiversity of the region and in a manner that increases the forest communities and societal awareness of the environment, during the collection and harvesting of NTFPs within PROSPER sites, ASNAPP, Rutgers University, PROSPER, ACDI-VOCA, CFMB (community forest management body) as representative of the forest communities, national NGO partners and any other. The Mitigation and Monitoring Plan (M&MP) prepared for the USAID funded PROSPER Project addresses the potential environmental effects of conducting mobilization and wild collections of Non Timber Forest Products (NTFPs) using a Liberian indigenous product, *Griffonia simplicifolia* (Griffonia) and nursery construction in Nimba and other PROSPER sites (TBD). This Mitigation and Monitoring Plan is focused on Griffonia since this is the major and currently only NTFP collected from the wild, traded and sold for the export market. When markets for other NTFPs (e.g. African Wild Black Pepper, Grains of Paradise, Bush Mango, Voacanga, Xylopia) will become a larger scale reality, this M&MP will be expanded to incorporate these to ensure mitigation and monitoring of the impact of the collection and sale of these ethnobotanical commodities. Other NTFP species will be added to the nurseries as a market emerges for these specific NTFPs and collection, sales and marketing, either domestic or for export, will develop.

Though cross border trade in NTFPs, Griffonia and others, has always been taking place, the type and the volume of these products is difficult to estimate. Mitigating the impact of this, largely un-regulated cross border trading in various NTFPs could (or should?) be considered because it might have an impact on the forest outside the area of the demarcated and established Community Forest under a Community Forest Management Agreement (CFMA). Though the Regulation on the Commercial and Sustainable Extraction of Non-Timber Forest Products (NTFPs)[9] states that NTFPs have to be harvested sustainably, the FDA or any other institution of the Government of Liberia has is no mechanism in place to check and verify that. This M&MP will focus on the NTFPs collected from the community forests under a CFMA with the FDA, established under the USAID funded under LRCFP[10] and PROSPER.

[8] People, Rules and Organizations Supporting the Protection of Ecosystem Resources (PROSPER)

[9] Forestry Development Authority Regulation No. 111-08

[10] USAID funded Land Rights and Community Forestry Project (LRCFP) 2008-2011 Tt/ARD

This mitigation plan analyzes impacts associated with the PROSPER Project and describes environmental commitments and mitigation measures to reduce those impacts. The Mitigation and Monitoring Plan is designed to ensure that, during PROSPER implementation, TetraTech/ARD and Partners (ACDI/VOCA, ASNAPP/RUTGERS, AGRHA and the CFMBs of the established community forests, as representative of the forest communities, and any other responsible parties all agree to and comply with the feasible mitigation measures adopted by the FDA and described in this document.

Case Study 1: Griffonia.

Griffonia, *Griffonia simplicifolia*, is an indigenous plant in Liberia and found in many counties including Nimba, Lofa and Grand Bassa counties. Griffonia is known locally by many names including Glabler (Mamo), Guoblo (Gio) and Wawatoto (Kru and Sapro tribes). As a perennial legume-climbing vine that grows in primary and secondary forest, the plant self-propagates by seeds that germinate from pods that naturally fall from the plant once the pods are physiologically mature. The emerging seedlings later easily grow and thus the plant self propagates and can form thickets. As a climber, Griffonia vines can reach 10m in height or higher depending upon the canopy and surrounding forest trees. In Ghana, typical griffonia reaches 10-12m, while griffonia found in Nimba County has been observed to reach 10-15 m and higher (estimated). This species has an extensive root system and is a hardy plant. Griffonia regenerates in a number of ways including, via the vines and from fallen seeds, which emerge from pods that naturally fall on an annual basis from the plant when mature. The woody vine can regenerate when cut, but few studies have documented the actual nature of such re-growth (rate of re-growth, impact of the regeneration relative to area on vine which was cut, seasonal variation in regrowth when vine is 'cut' over the course of the year and more). Griffonia does re-grow in areas following slash and burn and even after bush fires. The seeds from the pods are viable and in general have been found to have about a 50% germination rate, dependent upon nature and maturity of seed and the environment. There are no adverse (toxic) reports of Griffonia to plant and animals, nor is it considered an invasive weed species. Rather, it is considered an underutilized species one that lends itself to being introduced into cultivation. Historically, there has been informal periodic trade in the collection and sales of griffonia seeds with the bulk of the Liberian seeds collected and sold to dealers and/or brought to Côte d'Ivoire.

The seeds of the griffonia pods are the product of harvest and nearly all the griffonia in the trade come from the collection or gathering of the pods and seed from wild natural stands of this species[11]. As it is a wild collected medicinal plant, this plan will follow the WHO Guidelines and Protocols for Good Agricultural and Collection Practices[12], which focuses on traceability of origin, and the assurance of sustainable and nondestructive collecting/harvesting practices are followed.

In Liberia and Ghana, from an observational perspective, rather than a quantitative one, it appears that limitations to griffonia populations are not impacted by harvesting techniques and approaches, particularly since the mature pods naturally open while in the vine and seeds fall from the vine canopy to the ground from which the collectors gather the seeds. In addition, as any seeds in the open pods which have begun to sprout are left on the ground because neither seeds are of marketable quality and thus not worth the time and effort of the collector as it will be discarded by the buyer, the harvest techniques of griffonia are sustainable. In addition, specialized pruners are employed (similar to that used to remove cocoa pods) long pole with serrated blade at one end allowing the stem petiole to be cut while standing on the ground or on a ladder without cutting the branches and/or vine. Potential threats to indigenous populations of griffonia in Liberia rather appear to come from the encroachment of agriculture into forested areas in which segments of the forest are cut prepared for rice or cassava and other food crop

[11] Kim et al 2009

[12] WHO, 2004

production. Interviewing small-scale subsistence farmers in the PROSPER Zor community in Nimba County (interviewed in LRCFP), it was learned that many farmers now realize that they cut down griffonia when preparing a new section of land for rice or cassava. That was prior to the community members recognizing the economic value of their own indigenous non-timber forest species, such as griffonia but not limited to griffonia.

2. Case Study 2. Liberian or West African Black Pepper:

Liberian or West African Black Pepper, *Piper guineense* Schum. and Thonn., is a tropical perennial climbing vine indigenous to Liberia and West Africa, known locally by many names including Zember (Mano), Lan (Gio), Sanapuaway (Kru) and Sanipanpan (Sapro). Black pepper vines can reach lengths of 10 meter or longer and are difficult to collect in the wild as the berries hanging from the vine are often found high up in the forest or tree canopy with the vines climbing up on other indigenous trees. The berries are visible hanging from the vines but too high to easily reach. As such, while the berries can be collected in a sustainable nondestructive manner, the berries can also unfortunately be harvested destructively by the cutting down of the trees supporting the pepper vines, leading to the dropping of the berries close to the ground within reach or to the ground where they are collected by hand. Often, the collectors do not recognize the destructive nature of this technique. Or, those collectors may not care whether the peppers will regrow, or assume that given the heavy rainfall the vines will regrow or fallen berries will re-sprout and have not been taught the importance of sustainable harvesting and collecting techniques. To some extent, this assumption may also have some credence but appears to depend upon the species cut, and the manner of harvesting method used. In addition, the berries need to be harvest when ripe, but often the berries are harvested immature, at the green color stage, resulting in an unacceptable final product relative to market requirements.

Collectors can harvest pepper berries in a nondestructive and sustainable manner by using poles with curved serrated blades to cut the pods hanging from the vines and then place into a collecting bag or onto the ground from where they are manually collected.
The PROSPER mitigation plan for Non Timber Forest Products focuses on those products that include fruit, berries, pods and seeds and does not include any plants harvested for their roots, rhizomes and /or bark which present greater challenges and threats to sustainable harvesting and biodiversity (a separate plan of action will be developed for those NTFPs). This plan thus, outlines specific collection and harvesting guidelines for such Liberian NTFPs as griffonia and West African Black Pepper and recommends the following steps and measures:

1. Gathering the pods from which the seeds are removed from the forest floor.
2. Leaving the older, rotten and partial rotten pods on the forest floor as fresh pepper seedlings can sprout, emerge and grow in the forest floor naturally. As the market does not want seeds that are decayed, moldy, have sprouted and/or damaged, there is no loss or incentive for the collectors to harvest and collect those pods and/or seeds from the forest floor.
3. Whenever removing the pods hanging from the tree, apply manual selective pod removal techniques in which only the actual petiole keeping the seedpods attached is cut for pod removal. No branches, no main stems are to be cut, and pod removal is to be done in a nondestructive process. In the griffonia areas within the PROSPER targeted communities, the use of actual cutting the petiole will be little used due to the relative ease of waiting for the pods to drop. With West African Black Pepper, the strings of pods (pepper berries) naturally fall and can then be collected or the pods carefully cut from the vine and collected. Typically the tool used to cut the pods is similar to that used in trimming trees, and cutting cocoa pods. Such tools can be retrofitted also with open bags to catch the cut pods and prevent the pods from falling onto the forest floor.

4. Several techniques and technologies for pods collection from the tree, such as long pruners on a pike pole, horticultural tree pruners for manual cutting of the petiole will be introduced to simplify collection and harvesting of seeds or berries.

5. In the PROSPER project, through ASNAPP and other partners, trainings will be conducted. ASNAPP-led workshops will first focus on training-of-trainers, comprising of staff from PROSPER and its partners in the Good Collection Practices of griffonia, West African Black Peppers using the WHO guidelines (2004) with modifications to ensure the specifics of these Liberian plants are provided. Other NTFPs might be added to the GCP training-of-trainers sessions when market perspectives have developed to warrant such training (e.g. Grains of Paradise and others). ASNAPP and RUTGERS in concert with ACDI/VOCA will develop, test, duplicate and disseminate posters and handouts showing in picture form sustainable harvesting methods.

6. PROSPER will conduct an outreach campaign to collectors and agents, to create knowledge and understanding why NTFPs should be harvested in a sustainable manner and an appreciation of the need to protect the forest and its biodiversity.

7. PROSPER will provide tracking forms to Botanical Plant Association of Liberia (BOTPAL), other Collectors' Cooperatives and individual NTFP entrepreneurs to document the collection sites (as precise as possible) and signed and named affidavits from collectors stating that the NTFP product was harvest according to sustainable methods, and will provide information on approximate collection location and production quantity to document origin of materials, and the names of each collector. PROSPER will use this information with buyers and traders and request that they only purchase materials that are accompanied by such tracking forms thus, using the markets and sales/no sales as further incentive to comply with good collection practices.

8. PROSPER will support the CFMBs to initiate a licensing program, whereby gatherers collecting NTFPs will have to obtain a license to collect a specified amount of NTFPs. Though the license will be (initially) free of charge (cost will be paid for by PROSPER), the permit requirement will be monitored by the forest guards. Any person collecting NTFP without a license will be advised to obtain such a license from the CFMB. In the process of obtaining a license the collector will receive information on sustainable harvesting and will sign an affidavit too stating that she/he has received, read and understands the information provided and will commit to apply only sustainable harvesting techniques.

9. Buyers and traders of griffonia seeds and black peppers will be asked as to the origin of their seeds, and that they too agree to request/require the collectors follow GACP practices as stated above. This includes agents, sub-agents and other traders and buyers.

10. PROSPER will train the collectors/gatherers, community leaders, forest guards, CFMB members in the sustainable collection of griffonia. Training the dealers, buyers and traders that are also involved in the business of buying and selling NTFPs harvested from established community forests, and from other forest areas within the communities but outside the current community forest boundaries for which the communities have an agreement with the FDA.

11. Any NTFP grower/marketer associations formed by PROSPER will agree to adhere to these policies and support the sustainable collection and harvesting of the NTFPs in which they are involved. Members will serve as advocates and recognize that it is in the interest of their association, their business, their community and their forest to preserve these valuable natural resources.

12. The international buyers of the NTFP will be provided with a statement that the collected, sold NTFPs have been harvested in a sustainable way and will bear the name of the country, region and supplier/agent in that region. Part of requirement for international buyers is their ability to

track the origin and batch identification of the botanical product. All those operating in PROSPER targeted regions will also be trained in quality control, further providing incentives to all those involved in NTFPs to adhere to the sustainable collecting and handling practices.

13. PROSPER will solicit confirmation and acceptance from all players involved in the commercialization of NTFPs, to agree to the terms and definitions presented relative to GACP and sustainable production. The confirmation and acceptance will be in form of a public affidavit.
14. In the PROSPER program ASNAPP and Rutgers will, to the extent possible, identify international buyers who are willing to buy NTFPs (Griffonia, African Wild Black Pepper and others) which are sustainably harvested in Liberia. Rutgers will on the Specification Sheets (to be developed for each NTFP) indicate that the source/origin country is Liberia and that the product was harvested by sustainable harvesting methods. The use of tracking forms, and quality control in postharvest handling (drying, cleaning, proper storage and packaging) will all be used to further enhance the demand of these Liberian NTFPs and the trainings to communities and collectors in these supportive areas will provide incentives to adhere to GACP.

Monitoring Plans:

1. Must identify those areas from which the NTFP was sited, identity confirmed and collected. Mapping these sites using GPS coordinates will be conducted, along with written coordination's of the physical location and notation of the vegetation and ecology of each site. Together, they will be used to map and record the geographic sites. Must note stage of flowering time frames and pod drop etc. at time of ASNAPP intervention.
2. Record the total number of griffonia and Black pepper vines in each quadrant, and then also record the number of vines that have been cut down and laying on the ground, or any branches from this same species are found on the ground, indicative of a more serious destructive harvest. Stable long-term quadrants will be surveyed and flagged for monitoring in each harvesting region in which PROSPER is operating. Each quadrant or plot will be sized at 20m x 20m area using GPS coordinates and with three replications/site. At least 2x/year the quadrants shall be monitored. We recommend that the monitors include Community Forest Guards. Monitors (we recommend from FDA, FMC and Dr. Sam Koffa, ARD Forester specialist) walk through to assess the health and presence of young seedlings, and to note the number, if any, griffonia trees/vines that were destructively cut (specifically searching to see any signs of destructive harvest that could lead to the injury health and death of the parent plant from which griffonia was collected). For NTFPs from trees and shrubs, smaller plots of 10m x 10m would be employed, but with these vines larger plot sizes are recommended initially until data can support reducing the quadrant size.
3. We recommend monitoring three sites for both griffonia and black pepper where each is in high population density and where: (i) it has been collected; or (ii) where it will be collected; or (iii) is being collected. And, in each region/county, flag out three quadrants (or plots) in each region.
4. For griffonia: (i) where no collection occurred and will not occur this season; (ii) where the griffonia was collected from but leaving the rotten pods, noting how many rotten pods left, and how many griffonia vines within the pre-selected area; (iii) removal of all rotten pods that collectors gathered for later monitoring number of griffonia seedlings in re-marked area under all 3 sets of treatments. For black peppers: (i) where no collection occurred and will not occur this season; (ii) where the black pepper was collected from destructively to assess regrowth of the tree and black pepper that were cut; (iii) where the berries were collected only from the ground after natural berry drop; and (iv) where the berries were collected by cutting the berries from the vine.

5. These would be replicated plots/sites in order to provide the baseline data to ensure that no significant changes occur in the forest form the sustainable collection of griffonia and Black Pepper harvest from indigenous vines and to assess any changes in biodiversity. We hypothesize that the collection of dropped pods will not impact the biodiversity, negatively impact the live vines and reduce any new population growth of these vines.
6. Data to monitor would then include: size of plot area, marking plot area with flags or another equivalent signage; number of NTFP mature plants in site; identification and number and type of other plants in this site (common and botanical name); and number of younger immature NTFPs growing presumably then from a prior season's pods drop and seed emergence. However, given the system in which griffonia is harvested non-destructively, the ability for this plant to self-sow and the relative abundance of young seedlings within griffonia thickets, in the areas in Nimba County we have observed, coupled with the fact that griffonia is a trialing vine making it difficult to even accurately assess the number of plants/unit area as the vines spread widely and go up and down the plant canopy, and the dense vegetation within the griffonia stands making it difficult to count all the young griffonia seedlings, we expect the counting of live griffonia vines to be difficult and we need to be careful to ensure that the physical counting within the flagged plots does not result in any vegetative destruction as we seek to ensure that a robust mitigation plan is in place and which works that ensures the preservation of the plant populations.
7. We hypothesize the situation to be different with black pepper, which could witness some destructive harvesting (either purposefully or inadvertent) due to the ways in which peppers grow and can lend themselves to cutting of the part of the vines to more easily reach the hanging berries. As such, we recommend that the CFG, supervised by a team of experts from PROSPER (e.g. ASNAPP and Rutgers) and with training of selected members of FDA, FMB, AGHA to visit randomly collecting areas with sub-agents to assess whether there is any visible destructive harvesting being carried out. Continued trainings and the recognition by collectors that materials collected destructively will not be purchased may be among the strongest mitigation guidelines. In short, we recommend additional areas where black pepper is being collected to 'randomly audit' the sites for signs of destructive harvesting in addition to the monitoring of the long-term quadrants described earlier.

While this program is very new in Liberia, and that the preservation of biodiversity is paramount within PROSPER and for Liberia, it should be noted that we are more concerned with the encroachment of agriculture into forest lands that are leading to loss of populations of a wider range of plants including, but not limited to griffonia, voacanga and kombo butter, just to illustrate a few of the Liberian NTFPs found in these counties that could provide income generation schemes and improve the livelihoods of the communities.

GENERAL MONITORING AND ENFORCEMENT PROCEDURES

PROSPER, as the lead agency for the project, will retain primary responsibility for ensuring that project activities meet the mitigation program requirements and other permit conditions imposed by participating regulatory agencies like the FDA. PROSPER and any monitors (e.g. CFGs) are responsible for supervising that monitoring activities will occur during project construction and operation. Other agencies such as FMC, ACDI/VOCA, NAEL and CJP should be involved in monitoring and using mitigation approach as well as sustainable collecting of NTFPs using the WHO guidelines. ASNAPP will also provide training to members of BOTPAL and other Liberian-based buyers/processors/traders/actors/agents along the value chain.

ASNAPP is responsible for submitting all documentation and reports to PROSPER in a timely manner to demonstrate compliance with specified mitigation requirements. PROSPER has the responsibility for implementation of mitigation requirements and will be capable of terminating actors/agents who do not demonstrate the desire and commitment to comply with adopted mitigation requirements.

In addition to PROSPER's responsibility for mitigation implementation and monitoring, other agencies also have responsibility for ensuring or guiding implementation of certain measures. In completing the requirements of the mitigation measures, PROSPER will coordinate with development partners to ensure that implementation meets the Forestry Management Requirements.

Drafts of this document are being circulated to the FMB and all active players to ensure a community voice in the approach and developing a realistic practical plan to ensure that the NTFPs can lead to new income streams to the rural communities while maintaining a healthy forest by using sustainable harvesting practices.

For those NTFPs introduced into cultivation, then a simple tracking system indicating that the products came from cultivation will also be used and modeled after the WHO guidelines as well.

The proposed mitigation plan will start implementation in Nimba on two sites (Zor and Bleih). Gba site might not be included since the griffonia collection seems to be very limited in that area, which might indicate that there is a very low griffonia population in that area. The ethnobotanical survey (September 2012) will have to provide some more information to confirm this observation.

The monitoring part of the mitigation plan will be carried out by assigned students from Cuttington University and/or FTI, supervised by a Cuttington and/or FTI research student. All sites will be conducted with help and support from the forest guards and CFMB's. The students and supervisor will receive a stipend to conduct regular monitoring which will have to start in November/December and run till April.

The protocol will be developed by Rutgers University in concert with PROSPER partners (ASNAPP, TetratechARD, ACDI/VOCA, others). The cost and organizational aspects of the monitoring will be covered by PROSPER. The monitoring in the Nimba sites will be for 3 years. Additional monitoring sites will be established in other ecological zones, different from Nimba (e.g. Grand Bassa if selected).

To offset any possible negative effects of griffonia collection, nurseries will be established to propagate domesticated griffonia, and later perhaps also *Piper guineense* and other marketable NTFPs, depending on the outcome of the ethnobotanical survey.

Specific attention will be given in the training on how to setup and run a proper nursery to produce vigorous and viable plants which will not only mitigate an averse risk of harvesting NTFPs in the wild, but also will increase the production volume on farmers own plots in an agroforestry production system. Nurseries will be established on all eight demonstration sites in Nimba (old LFSP) sites. One of them will be a central training spot for all NTFP (and other trees) nurseries.

We recommend that in Year 1, nurseries be established both at the FTI and at Cuttington University which can both then serve as centers of training, for providing seedlings to communities for planting and for educating communities and other public and private sector stakeholders in forestry and natural resources management. Knowledge and seeds will be made available to be grown in the Nimba nurseries.

After three years of monitoring the griffonia growth on harvested and non-harvested (control) sites it is expected that broad conclusions can be made on how sustainable griffonia "extraction" using harvesting methods does not alter the physical condition of the plant except for removing/harvesting the pods/seeds, have any effect on the griffonia population in a forest.

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APPENDIX VIII: SUPPORT SERVICES PROVIDED BY AGENCIES/ORGANIZATIONS ACROSS THE VALUE CHAIN

Agency/Organization	Role(s)	Challenge(s)
Ministry of Agriculture	Is at the forefront of agricultural extension service provision in Liberia	At present, the Ministry has no programs in or support of NTFP collection and production as it does not fall under its mainstream products. Because the NTFP are considered a product of the forest, the current thinking is that these products should therefore be under the supervision of FDA. As some of these NTFP would be brought into cultivation, stronger linkages could be developed but presently their staff lacks the technical expertise in many aspects that are needed.
ASNAPP	Is a value chain development organization established to enhance growth in the African indigenous plant products and horticultural industries by intervening and building capacity along the supply chain to boost productivity, competitiveness and increase private/public investments to reduce poverty and hunger? Has trained Liberian collectors and farmers on GCP and GPHP training on NTFP over the past two years?	The training has however not been comprehensive enough as repeated training and investment is needed to achieve sustainable growth in the NTFP industry. Additional trainings are needed both in the communities where ASNAPP has worked and in communities not yet trained at all by ASNAPP. Sustainable collection practices and ensuring mitigation against loss of biodiversity needs to be introduced into each targeted community with trainings also to members of the FDA and other GOL organizations that will be involved, as well as the subagents and agents involved in this sector
Rutgers and the New Use Agriculture and Natural Plant Products Program (NUANPP)	Rutgers via its NUANPP is an internationally recognized center of excellence relative to the commercialization of NTFP. This group has also been involved in training Liberian collectors and farmers in GHCP and GPHP with particular focus on griffonia and in helping to develop product specifications and standards.	Increased resources are needed to carry out the chemical analysis of the NTFP continuously to measure baseline quality and seasonal changes of the NTFP in the different areas and over time as well as determine the impact/improvement in the quality of products after ASNAPP and Rutgers interventions. Continual comparison of products on the street and market prior to and after interventions is important to track and link to prices received and market opportunities.

Forestry Development Authority	The Forestry Development Authority (FDA) is responsible for protecting and managing the forest resources in Liberia.	At present, little has been done on building the capacities of communities on sustainable harvesting of NTFP in Liberia to support growth of the sector. FDA staff needs training in NTFP and NTFP must become part of their mandated responsibilities in order to shift the paradigm of their current focus with timber and other priorities such as forest protection to seriously include other forest products and activities such as NTFP.
Ministry of Trade and Commerce	This Ministry is in-charge of providing trade related support for products that has the potential to boost the economy.	The Ministry had no data on trade statistics for NTFP and at present has no policy focused on enhancing the competiveness of the Liberian NTFP industry.
Customs	This institution is responsible for processing of documentation for export and mobilizing revenue for government through import and export duties.	A cursory look at the operations of customs at the Ganta border showed lack of poor record keeping and non-adherence to procedures (NTFP Field Survey 2012).
Micro-financing/ Value Chain Financing	There are a number of service/support providers and micro-financing institutions in Liberia including NGOs, international agencies, private individuals, banks (commercial, non-commercial), credit institutions like ROSCAs and BRAC. These various organizations do cater to the financial, training and other pertinent needs of MSMEs in general and, in few particular cases, SMFEs.	Traders or Agents have access to larger amount of funds for business as compared to farmers and therefore higher chances of assess credit facility from banks and financial institutions. Traders however, cited high interest rate of around 28% as a major setback in loan accessibility.
BOTANICAL PRODUCT ASSOCIATION OF LIBERIA (BOTPAL)	BOTPAL is the national association formed by a small group of Entrepreneurs in Zorgowee with their operations covering four counties in their first year of existence (2010). BOTPAL's role is to supervise the purchases of NTFP as well as ensure its collector groups adhere to sustainable harvesting practices.	Their collaboration however needs to be deepened and taxes with FDA revised to meet situation prevailing in countries in the sub-region. Additional members need to be welcomed into BOTPAL to ensure it is open to new entrepreneurs and players that can help develop the Liberian natural products sector. This is a new association and as such needs strengthening and support.
LIBERIAN SHIPPING INDUSTRY	The maritime industry is becoming an important contributor to Liberia's Gross Domestic Product (GDP).	Liberia needs to explore opportunities building on these strengths as this has a major impact on the costs of shipping NTFP-containers out of the Liberian port relative to prices/taxes/permits, access and convenience..

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