



# Value Chain Analysis Of Agricultural Small Holders In Southern Shan State



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## ACRONYMS AND ABBREVIATIONS

DOA	Department of Agriculture
FD	Forestry Department
FGD	Focus Group Discussion
KII	Key Informant Interview
ICIMOD	International Centre for Integrated Mountain Development
MBLN	Myanmar Bamboo Lovers Network
MIID	Myanmar Institute for Integrated Development
NTFP	No Timber Forest Product
VC	Value Chain
VCD	Value Chain Development

## 1. INTRODUCTION

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### 1.1. Project Background

The Myanmar Institute for Integrated Development, MIID, in partnership with the International Centre for Integrated Mountain Development, ICIMOD, is implementing the Himalica Pilot Project in Southern Shan. The action is part of a wider intervention of the EU-funded Rural Livelihoods and Climate Change Adaptation in the Himalayas (Himalica) programme.

Five villages situated South of Heho village tract and belonging to Nyaung Shwe Township and Kalaw Township encompass the target area of the pilot project development. Four of the villages are under the administration of Nyaung Shwe: Pantin, Thayet Pin, Kyaung Nar and KyaungTaung (belonging to Let MaungGwe village tract) which land is under the jurisdiction of the Forest Department as protected forest area. The fifth village, Zeyar, belonging to Kalaw administration, is under Bawnin village tract administration.

All five villages are situated within the Inle watershed, western of Nyaung Shwe Township and south to Heho village tract (Kalaw) with altitudes among 1,200 to 1,500 meter above sea level<sup>1</sup>. The topography of the area is dominated by hills with moderate to extreme slope and scattered permanent vegetation indicating the significant environmental degradation.



Project area

The *Taungyo* population has settled around 100 years ago, on those hills previously forested with native pine on the upper slopes and with mixed broadleaf forest further down. Currently, bamboo is present in the home yards and surrounding of the villages, meanwhile forest trees are scarce and uncommon.

Farming is the main economic activity, based on rain-fed agriculture on sloping land where deforestation has occurred and there is not environmental protection to control soil erosion. The majority of households—over 70%—own less than 2 hectares (according to project baseline and data collected during the study), so they are categorized as small-holder farmers, those who own less than two hectares of marginal and sub-marginal land, those who own less

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<sup>1</sup>Land resource assessment report. The highest point is around 1493 meter, in the south-west of Zeyar, and the lowest part is around 1200 meters in the middle of the Eastern part of Pantin and Thayetpin

than two hectares of marginal and sub-marginal land.<sup>2</sup> In general, a household is farming Taungya land<sup>3</sup>, among 2 to 5 plots, with at least one dedicated to produce the staple food: upland rice, and the other(s) are in fallow (3 to 5 years).

Farmers produce in a subsistence oriented agriculture system, where livelihood is the contribution of the diversification of productive activities within a limited access to land and water. However, during the study, farmers expressed that they can assure only 6-9 months food security from their own cultivation.



Topography of the area

Farmers produce mainly five groups of crops: cereals (upland rice, wheat and maize), oil seeds (groundnut and niger), pulses (pigeon pea and rice bean), spices (ginger and turmeric) and vegetables (butterfly bean, cucumber, cauliflower, chillies, tomato and mustard). The crop production intends to fulfil the household food security and also to obtain cash from the marketing of products. The main crops intended for marketing purposes are hybrid maize, wheat, ginger, vegetables and pigeon pea; meanwhile other crops, such as vegetables and pigeon pea would be used both for self-consumption and marketing.



Bamboo at homestead

Farmers keep small amounts of bamboo near their homes, mainly for self-consumption as building material, wall mats, mats and baskets. Few villagers are processing bamboo onto value added products, such as baskets and mats and their marketing volume is small.

Water scarcity is one of the most significant factors hampering the opportunities of these communities to assure their own food security and other aspects of their livelihoods. The shortage during the summer season is dramatic for fetching drinking water due to distance and conditions of water availability. The project is currently addressing this important constraint with many actions such as harvesting rain water at household and village level, pond

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<sup>2</sup>Land Core Group of the Food Security Working Group. The Role of Land Tenure Security for Smallholder Farmers in National Development

<sup>3</sup>Taungya or upland farming is the one that has been traditionally using a shifting cultivation approach, which includes: clearing new or previously cleared forest or scrubland through burning, cultivating for several years and then allowing the land to lie fallow and regrow, whilst farmer move onto a new piece of land.

rehabilitation, catchment areas improvement and promotion of climate resilient value chain development and practices.

Villages are isolated due to poor accessibility through the two main existing roads, one connecting to Heho village tract and the other to Nyaung Shwe Township. Poverty and the lack of means of transport also hamper the access to technology, services and information in all aspects of livelihood.

The Himalica pilot project aims to support the five communities in implementing livelihoods opportunities activities, sustainable management of the natural resources and pro-poor value chains actions of mountain products or services that can contribute to mitigate and adapt to socio-economic and climate changes. The 3 year project interventions focus on the development of good practices for integrating sloping land and water management with improving livelihoods.

## **1.2. Objectives of the study**

The overall objective of this study is to provide expert analysis for two value chains development in the Himalica pilot project; that can bring a significant increase in income for the target group of the five hilly villages in Southern Shan State of Myanmar.

The study aims to provide the necessary specific and contextualized information and analysis to implement sustainable actions on two potential value chains while contemplating the fragile environmental context and assuring that the result of the study is in line with the project aim of protecting land and water resources. This study forms part of the logical framework as the first Output of the project. Its results intend to be part of other project activities implementations, such as farmers' field school (FFS), and community-led micro-planning for catchment areas improvement.

Specific objectives of the study include: to identify and select two potential value chains through a participatory workshop with members of the villages, to examine the two value chains in terms of market price analysis, actors and information mechanisms in order to identify constraints and the possible leverage points that help to increase income of project's target group with special gender consideration for facilitating equal and social inclusion. Last but not least, it is expected that the study will bring a list of recommendations and action plan within the framework and resources of the project for a total of two potential value chains.

## **2. METHODOLOGY**

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## **2.1. Value Chain Development: Analytical and Strategic Framework for Mountains**

In general, the majority of development actions have as a final goal to reduce poverty and increase the opportunities of poor communities to participate in the social and economic development of their regions and countries. Among the different strategies and tools utilized, the analysis and development of selected Value Chains can be significant in providing benefits for pro-poor growth.

Value chain analysis entails understanding and analysing the context of the target group that the Value Chain Development (VCD) aims to support. In the case of mountain regions, it is vital to reflect on the mountain specificities (niche product/services opportunities, poor accessibility, fragility, marginality and diversity) as they influence all productive activities.

Mountain and hilly regions have a fragile environment, where productive activities are particularly interrelated as people's livelihoods depend in the diversity of resources and productive activities. Therefore, the analysis of Value Chains requires an analytical and strategic framework where mountain specificities are considered and can lead to solutions that integrate economic, social and environmental aspects.

The Analytical Framework for Mountains involves measuring the level of mountain specificity of selected mountain value chains by comparing and scoring the mountain specificities (niche product/services opportunities, poor accessibility, fragility, marginality and diversity). At the same time, it would be identified relevant specificities of the VC to be considered in the future intervention.

The Strategic Framework for Mountain Value Chains is defined from a central point, the Primary Focus, which is the Niche/Unique products/services and local value addition that shows some potential opportunities for pro-poor growth. The Primary focus is analysed according to the challenges that the Mountain specificities present, being expressed as a strategy to address the specificity.

The research has been conducted considering the methodology that ICIMOD utilises for the analysis of Value Chains Development for Mountain regions and a resume of the methodology was provided by the MIID project team.

## **2.2. Data resources and collection**

Primary and secondary data has been used for this study. At the initial stage the MIID project team provided project information with the following documents: log frame, proposal, baseline, PRA, work plan, agreement among MIID and ICIMOD, report on Value Chain exercise in March 2014 and VC analysis review November 2014, rapid water assessment, land

assessment, gender and governance assessment, ICIMOD’s methodology for Value Chain Development, KAP summary, and progress report.

The main sources of primary data for the research was collected from interviews with actors of the value chains to study: farmers from the project villages, village tract administrator, traders, wholesalers, retailers, exporters (agents), producers, processors. Data was also collected from interviews with stakeholders from public institutions related to the value chains and from the private sector.

The summary of KII is collected in the following table 1.

Table 1: Summary list of KII

Sr	Actors	Location	Number
1	Farmers who cultivated the Ginger	5 project villages	30
2	Farmers who established the Bamboo plantation	5 project villages	20
3	Village tract administrator	Latmaungkwe	1
4	Traders	Aungban and Heho	5
5	Wholesalers	Yangon	2
6	Exporters	Yangon	2
7	Agribusiness	Heho and Nyaungshwe	2
8	Retailers	Heho, Nyaungshwe, Yangon	6
9	People who produce the value added bamboo products	5 project villages	10
10	People who produce the dried ginger	5 project villages	5
11	Women who produce the bamboo shoot	5 project villages	10
12	Department of Agriculture	Kalaw, Nyaungshwe, Taunggyi	4
13	Forest Department	Kalaw, Nyaungshwe	2
14	State Institute of Agriculture	Heho	1
15	Myanmar Bamboo Lovers Network	Yangon	1

#### Annex 1: List of the Key Informant Interviews conducted to stakeholders (private and public)

The collection of primary data has been conducted through semi-structured Key Informant Interviews (KII) and also Focus Group Discussion (FGD). A total of 50 KII have been conducted at village level: 30 KII for ginger producers (6 interviews per village) and 20 KII for bamboo producers or processors (4 per village). Moreover, a total of 5 FGD were conducted for further discussions on ginger and bamboo, which detail is shown in Annex 1

Secondary data has been collected from the Agriculture Department of Southern Shan State, the Department of Agriculture (DOA) of Kalaw and the DOA of Nyaung Shwe, specifically data on: regional and national production of ginger, market prices and its trend for the last five

years, varieties produced and areas of production, area where it is produced best quality and the current priorities and plan government for ginger production.

In addition meetings were held with the Forestry Department of Nyaung Shwe and data related to bamboo and reforestation was collected, specifically underlying policies related to bamboo cultivation and management, current plan and investment for reforestation at Township level, relationship and collaboration with the project area.

The Myanmar Bamboo Lovers Network (MBLN) have provided information related to the development opportunities of the sector and first steps done by some processors, the constraints that bamboo sector faces and the opportunities. Information has also been collected on the general plans and investment from the BLN for the promotion of the bamboo sector.

Last but not least the Internet has been a great source of information and secondary data for a wide range of the topics of this study.

### **3. PRIORITIZING VALUE CHAINS**

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#### **3.1. Selection of the Value Chains**

Prior to this study, the Himalica project's team conducted a workshop on 26<sup>th</sup> of March 2014 with farmers of three of the targeted villages, village leaders, agents from traders and members of the potato grower association and the cabbage grower association. As a result of the workshop, ginger was selected as a value chain to study and develop its potential for increasing the income of farmers by 30%.

A first step of this study was the facilitation of a workshop aiming to select the second value chain by the participation of villagers from the targeted villages and stakeholders. This was conducted at MIID office in Heho, on 15<sup>th</sup> of March 2015, with a wide participation of stakeholders: a total of 25 farmers (4 women) from the five villages, the private sector: ginger exporter and a representative from Myanmar Belle (vegetables processing factory) and the public authorities: Director of the Department of Agriculture for Southern Shan State, representative from the Township Administration of Kalaw and the Principal of the State Agricultural Institute in Heho.

The workshop consisted in clarifying the methodology for the selection of value chain and special emphasis was dedicated to explain the importance to consider the mountain specificities in the selection of the value chain.

In order to select the second value chain 5 groups of farmers were organized with the support of MIID team for scoring a total of 10 potential crops (upland rice, wheat, maize, niger, groundnut, ginger, pigeon pea, cabbage, cauliflower and bamboo) against the defined set of criteria.

The set criteria defined are:

1. *Outreach to the marginal poor or landless people of mountains*
2. Income generation with less investment
3. Value addition potential at upstream level
4. Traditional knowledge so that they will understand the process
5. High demand in national and international market
6. Opportunity for economies of scope
7. Comparative advantage
8. Impact on Environment

A total of 25 farmers who live in project villages participated in the workshop (4 of them women). Before the selection of the potential improved value chain, the definition of criteria was thoroughly explained to the participants. All participants are divided to 5 groups based on their location and were provided with score cards from 1 to 5. Then participants of each group discussed which score was more appropriate depending on their local context and provided the score for each indicator. They were also encouraged to explain why they provide that score. The score they provided was noted down on a flip-chart and compiled.



Participatory selection of Value Chain

Results are compiled at Table 2, showing higher score for bamboo and ginger, so they were selected for the value chain development.

Table 2: Results of the participatory selection of value chain (15<sup>th</sup> March 2015)

Criteria	Upland rice	Wheat	Maize	Niger	Groundnut	Ginger	Pigeon pea	Cabbage	Cauliflower	Bamboo
Outreach to the poor	7.5	4.5	3	4.5	1.5	7.5	4.5	4.5	4.5	7.5
Income generation	4.5	4.5	3	4.5	3	6	4.5	3	3	7.5
Value addition potential	1.5	1.5	1.5	1.5	1.5	7.5	1.5	1.5	1.5	7.5
Traditional knowledge	5	5	5	5	5	5	5	5	5	5
High demand	4.5	4.5	6	4.5	4.5	7.5	4.5	4.5	4.5	7.5
Economies of scope	1	1	4	1	1	4	1	1	1	4
Comparative advantage	3	1	1	1	1	5	1	1	1	5
Impact on Environment	1	1	1	1	3	2	3	1	1	5
Weighted Total Score	28	23	24.5	23	20.5	44.5	25	21.5	21.5	49

### 3.2. Setting the strategic focus:

To contextualize the project area is of pivotal importance necessary for the study of value chains as practically all aspects of their livelihoods are influenced by the mountain specificities. Understand the social, economic and environmental imperatives of the target villages are essential in order to identify appropriate leverage points and future interventions in the value chain.

The mountain specificities: availability of unique and niche products and services, accessibility, fragility, diversity, and marginality, have been analysed during the participatory workshop after selection of the value chain and the results contribute to elaborate the strategies of the ginger and bamboo value chains.

#### ***Unique/niche products or services:***

The uniqueness of products is the core element in the mountain value chains analysis and it can be an opportunity for the poorest.

In the analysis the niche products of the project area, two main circumstances have strongly been considered as they affect widely in all aspects of those villages:

1. The scarcity of water(for drinking and house consumption) is a strong driven circumstance affecting all aspects of life of the project area, for that reason it has taken a dominant consideration in the analysis of the value chain. Despite the project is currently addressing this problem with many activities, at the moment of the research it was still uncertain the extend of water access and availability in the near future in those villages

2. The environmental degradation observed and reported in the area: hills with scattered and scarce vegetation, lack of sustainable agricultural approaches, low fertility of soils and so low productivity, jointly with the limited access to land by poor farmers - less than 2 hectares, depicts an agricultural system that claims urgently environmental actions in order to be able to provide livelihoods in the short, medium and long term.

Under these two significant circumstances the research has analysed the value chains in the targeted villages.

***Accessibility:***

The accessibility to the project area is a crucial determinant of the performance of mountain value chains as all products from the villages are marketed at Heho and Nyaung Shwe five day markets respectively.

There is a limited access to the villages with two main roads, one to Heho and other to Nyaung Shwe Township –both approximately 6 miles in distance from the villages. The most frequented road links to Heho and it can be used by motorcycles, bullock cart and trawlergy. The other road connects to Nyaung Shwe Township, and it is mainly traversed on foot, because of the steep incline and poor conditions. The community is currently involved in repairing this road. Villagers use motorbikes to go to Heho taking 30 minutes.

The time needed for transporting agricultural products to the 5 day market in Heho ranges from 1.5 to 2.5 h depending of the mean of transport, bullock cart or trawlergy. For Nyaung Shwe it takes about 2 to 3h on foot. The availability of bullock carts and trawlergies at the villages is very limited, and only few villages have bullock carts. Transport costs for the agricultural products are cheaper with trawlergy than bullock cart, however prices are extremely high in comparison to transport prices from Heho to Yangon (50 MMK/viss versus 45 MMK/viss).<sup>4</sup>

Poor infrastructure and lack of means of transport are some of the factors responsible of the isolation; lacking many services, like agricultural extension and trading are among other needs.

***Fragility:***

The dominant use of the natural resources is agriculture, thus its performance and sustainability is determined by the pattern and pace used. The lack of sustainable and productive agricultural model in the project area may have affected in degrading or depleting the potential of the environmental resources.

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<sup>4</sup>One viss is 1.63293 kg or 3.6 lb.

According to the soil test results, from the Land resource assessment, soils of the project area are moderately to strongly acidic (pH 4.43-5.61), low to very low organic carbon content (0.08-1.55 %), very low to medium nitrogen content (0.1-0.23 %) and low phosphorus content (0.22-4.34 ppm). These traits indicate low fertility and challenges in terms of quality and quantity of crop production. Soil texture is predominantly silty clay, clay, silty clay loam, this substrate type exacerbated by low levels of humus (indicated by the low organic carbon) show that the soil is highly susceptible to erosion, and has low water retention.

The topography of the project presents moderate to extreme slopes and shows significant deforestation and critical situation for the resources soil and water. Furthermore, the rain-fed agriculture, which it is the only practiced in the area, is more susceptible of failure as increases the frequency of erratic rainfall and droughts in the area.

The above described conditions exacerbate the challenges of communities for being more resilient in front of potential damage, to increase the carrying capacity and being able to find solutions to droughts.

***Marginality:***

In line with the remoteness and isolation of project area, communities are socioeconomically marginalized due to the fact that they have to work in marginal land with limited access to inputs to obtain their livelihoods. The risk of production is higher as land is less productive and extremely vulnerable to degradation.

The majority of small holder farmers do not have linkages with main stream markets and they relate almost exclusively to Heho market and/or traders. It has been observed that the high dependency on the local traders is due to the on one side the knowledge gap of farmers in understanding markets, their demands and the lack of negotiation powers for dealing with other actors of the chain. And on the other side, farmers need cash in order to cover immediate needs. As a result of this situation farmers would not be receiving a fair share of the value of the products

***Diversity:***

Farmers cope with the challenging context by employing strategies such as the diversification of activities in terms of types of crops/products. There is not space for approaches related to economies of scale; however there is potential for economies of scope through diversified activities, interlinking products and value addition. Currently, there is a large variety of crops produced in the project area, showing the potential for diversified crop production.

Productive systems, such as agro-forestry presents a wide range of options optimizing the resources (soil and water) meanwhile they are protected. Specifically, agro-forestry systems

produce a wide range of products at different stratus: underground, small vegetation, medium vegetation (bushes) and higher vegetation (trees). Producing and harvesting different crops/products also leads to spread during the year the use of the resources (all year round).

In order to obtain a clear understanding of the dimension of the mountain specificities for the selected value chains (ginger and bamboo) and assist in choosing the right value chain and prioritizing strategic interventions, an exercise of **rating the Mountains Specificities** using a criteria was done, during the workshop on 15<sup>th</sup> march 2015. A scale from +3 (very good) to -3 (not very good) was used. The results of this exercise have been compiled in table 3.

Table 3. Results of rating the criteria of the Mountain Specificities for Ginger and Bamboo

Mountain Specificity	Criteria	Ginger	Bamboo
<b>Pro-poor growth opportunity (niche product)</b>	Uniqueness	3	3
	Participation of poor	3	3
	Pro-poor benefits	3	3
	Backward linkages (previous investment and knowledge transfer)	2	2
	<b>Mean</b>	<b>2.75</b>	<b>2.75</b>
<b>Accessibility</b>	Remoteness	-2	-2
	Distance to markets	-2	-2
	Infrastructure	-3	-3
	Weight/volume	-1	-3
	Communications	-2	-2
	<b>Mean</b>	<b>-2</b>	<b>-2.4</b>
<b>Fragility</b>	Vulnerable to irreversible damage	-2	-1
	Carrying capacity	-1	-3
	Drought resistant/water dependent	-2	-2
	<b>Mean</b>	<b>-1.67</b>	<b>-2</b>
<b>Marginality</b>	Linked to markets	-1	-2
	Communities market capacity	-3	-3
	Negotiating power	-2	-2
	Ability to bear risk	-2	-2
	<b>Mean</b>	<b>-2</b>	<b>-2.25</b>
<b>Diversity</b>	Potential for economies of scale through diversified but interlinked activities (economies of scope)	2	2
	<b>Mean</b>	<b>2</b>	<b>2</b>

A resume of the mountain specificities (obtained from the average of the scored criteria per each specificity) for ginger and bamboo value chains are compiled in table 4.

Table 4: Scored results of Mountain Specificities for Ginger and Bamboo

Mountain specificity	Ginger	Bamboo
Pro-poor growth opportunity	2.8	2.8
Diversity	2	2
Accessibility	-2	-2.4
Fragility	-1.7	-2
Marginality	-2	-2.3

### 3.3. Strategic Framework for the selected Value Chains

The two selected value chains have been illustrated (Figure 1 and 2) according to their mountain specificities for and their supportive environment: the business environment, the policies and the adaptation to change.

Figure 1: Strategic Framework for the Ginger Mountain Value Chain

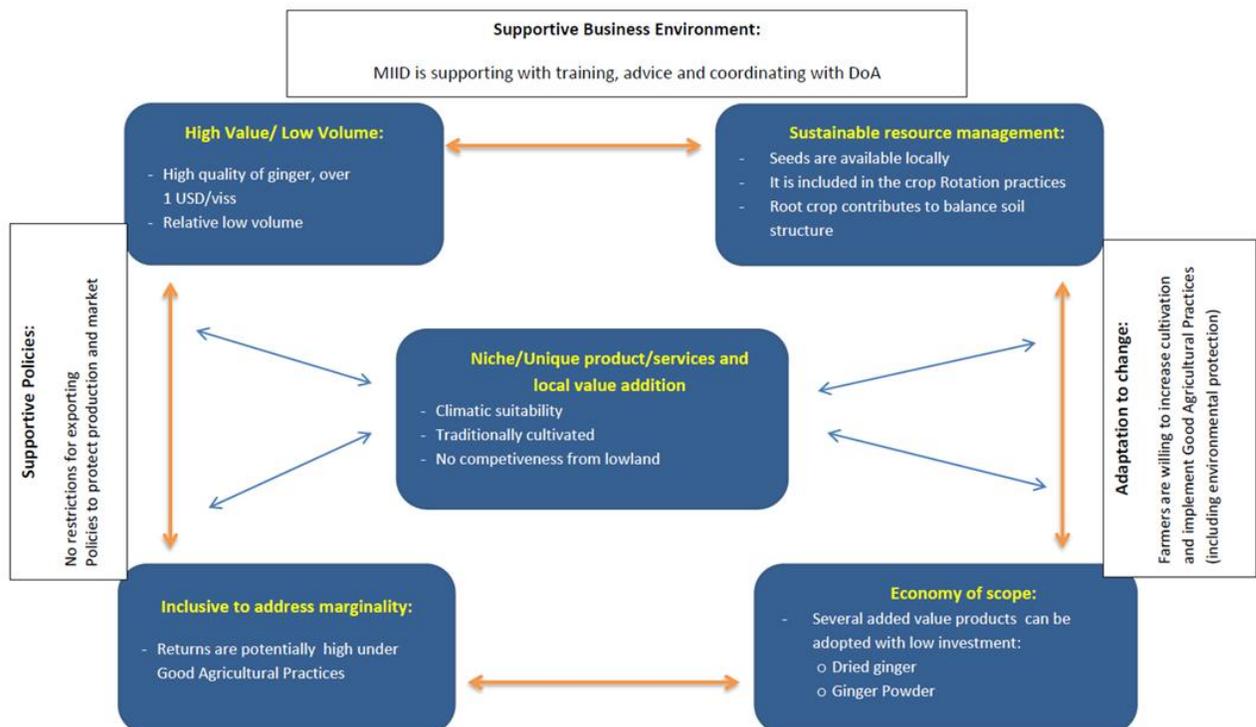
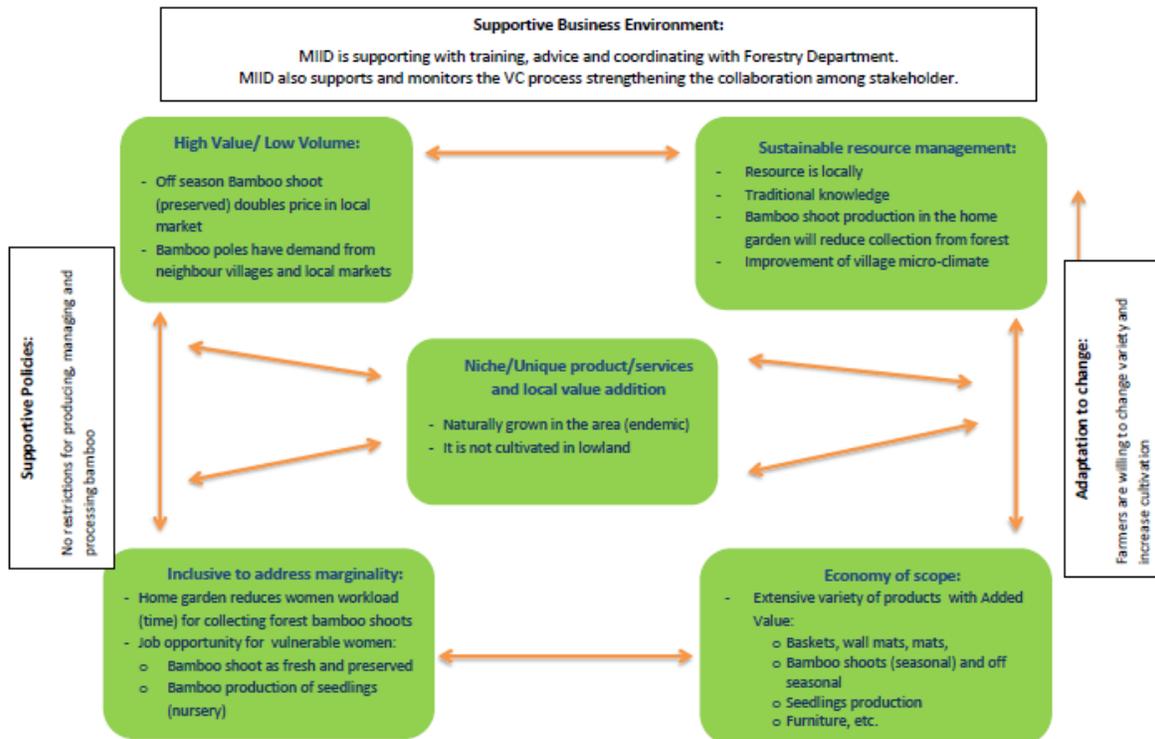


Figure 2: Strategic Framework for the Bamboo Mountain Value Chain



## 4. GINGER VALUE CHAIN

### 4.1. Overview

Ginger is an important commercial root crop, produced in tropical and sub-tropical regions up to altitudes of 1,500 m above the sea level. Ginger plants require a deep (25-40 cm) rock-free, rich, fertile, and well-drained soil with a mildly acidic pH (5.5 to 6.5) for healthy growth. It can grow in warm and humid climate and under rain-fed; however soil must not get waterlogged. The best soil texture to provide moisture retention and drainage is the sandy loam soils. The plant produces underground rhizomes, which are harvested 8-10 months after planting.

Ginger is commercialized for its aromatic rhizomes, which is used both as spice and a medicine. It is mainly commercialized as fresh ginger, however it can be also processed in a variety of products, such as dry ginger, bleached dry ginger, ginger powder, ginger oil, ginger oleoresin, ginger ale, ginger candy, ginger beer, brined ginger, ginger wine, ginger squash, ginger flakes etc.

The project area presents a good potential for ginger production, in terms of agro-climatic conditions, such as altitude, suitability for rain-fed growth, soil pH and soil moisture and drainage are according to requirements. According to the soil analysis from the land

assessment report, fertility is lower than the required parameters; however that could be addressed with good agricultural practices and fertilization.

The project villages have comparative advantages than those who produce ginger in other parts of the country, because of its favourable climatic conditions, increased demand in domestic and export market and the accessibility to the biggest ginger market.

Ginger started to be cultivated in the project area approximately 20 years ago and prices fluctuated until 2010. However, the demand of international market in 2011 has led to an increase in the price of ginger. Therefore, the cultivation of ginger has gained popularity among the farmers due to the favourable agro-climatic conditions and the increasing demand. In the project area many small holder farmers are willing to grow ginger in 2015.

#### **4.1.1. Existing practices**

It can be assumed that 1 out of 4 farmers in the project area grows ginger and among them, 43% are considered poor household (HH), 50% moderately well-off HH and 7% well-off HH. Land ownership among the interviewed farmers ranges from around 1 to 15 acres. On average, this means that the poor HH owns 3 acres; the moderately well-off HH owns 5 acres and the well-off HH 7 acres.

According to the field study, each farmer invested about 100 to 1,200 viss (1,623 kg to 1,959 kg) of ginger seeds last cropping season (2014). In terms of average use per wealth ranking, the poorest invested 150 viss, the moderately well-off invested 400 viss, and the well-off invested 700 viss.

Regarding production, harvest obtained ranged between 300 to 5,800 viss, with an average of 600 viss for poor HH, 2000 viss for the moderately well-off HH, and 4200 viss for the well-off HH.

A way to display the crop performance is frequently referred to as the ratio production/seeds invested, both measured in the weight unit viss. Ratios of 4, 5 and 6 were obtained by the poor, the moderately well-off and the well-off respectively.

The current **farming system** in the project area consists of cultivating Taungya (upland farming), which is based on the practice of shifting cultivation: plots of land are cultivated temporarily until its fertility diminishes, then abandoned and allowed to restore its natural vegetation by lying fallow. Farmers divide the land into several plots (2 to 5), where at least one is in fallow period of 3 to 5 years. Afterwards, farmers often use the slash-and burn practice for land clearing.

Ginger **cropping patterns** are always within a crop rotation system lasting around 3 years. Ginger is mostly cultivated after the fallow period. Some examples of the rotation practices are

depicted in Figure 3. In each example (1 to 11) it is represented the cropping pattern that one HH implements in one plot of land. Years or seasons are represented in the vertical. In general, the year 0 can be considered when land is in fallow, 1<sup>st</sup> year land is used for the Ginger cultivation, Upland rice is cultivated during the 2<sup>nd</sup> year and follows by groundnut, pigeon pea, maize, niger and wheat (3<sup>rd</sup> and 4<sup>th</sup> year).

Figure 3: Examples of crop rotation practices in the project area

Exemple 1	Exemple 2	Exemple 3	Exemple 4	Exemple 5	Exemple 6	Exemple 7	Exemple 8	Exemple 9	Exemple 10	Exemple 11
Fallow										
GINGER						Cauliflower	GINGER		Sesame	Wheat
upland rice + cow pea	upland rice				GINGER	Fallow	wheat	GINGER	pigeon pea	
hybrid corn+ pigeon pea	groundnut	pigeon pea +maize	niger		Fallow	upland rice			GINGER	
Fallow	niger	Fallow			upland rice	wheat			Fallow	upland rice
	upland rice				niger	Fallow				Fallow
	Fallow				upland rice					Fallow
					niger					
					upland rice					
					Fallow					

Considering that ginger is a crop that extracts high amounts of nutrients from soil, it is understandable that its production is over different plots year after year, avoiding the depletion of nutrients that mono-cropping practices generally cause.

Despite that ginger can be intercropped with shade-giving plants, e.g. banana, mango and pigeon-pea and also mixed crop with young coffee and orange plantations; in the project ginger is cultivated as a single crop. Intercropping with a leguminous crop, such as rice bean that fixes atmospheric nitrogen would be an interesting consideration for increasing the source of nitrogen in the soil.

The calendar for the main crops is specified in the table 5 showing the dependency of all crops during the rainy season, being cultivated from May and onwards (with the exception of ginger that is planted in March).

Table 5: Calendar for main crops cultivation

Crop	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Upland Rice												
Maize												
Niger												
Ginger												
Pigeon Pea												
Rice bean												

Most of the ginger growers have **indigenous technical knowledge** for selecting suitable land for ginger cultivation that prefers *cold soil*, which means that plots are on a slope-orientated to the south-west, receiving direct sunshine only in the afternoon. During this time of day, soil is partially in the shade, keeping more moisture. Soil could also be more fertile, as it is less exposed to the sun's effects.

In general, the **agricultural practice** of ginger production is labour intensive, due to the limitations of simple mechanization and difficulties in the topography of the area. Practically all activities are manual: land cleaning, burning, ploughing (with buffalo), furrowing, weeding and harvesting. When needed farm labour is hired just from the area or farmers are mostly reliant on the family support -on a reciprocal basic within their community. The ginger agricultural calendar (table 6) shows activities distributed in two years after the fallow period.

Table 6: Calendar of ginger activities in the project area

Activity	Previous year												Current year											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Land cleaning																								
Burning bush																								
Ploughing																								
Weeding																								
Furrowing																								
Basal fertilizer application																								
Sowing																								
Weeding																								
Earthen up																								
Fertilizer application																								
Weeding																								
Harvesting																								

After the fallow period, a set of activities are developed during *the first year*: cleaning the land and burning the bushes, land preparation (by hoe or by buffalo depending on land slope and assets owned by the farmer) as well as weeding. In steep and stony plots, the use of buffalo is limited.

In June/July of the first year, the soil following a few years of fallow period is left bare, with high exposure to water erosion by the monsoon. After this sun and wind erosion during winter and summer seasons occurs. At the same time a considerable amount of labour having been utilized on these activities during the first year no financial gain is obtained. It appears highly

convenient to revise the current practice in order that soils are covered with crops as long as possible and decrease the exposure of bare soil that can prevent soil erosion.

Before the onset of the monsoon, during the *second year*, farmers crush the soil; make furrow lines manually up and down and also water ways diagonally to the slope to avoid water logging. Farmers believe that the plants are more protected in up and down furrows against the water speed downstream. The spacing on planting is 45cm between rows and about 15cm between rhizomes.



Furrowing for planting

Fertilization is applied twice during the cultivation period: basal fertilization is done at planting time in March/April and 3 months after the mother rhizome is unearthed (June). Farmers mainly use cheap and low quality fertilizers mainly produced in China. For basal fertilization farmers apply compound NPK fertilizer (ratio 15: 5: 5) and urea fertilizer when the mother rhizome is unearthed. Only very few farmers can afford to buy better quality urea, like AMRO brand. It is noticed that no potassium fertilizer is used, despite the soil's acidity there is no use of soil amendments. In the project area there is no presence of any input supplier and farmers have to rely on purchasing and transporting the fertilizer from agro-businesses in Heho.

Farm yard manure (FYM) is not widely used in ginger production, mainly because the buffalo dung available at village level is prioritized for home gardens. Furthermore, the topography of the area makes access to the farms difficult meaning that all inputs need to be carried on foot. Additionally, there is not external supplier of FYM in the project area, probably due to the poor accessibility.

The average amount of fertilizer used varies from farmer to farmer. The average amount of compound fertilizer used by poor HH, moderate well-off HH and well-off HH are 45 kg/ac, 57 kg/ac and 64 kg/ac respectively. The average amount of urea fertilizer used by poor HH is 93 kg/ac, moderate well-off HH use 100 kg of urea per acre and well-off HH used 129 kg of urea per acre. Majority of the ginger growers never use pesticides or fungicides.

In general weeding is practiced twice per harvest period; however some farmers even need to do it 3 times. First weeding is in July/August jointly with the unearthing of the mother plant and fertilization; and the second could be in August, September or October, depending on the needs.

When plant is fully mature (leaves turn yellow), it is then harvested manually with a bamboo fork – avoiding metal tools that could damage the rhizome. The harvest period is from September to December, and there are different mechanisms for harvesting. Some farmers harvest once, usually in October, while some have been harvesting several times, even until

summer, as a coping mechanism for their livelihood. Storage is mainly done in a dry and shaded place (ground floor of the house) and *in situ* (also can be called delayed harvesting, as the rhizome is left in the ground). One disadvantage of the delay harvesting is the exposure to rhizome rotting, sprouting and the risk of being affected by pests. Losses are not generally measured.

The research shows the ratios of productivity ranging from 4 to 6 times the quantity of seeds planted (for every 100 viss planted 400-600 viss are harvested). In other words, productivity (viss/acre) ranges from 1,600 viss/acre to 2,400 viss/acre. The performance of the crop (production and productivity) is influenced by many factors. These factors, however, can be altered with appropriate agricultural and environmental practices, resulting in higher income.

Part of the last harvest (around 21%) has been stored for the upcoming cropping season; this proportion seems high when considering the small and limited size of land owned by the farmers, which it is a reflection of low production.

The cleaning and grading of the ginger are performed outside the project villages. Local traders in Heho and Aungban employ young local women for these activities.

The **processing** of dried ginger has been practiced by farmers when prices were dramatically low. Traditional methods for drying the ginger are practiced, which include boiling and drying in the sun. The ratio for processing dried ginger is 4 to 1 in weight. The current price in Aungban (March 2015) ranges 1,500-2,000 MMK/viss according to quality. The opportunity of added value for processing dried ginger will depend on product size/price versus the cost of the processing. Then the small sized ginger –with low market value could be sold with further profits made.

The majority of the ginger farmers in the project area is marketing and selling their fresh ginger in Heho with only a few entered into the Aungban market.

Farmers use different strategies for **marketing and selling** their produce, shortly after harvesting. This is done once off, or several times as needed with conjunction to the 5 day market. In any of these cases, the majority of farmers use either a 20 viss sack or bag made of red plastic (150 MMK/sack) or a bigger size sack with capacity for 30 viss (170 MMK/sack). Despite the weight of the bag, which is only 0.10 viss, the buyer deducts 1 viss/bag. Farmers using bamboo baskets with a capacity of 50 viss (1500 MMK/basket) lose 10% to the buyers.

Regarding **transportation**, the ginger is carried from farm to home mainly on foot along narrow paths and in some cases bullock cart are used.

Transportation to market is done by means of bullock cart, which can carry up to 10 bags of sack or 4 bamboo baskets (200 viss) with a total transport cost of 10,000 MMK/ 200 viss, equal

to 50 MMK/viss per trip. Small trawlergy from Heho is also used, with a capacity to carry 20 bags (400 viss). The total cost for this means of transport is 10,000 MMK, or 25 MMK/viss per trip. A big trawlergy can carry 65 bags or 2,000 viss and the cost per trip to Aungban is 40 MMK/viss. Some small ginger producers can neither afford a bullock cart nor a trawlergy, so their only option is to carry their goods on foot, which usually weigh no more than 30 viss.

Unforeseen circumstances, such as poor road conditions, might result in losses by rhizome breakage, which it is difficult to accurately measure. It has been reported that ginger transported in plastic bag packaging resulted in greater losses.

The **marketing of ginger**, takes place mainly at Heho. There are 5 ginger traders in Heho and 20 in Aungban. During the selling process, farmers are not informed that the total weight and the buying price is relatively lower compared to direct selling at the 5 day market. In general the process lacks transparency and honesty between traders and farmers. It is needed to assist farmers with the skills for full control of the transactions. Only 2 out of 30 farmers sold ginger in Aungban, in December 2014, gaining 150 MMK/viss more than those in Heho.

Apparently there has been no broker in the project communities, due to the poor road infrastructure. In general, large volumes of ginger are sold to the traders in Heho, whereas small volumes being directly sold at the 5 day market. Some farmers see advantages of direct selling, as an opportunity for price negotiation. Many women have built some experience through the selling of their home garden vegetables at the 5 day market and they prefer selling the ginger directly in the market.

The trading between farmers and traders are exclusively verbal. There is no set or standard agreement regarding the quantity, size or price. Farmers often continue sales with the same trader or buyer, which it is probably due to the lack of exposure to other traders. Moreover, the lack of trust and poor negotiation skills negatively affect potential income. Traders purchase ginger in bulk, without any grading and price differentiation, showing that many farmers do not know how the size of the rhizome influence the price value.



Ginger marketing at Heho's five day market

Farmers depend heavily on traders as a main source of market information. The farmers often check current prices during their visits the 5 day market. Also, to some extent, relatives and neighbours provide information, however, many farmers have also shown more secretive attitude about the price gained. Even some HH have mobile phone, they rarely use it for obtaining market information from traders or other sources. None of the farmers are aware of the ginger prices achieved at distant markets like Aungban and Yangon and of the demand for the international market. They are unaware of the market requirements in terms of quality, quantity and time and for sure the price gained in destiny.

Exporters are based in Yangon and their agents are actively purchasing from traders in Heho and Aungban, based on verbal agreements. There are approximately 140 exporters in the country making sales to India, Pakistan, Bangladesh and China. Ginger is packaged in plastic bags (the same that are used by farmers) and transported to Yangon, Muse and Sitwe by truck. The ginger is then shipped from Yangon and Sitwe to different countries: India, Pakistan and Bangladesh mainly. For China, it is transported directly by truck from Heho/Aungban. On the international trade, there is a first advance payment (50%) and the second payment after the order arrives to destination.

## **4.2. Mapping Value Chain**

### **4.2.1. Functions, Actors and Marketing Channels**

The ginger chain is primarily made up about with small number of actors and functions as it is mostly produced and commercialized as a fresh product. Details can be seen in figure 4. Due to favourable climatic conditions and the increase of demand for ginger, the number of farmers,

traders and exporters has increased in the last years, mainly in the Taungyi District, as more than 80 % of ginger is cultivated in this District.

Figure 4: Functions and actors in the ginger value chain

<b>FUNCTIONS</b>	Input Supply	Production	Selling Bulk	National Trading	Processing	Wholesaling	Exporting	Wholesaling	Retailing
<b>STAKEHOLDERS</b>	Agro-business, traders, farmers	Farmers	Local Traders	National Traders	Young Women processing	Exporter		Importer	Retailer
<b>ACTIVITIES</b>		Growing Harvesting Transporting	Collecting Organize Processing Supervision Storage	Collecting Transport Distribution	Categorize Brush Packing	Collecting Quality Control Transport by road Shipping transport Storage Distribution in Yangon	Quality Control Storage Distribution	Storage Selling to consumers	

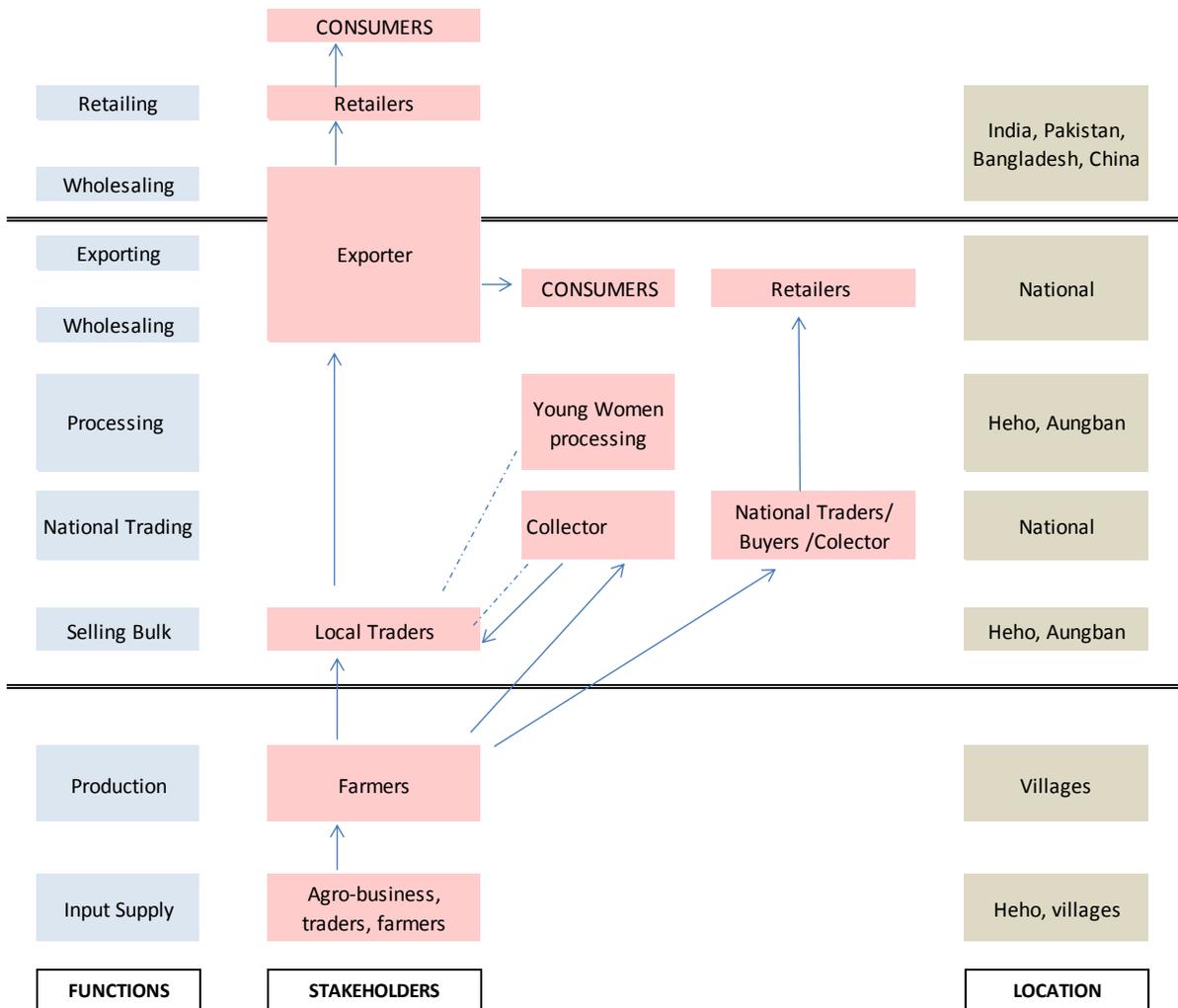
The marketing channels are mainly for export purposes; the approximate 140 exporters in Myanmar are based in Yangon, the commercial hub of Myanmar, prior to delivery abroad. The research cannot specify the number of exporters operating in the region (Aungban, Heho, Kalaw), however no exporters are directly operating in the project villages.

Aungban and Heho market are the main source of ginger supply in Myanmar for export and domestic trade and the majority of the big traders and exporters -based in Yangon- buy large amount of fresh ginger and also dried ginger in these markets. The large supply (88% of the national production), the quality of ginger and the good access to infrastructures are the main factors of the commercial importance of these markets for ginger, versus other regions producing ginger, like Chin State, Rakhine state and Kachin state. In 2014 the estimated production in Myanmar was around 30,000 mt, from those 26,400 mt(88% of the total production) was from Southern Shan State. Only 12% of production was from other regions of the country.

For domestic market, the main centres receiving ginger are Yangon, Mandalay, Pyay, Magway, Sitway and Monywa and for export as well Yangon, Sitwe for Bangladesh and Muse for China.

There are opportunities that exporters get into contact with farmers for a possible direct transaction of ginger that could bring more income to the farmers of the selected villages, as one of the exporters expressed the willingness to study this possibility with farmers.

Figure 5: Marketing channel of Ginger (Myanmar, 2015)



Farmers maintain strong relationships with traders as approximately 66% of their produce is sold to traders, whereas 25% is sold to collectors at the 5 day market. The main destiny of the fresh ginger (91%), produced in the project area, is to be exported.

Traders are based in Heho or Aungban and only rarely they send agents to the villages for purchases. The common practice is that farmers bring their production to traders to sell it and they accept the trader price offered. Traders control the grading and packing of the ginger in their warehouses, without involvement of farmers, who also do not know the size requested by market. Farmers have two sources where they obtain seeds (rhizomes); traders in Heho or other farmers in the project area -mainly relatives.

According to the key informant interview with traders, it is informed that there are about 20 traders based in Aungban and 5 based in Heho. In general traders and exporters are middle age and educated. The trading period of ginger is 6 months per year (from October to March).

#### 4.2.2. Knowledge and flow of information

The flow of information is quite lineal as each actor only communicates and receives minimum information from the actor who is one step up. As mentioned previously, collectors receive information from the trader regarding the quantity of ginger needed and the local price. Traders receive information from exporter about price depending on the size and demand.

The knowledge gaps are dramatically significant as we move downstream of the value chain, near producers who only know the price current market value given by the trader or collector. Farmers are unaware of the market requirements in terms of the quality (which it is categorized by size), quantity, time, and price.

Ginger price depend mainly on the size of the rhizome; small size is 165 to 245 g by weight. The minimum weight of the small size of ginger should be 110 g per rhizome. The majority of farmers do not know that the different size of ginger rhizome has different price and they accept from traders and buyers a lump sum price for all the produce they bring to the trader or market, which it is a mix of different qualities (sizes).

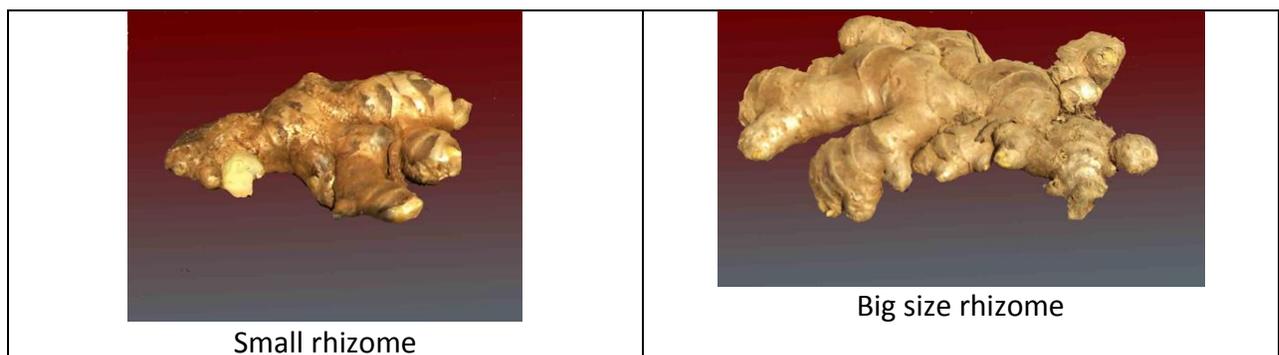
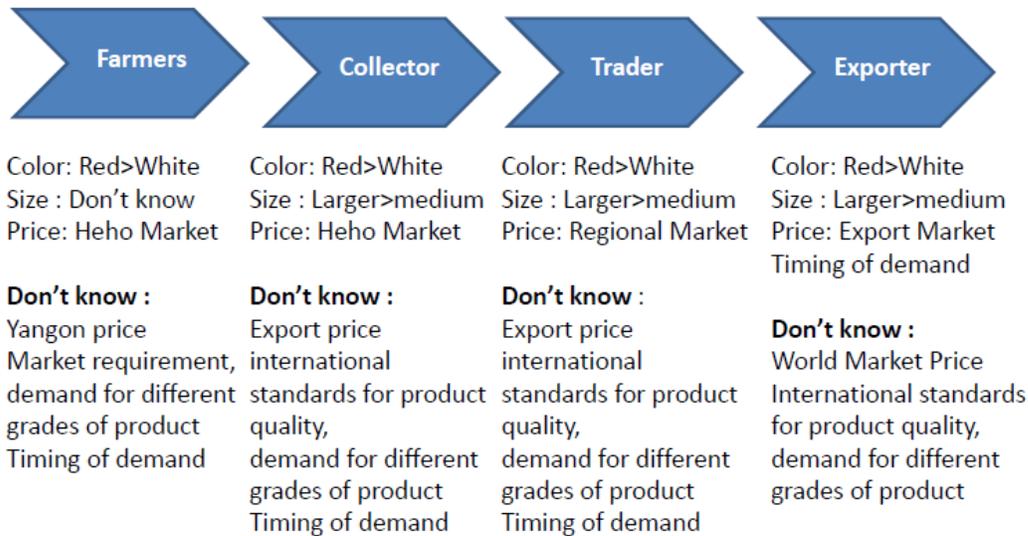


Figure 6: Information gap in ginger value chain (What each Actor group Know and Don't know about the whole chain)



### 4.2.3. Governance

In terms of participation, it is a challenge for farmers to make their voice heard and to find a better stand with the buyer-driven governance of the chain, as they are unaware of the market channels, requirements, and opportunities that the sector could offer them. Therefore, efforts in order to empower farmers should focus on facilitating access to productive inputs, credit, market information, capacity building and collaborative strategies among others.

Market prices fluctuate as they are governed by traders at regional level, and it is set by the demand of external markets: Pakistan, India, China and Bangladesh mainly. The trading of ginger is mainly governed by Indian importers, where contract farming is not seeing at any stages of the value chain.

The lack of information and empowerment negatively affect the producers of the value chain, who lose out on the opportunity of higher revenues. This is mainly a reflection of their vulnerability and strong need for food security.

Information flows according to the buyers needs and basically focuses on the price and demand. It is expected that actions facilitating the flow of information downstream will enable farmers to have more negotiation power within the buyer-driven chain.

### 4.2.4. Gender

In the project area, ginger growers as well as traders, is mostly dominated by men. According to the findings of baseline survey, 81% of household head was found to be a male. It is seen that women are mainly involved in major activities related to the production of ginger such as planting, preparation of farmyard manure, weeding and harvesting. These activities require

more labor and greater time involvement of women. The processing of ginger, i.e., cleaning, boiling and drying, is also mostly done by women, and is equally labor intensive and tedious as most of the activities are done manually.

The roles of men are prominent during land preparation and transportation activities. Men mostly have their role in pricing and they usually owe income from selling. However, decision on ginger cultivation is mostly done jointly. Depending upon the available resources, excluded and marginalized people are equally involved in ginger cultivation.

At traders' level, male are leading the trading activities, however, many firms have their own family members and hired labor as source of labor. More than 90% of the employees who are working for cleaning, sorting, grading and packaging are female.

There is not a clear-cut role defined in terms of access to resources between male and female. They seem to be involved equally while making decisions on cultivation and marketing. On the other hand, usually male gets control over the benefits, but most of the income/benefits go to the family basket for the welfare and need of the family members-that are jointly decided in majority of the cases.

Both men and women are in general not restricted while accessing the enabling factors at macro level as it could be reflected in terms of cultural settings, values and norms. General belief and value of male member's domination in accessing the enabling factors are slowly changing also in the favour of female members in the family, mainly at the household level.

#### **4.2.5. Added value through the chain**

In the analysis of added value through the ginger chain, it is founded that the highest added value is for the producer (590 MMK) per viss produced.

Consumers paid to retailers a value of 1,500 MMK per viss (0.9USD/kg), which means that retailers keep a profit margin/value addition of 200MMK (0.2 USD), as they pay to wholesalers 1300 MMK (1.3 USD). Wholesalers in Yangon keep a profit margin/value addition also of 200 MMK (0.2 USD), as they pay to National Traders (who act as Exporters as well) 1,100/MMK (1.1 USD). National Traders pay to local Trader 950 MMK (0.95 USD), which leads them to obtain a profit margin/value addition of 150 MMK (0.15 USD). Local Traders keep a profit margin of 100 MMK (0.1 USD) as they pay 850 MMK(0.85 USD) and sell for 950 MMK (0.95 USD). Finally, Farmers sell for 850 MMK (0.85 USD), when they have invested 260 MMK (0.260 USD), this means a value addition of 590 MMK per viss of ginger (0.36 USD/kg).

Figure 7: Added value through the value chain (MMK/ viss produced).



#### 4.2.6. Financial Analysis: estimation of share and estimation of gross value

Considering the added value in each node of the value chain and the costs through the chain, the share among actors is represented in Figure 8.

Figure 8: Share Distribution for Retail price, Total profits and Added Cost.



A pro-poor growth approach intervention would have to increase the benefits of the poor more than the benefits of the non-poor. The activity of cleaning and grading the ginger is currently done by young women at the warehouse of traders in Heho and Aungban, however, it is recommendable to bring downstream to village level increasing employment opportunity for farmers and women and moving part of the share of profit margin to the village.

In order to increase the share for farmers, it is essential to reduce the cost of production and increase productivity, and for that reason studies on soil nutrient management with cost/benefit analysis should be done on demonstration plots during at least 2 years, where green manure, adequate sequence of crop rotation, soil and water conservation practices and GAP are implemented and measure against yield and quality of ginger.

In addition, the cost of transport can also be reduced by collective organization of transport that can reach more favourable markets. Last year, the ginger price in Aungban was 150 MMK/viss(0.090 USD/kg) higher than in Heho, with a cost of transport with big trawler of 40 MMK/viss (0.024 USD/kg). Considering that the cost of transport to Heho was for small trawler 25 MMK/viss(0.015 USD/kg)and for bullock cart 50 MMK/viss (0.03 USD/kg); in both cases the best option was to sell to Aungban with additional income of 160-185 MMK/viss (98-113 USD/mt), as bigger transport was cheaper and price considerable higher.

The access to price markets and markets requirements, and the functioning of a ginger growers group can be vital actions in bringing downstream some of the profit shares and decreasing the share of added costs for farmers.

#### **4.2.7. Constraints and possible solutions**

##### ***Input supply***

###### *Inappropriate seed selection and preservation*

Farmers are unaware and lack knowledge regarding the importance of the selection of the rhizome for next plantation and the appropriate preservation method. As it has been explained earlier, farmers keep seeds without any criteria and they are stored at home or *in situ* in the field (rhizome is left under the ground as delay harvesting) and then exposed to environmental phenomena.

Improvements can be achieved through the provision of training and demonstrations of proper practices within the Farmers Field Schools (FFS) sessions and through field days demonstrations at village level. Healthy and disease-free clumps should be marked in the field when the crop is 6 - 8 months old and still green, then from those plants, big and healthy rhizomes should be selected immediately after harvest.

Seed rhizomes should be stored in pits of convenient size made under the shade to protect from the sun and rain. Seed rhizomes should be stored in layers along with well-dried sand/saw dust (i.e. one layer of seed rhizomes, 2 cm thick layer of sand/saw dust). Sufficient gap should be left at the top of the pits for adequate aeration. Inspection should be done once in twenty days to remove shrivelled and disease affected rhizomes. Walls of the pits may be coated with buffalo dung paste.

###### *Varietal selection*

Farmers grow ginger local variety, without any varietal research or test being conducted that could upgrade their returns by obtaining higher yields and more competitive rhizomes. Large

size rhizome with moderately fibre content, equal fingers and minimum 150 g weight are considered the features of high quality ginger in international markets.

The supply of seeds is mainly provided by other farmers or trader, without having options to different varieties. Seeds incurs in around 50% of the cost of production, so for poor farmers it is crucial to invest in high quality variety in order to minimize their risk in the production.

Project should acquire high quality varieties and conduct varietal trials and multiplication plots in order to develop a supply chain for locally adaptable improved variety. The supply chain should be managed through seed bank approaches as an inclusion mechanism for women and the poorest.

Some measures for women and poorest inclusion should consider: to be prioritized by the Seed Bank System to receive seeds and to have lower interest rate than other farmers. At other level also they should be prioritized in receiving technical support by agronomist and growers group to assure the good agricultural practices are applied.

#### *Lack of Potassium fertilizer*

Farmers are unaware of the specific fertilization needs of ginger in potassium, in addition to the lack of knowledge of the crop nutrients request. At the same time, there is a lack of availability of K fertilization, as suppliers focus mainly to general fertilizers like compound NPK and urea. Training and trial should be provided through the Farmers Field Schools (FFS).

#### *Lack of funding*

Ginger is one of the major cash crops for the farmers in the project area, however some of the poorest are excluded of this opportunity due to lack of investment. A scheme should be facilitated to provide soft loans to farmers, through the project (similar to the seed bank system) or even through the credits at Township level for CBOs.

### **Production**

#### *Lack of proper knowledge and technology*

There is a gap for farmers in the access to public or private extension services, which has led to inappropriate cultivation practices and lack of information and knowledge in assessing risk, like pests and diseases.

Poor farmers without access to buffalo prepare land manually (using the hoe) as result the depth of the furrow is only 15cm. It is recommended to provide a loose soil in furrows of 30 cm

for the good development of the root and to obtain higher yields. Farmers have stated that production is higher when land is ploughed with buffalo.

Farmers are unaware of the nutrients crop requirements and the grade of impact in the crop productivity. Farmers also lack knowledge of the dosage and the optimal application time and it is a general practice to apply compound as basal fertilization in March-April with no soil moisture available to be assimilated. Additionally, there is a lack of knowledge of alternative fertilizers, with the exception of FYM -which is not used in general due to the scarcity in the village and the hazard to transport to the farms.

Dosages are insufficient. The amount of NPK fertilization used by poor household has been 50 kg of N, 2 kg of P and 2 kg of K. Ginger is sensitive to and needs a large amount of available soil K and farmers unknown this major need.

Project should conduct a holistic approach on the management of soil fertilization and consider the needs of ginger crop. Based on agro-forestry, the project should be promoting the use of multi-purpose trees (like *Gliricidiasepium*<sup>5</sup>) in hedgerows around the plot (and also in contour bounding when plots are bigger) in order to have *in situ* green manure for fertilization and mulching material. Also it should be improving the crop rotation already in place with better sequence of crops and including leguminous (as crop or as green manure) before ginger production. Through the FFS and demonstration plots, project should provide knowledge on agro-forestry systems, soil fertility, ginger nutrition requirements and appropriate dosage and application. It is highly recommended to strength the contact with the Agricultural Institute of Heho. In addition to the technical support, there are many students from ethnic minorities that could also be an asset in the collaboration experience.

After planting, ginger plants should be covered with mulches consisting of forest leaves, grass and other plant residue up to 8-10 cm thick. Mulching protects the young plants from rain, prevents weed growth, keeps soil soft and moist and accelerates growth. However farmers are not applying this technique and bare soil on the hills is exposed to wind erosion during in March, April and the first rains in May. This practice as fertilization should be included within the curriculum of FFS and be part of the demonstration plots. Depending on the slope, it would be advisable to develop contour bounding with grasses (preferable the ones that fix nitrogen) to facilitate the mulching material *in situ* and also to be use afterwards as weed control.

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<sup>5</sup>*Gliricidiasepium* is a multipurpose tree widely used for nitrogen fixation. Its branches and leaves are used as green manure due to its easy management (tree can be kept at height of 1.5m) and the quick absorption of leaves nutrients by the soil. The application of 1 t/ha of leaf manure provides 21 kg N, 2.5 kg P, 18 kg K, 85 g Zn, 164 g Mn, 365 g Cu, 728 g Fe besides considerable quantities of S, Ca, Mg,B, Mo etc.

Project should organize contact farmer as community extension service providers through Farmers Field Schools.

## **Processing**

### *Cleansing and grading is done out of the village*

The fact that farmers do not do the cleansing (brushing) and grading of ginger at the village implies that farmers have less opportunity to negotiate price as they sell as lump sum and also it is lost an employment opportunity for this activity at the village that could be done by women. On the other side, if cleaning and grading is done at the village, farmers could acknowledge the prices according to size and evaluate if small size ginger is worthy to process as dried ginger. It is highly positive to bring down the share, moving this activity downstream to producers in order to get the advantage of: transparent and more honest prices according to size and as consequence higher income, employment opportunities at village level (potentially for women) and higher income by evaluating the convenience of producing dried ginger from small rhizomes.

The promotion of this action should be accompanied by training on grading and market requirements to farmers, the establishment of the ginger growers groups and the meetings with different actors as collectors, traders and exporters in order to clarify the market requirements and the prices for the ungraded and the graded and brushed ginger. Additionally it is recommended the promotion of bamboo basket, mainly because the ginger rhizome gets less damage when transported in bamboo baskets than with plastic bag. Breakages are the main losses in income as the higher prices are for rhizome of weight > 165 g.

In terms of cost of the bamboo basket and the plastic bag, the bamboo basket is used for many other activities in the farm and home, not only for the transport of ginger; it costs 2,500 MMK and lasts 2-3 years. The plastic bag is purchased only for transporting the ginger, it costs 150-180 MMK and the lifetime of the bag is 1-3 years as many traders keep it – so in both cases the cost is already being assumed by farmers

### *Lack of skills for processing dried ginger*

Despite that women have practiced the processing of dried ginger to some extent; there is scope of improvement in order to be processed more competitively. It is advisable to facilitate training and provide with basic and low external inputs technology for processing dried ginger with competitive hygienic standards.

It is required further research with the medicinal sector in Yangon to study possibilities for direct purchasing or collaborations. This study lacked time to explore the potential opportunities in this area.

## **Marketing**

### *Exploitative market-distress sale*

Farmers are in an extremely vulnerable situation due the lack of knowledge of the market requirements, demand and prices and they sell at any price in order to recover from investment and in a 5 day market to cover basic needs, as it has been detailed before.

### *Low bargaining power*

In addition to the lack of information just mentioned, most of the farmers do ginger marketing individually despite the existence of formal and informal groups, losing the bargaining power that a collective approach would bring them. Collective bargaining increases the power of producers at the procurement of inputs, when selling the harvest and decrease the cost of transport by increasing the volume of the transaction.

Training in marketing and collective purchases and sales are essential for farmers to be better positioned in the ginger market.

### *No institutional framework to protect the primary producers*

Under this lack of policy, it is recommendable the organization of the ginger producer group and promote the linkages with the DOA, in order start to set up the basis for bottom to up support to farmers from the authorities.

## **4.3. Analysis**

### **4.3.1. SWOT analysis**

Consultants have analysed the value chain according to the strengths, weaknesses, opportunities and threads at the different stages, from production, processing, marketing and the business environment. This has been a continuous analysis from all the data collected, secondary data, and analysis of the local context. Main features are collected in Figure 9.

Figure 9: Strengths, Weaknesses, Opportunities and Threats for Ginger Value Chain

Strengths	Weaknesses
<p><b>PRODUCTION</b></p> <ul style="list-style-type: none"> <li>Rural farmers are attracted by prospect of ginger farming and marketing</li> <li>Agro-Climatic suitability and adopted by farmers</li> <li>Some good agricultural techniques used by farmers (fallow land and crop rotation)</li> </ul> <p><b>PROCESSING</b></p> <ul style="list-style-type: none"> <li>Good demand of dried ginger in international market</li> <li>Fair demand of ginger powder</li> </ul> <p><b>MARKETING</b></p> <ul style="list-style-type: none"> <li>Growing International demand</li> <li>Well-established value chain and availability of traders</li> </ul>	<p><b>PRODUCTION</b></p> <ul style="list-style-type: none"> <li>Inadequate Agricultural Practices, grading and storage which lead to low yield</li> <li>Lack of environmental practices in a fragile context</li> <li>Difficult context with slopes over 45%</li> </ul> <p><b>PROCESSING</b></p> <ul style="list-style-type: none"> <li>Only basic ginger processing technology is known by farmers</li> <li>Lack of processing facilities</li> </ul> <p><b>MARKETING</b></p> <ul style="list-style-type: none"> <li>Lack of market information (volume, market requirements and prices)</li> <li>Lack of collective marketing practices</li> <li>Poor infrastructure for transport</li> </ul>

Opportunities	Threats
<p><b>PRODUCTION</b></p> <ul style="list-style-type: none"> <li>Availability of high quality seed variety</li> <li>Opportunity to increase productivity</li> <li>Opportunity to implement Environmental and Good Agricultural Practices</li> <li>Opportunity to implement agroforestry plots and register as Forest User Group</li> </ul> <p><b>PROCESSING</b></p> <ul style="list-style-type: none"> <li>Technology is simple and available</li> <li>Low cost investment on assets</li> <li>Employment opportunities for women and disadvantaged</li> <li>Bring down to village post-harvest techniques (cleansing and grading) for fresh ginger</li> </ul> <p><b>MARKETING</b></p> <ul style="list-style-type: none"> <li>Create a Ginger Farmers Group for collective marketing</li> <li>Establish informative meetings for Information sharing</li> </ul> <p><b>ENVIRONMENT</b></p> <ul style="list-style-type: none"> <li>Collaborative relation with DoA</li> <li>High potential for reducing poverty and employment creation through value chain</li> </ul>	<p><b>PRODUCTION</b></p> <ul style="list-style-type: none"> <li>Reluctance from farmers to change agricultural practices and adopt environmental conservation strategies</li> </ul> <p><b>PROCESSING</b></p> <ul style="list-style-type: none"> <li>Assure requirement standards</li> </ul> <p><b>MARKETING</b></p> <ul style="list-style-type: none"> <li>Price fluctuation</li> <li>Import countries establishing higher requirements and quality controls</li> <li>Other countries competitors offer higher quality and lower price</li> <li>Weak leadership in Ginger producer group</li> <li>Lack of trust among stakeholders and poor information sharing</li> </ul> <p><b>ENVIRONMENT</b></p> <ul style="list-style-type: none"> <li>Infrastructure (roads) have not improved</li> <li>Lack of leadership in networking among stakeholders</li> <li>Lack of gender strategies and women are left out</li> </ul>

### 4.3.2. Cost Benefit analysis

In order to be aware on the constraints in value chain, 30 ginger growers are interviewed at field visit. Household are categorized based on not only land holding size but also type of households, ownership of draught animals, productive assets and household durable.

Well-off farmers can invest in better land preparation and fertilization and also reduce in labour costs. The information below shows the different results obtained in 2014 between farmers of different wealth ranking.

Table 7: Cost benefit resume

	Unit	Poor HH	Medium HH	Rich HH
No of HH	%	43%	50%	7%
Average Land holding (ha)	ha	1.00	2.00	3.00
Ginger cultivated area (ha)	ha	0.12	0.40	0.71
% of ginger cultivated area from total land	%	12%	20%	24%
Average Seed Use	kg	245	652	1,141
Average Productivity	Seed to seed ratio	4	6	8
Average yield per hector	kg/ha	8,052	9,780	12,856
HH Average Production	kg/HH	978	3,912	9,128
Seed stored for 2015	kg/HH	308	960	1,304
Selling	kg/HH	670	2,952	7,824
Labor		Family labor	Family+hired	Family+hired
Land preparation		Man power	Man/buffalo	Buffalo
Use of Compound (15:5:5)	bag/HH	0.7	2.3	4.5
Use of Urea	bag/HH	0.8	2.5	4.5
Use of Compound (15:5:5)	kg/ha	144	144	158
Use of Urea	Kg/ha	329	313	317
Total cost of production	US\$/HH	155.6	1,034.0	1,830.0
Total cost of marketing	US\$/HH	35.4	141.6	330.4
Total Income	US\$/HH	510.0	2,040.0	4,760.0
Gross profit	US\$/HH	354.4	1,006.0	2,930.0
Net profit	US\$/HH	319.0	864.4	2,599.6

Remark: Net profit is the average among farmers within the same wealth raking.

As shown in table, the average ginger cultivated area of poor HH is only 0.12 ha that is 12% of their total cultivated land. Regarding ownership of draught animal, they have no buffalo. Being small land area of ginger cultivation, family labors is mostly used. They use compound and urea fertilizer and the amount use is 144 kg/ha of compound and 329 kg/ha of urea.

Rich HH has 3 times more land than the poor HH. Therefore their fallow period may be more than 4 years and they could select the cold soil for ginger cultivation. The majority of ginger growers prefer **cold soil**, which means more fertile and more moisture because direct sunshine is reached only on afternoon (slopes orientated to West)

The average of ginger cultivated area of rich HH is 0.57 ha that is nearly 6 times larger than of poor HH. In the regard to land preparation, hoeing on the steep slopes is very common for poor HH while well off ginger growers use buffalo for ploughing. When furrow is made with hoe, the depth of the furrow is about 15 cm only. If land preparation (ploughing) and furrowing is done with buffalo, it can make proper depth of furrow. Refer to literature, ginger gives high yield when planted at a depth of 30 cm.

Ginger cultivation is labor intensive; it is needed land cleaning, land preparation, planting, weeding and harvesting, mainly done manually. The ginger cultivated area of poor HH is too small (only 0.12 ha), they mostly used family labor. However, the well-off ginger growers used both family labors and hired labors.

Only well of HH that own the buffalo use buffalo dung for ginger cultivation, and poor HH if they have access they prioritize the buffalo dung for vegetable production. As shown in the above table, well off ginger growers used more compound fertilizer and urea fertilizer.

The productivity of the ginger may vary based on the years of fallow period, soil fertility of their land, affordability on use of draft cattle at ploughing and furrowing, availability of fertilizer use and amount of fertilizer application, proper use of good agriculture practices and skilled labor at critical period of crop season.

Table 8: Resume of costs per wealth ranking HH

**4.3.3. Market Opportunities and Market requirements**

Myanmar is strategically well located for the ginger sector, as some of the main country importers of ginger like Pakistan, Bangladesh, India, China and Malaysia are neighbour countries.

Before year of 2000, there is no ginger export market in Myanmar<sup>6</sup> and ginger is cultivated for domestic use. In 2010 there is a boom in the export market, mainly for Pakistan and China.

Table 9: Ginger exports (2001 – 2010)

Country	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
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<sup>6</sup>AungSoe. If the population is 80 million.

India	665	959	2,029	1,892	112	0	75	377	263	870
Bangladesh	1	70	96	36	0	0	0		0	51
Pakistan	0	0	576	4,347	1,623	225	0	2,912	136	6,247
China	17	0	20	52	21	0	0	70	504	1,041
Japan	0	308	556	8	5	7	2	35	7	5
Saudi Arabia	102	0	107	0	0	0	0	0	0	0
Singapore	0	14	121	259	0	19	0	0	0	0
Malaysia	108	15	41	123	208	5	16	0	0	10

Later there is an increase of exports to Bangladesh and India in 2012 and 2013.

This proximity to main importers is favourable as Myanmar can offer short delivery time and low additional costs on transport. However, the increase of production in China (29% in value and 4% in quantity since 2006-2019) could diminish the potential opportunity for Myanmar ginger. It is therefore crucial to improve the productivity in the project area in order to be competitive and advocate for policies protecting and promoting the sector. Further follow up on the international market and especially China's production and exports are recommended.

Domestic market is quite limited as the average consumption per capita of ginger is assumed as 330 gram per year<sup>7</sup> per person.

In Myanmar, the development of ginger in Chin State and its proximity to the Indian border could have some impact on the demand of ginger from Inle region, if their production increases significantly, as India purchase any size of ginger for processing purposes. It should be follow up in order to anticipate possible trends and advocate for policies.

International Market requirements are collected in table 9.

Table 10: Local and International market requirements for fresh ginger and price in 2014

Key Feature	Local Market	Pakistan	India	Bangladesh	China
Color	Red	Red	Any	Any	Red
Size	Any	Large	Medium	Medium	Large
Weight	Any	165-245 g/rhizome	> 110 g/rhizome	> 110 g/rhizome	165-245 g/rhizome
Price in 2014	0.25 - 0.43 USD/kg	0.92 USD/kg	0.36 USD/kg	0.25 - 0.43 USD/kg	0.43-0.61 USD/kg

Fibre content is also important in the quality of ginger. Japan market prefers low fibre content and young ginger and it is mostly used for Sushi. However, most of the traders prefer more

<sup>7</sup>AungSoe. If the population is 80 million in Myanmar

fibre content because it is not easy to be breakable. If rhizome is broken when transportation and handling, the price may be low.

#### **4.3.4. Business enabling environment**

Supportive Business Environment, policies and adaptation to change

MIID plays a vital role in the ginger value chain development supporting a business environment, leading the activities that can enhance the opportunities of income for the poor farmers. For the production MIID would be proving training and demonstration plots and involving stakeholders that should be taking part of the sustainability of the actions. For processing is foreseen training for grading fresh ginger and dried ginger processing and the provision of demonstration facilities for the production of dried ginger. Regarding marketing the MIID should play a role of facilitating the sharing information and networking in addition to training in marketing.

Advocacy is also a key element to thrive to catalyse the desired effects on policies that can protect the sector and the farmers. It is highly recommended to involve and strengthen the existing relation with Members of the Parliament for this purpose.

The lack of framework and standards defines a market scenario, so far with limitations to certain markets with high standards, like Japan, USA and also opportunities to markets with no restrictions (India, Pakistan, etc.)

During the research farmers have stated their willingness to increase cultivation and also to adopt technologies that can improve crop performance so income. It is recommended to consider the actions within a behaviour change approach in order to gain more impact in the development of the ginger value chain for the poor in the project area.

#### **4.4. Leverage points**

##### ***Process Upgrading:***

- Efficient use of the resources;
  - Soil: good agricultural practices for soil conservation
  - Seeds: using high quality variety, and practice selection of seeds and post-harvest technology
  - Fertilizer: understanding soil nutrient fertility under agro-ecology principles (fertilization in situ, combining natural and chemical fertilizers.
- Appropriate agricultural practices: right time for activity, enhance crop practice, introduce leguminous or multi-purpose trees

- Technical support through the DoA and establish linkages with the State Agricultural School for sharing trial experience and possible collaboration with students (many speak minority languages)
- Implementation of Agro-forestry system in demonstration plots with soil and water conservation structures, including contour bounding, hedgerows
  - Use of leguminous/multipurpose trees as source of green manure and soil stabilization
  - Establish cost/benefit analysis of the overall system
- Collective registration of ginger farmers with trees on the hedgerows as Forest User Group
  - Warranty of over 30 years of management
  - Access to credit through the Township Department of Cooperatives
- Reduce losses in transport (alternatives to the plastic bag through bamboo baskets)

***Product Upgrading:***

- Introduce a high quality seed variety
- Increase the skills on processing dried ginger with
- Develop facilities for the processing of dried ginger

***Functional Upgrading:***

- Downgrading the functions of grading, brushing and packing up to village level
  - Opportunities for increasing income for women at the village
  - Bring knowledge on quality standards and market requirements (training)
- Establish a Ginger Growers Group (3G) for collective purchasing and marketing, sharing price information and market requirements.
- Key farmer for agricultural extension services at village level
- Build farmers capacities on marketing
- Networking activities for market sharing information: meetings among different stakeholders

**4.5. Upgrading strategies**

Within the strategies to be upgraded an ample weight is on the process due to the value chain of ginger in Myanmar is mainly based on fresh ginger. It is also important to highlight that the establishment and support to the Ginger Grower Group and the activities aiming to increase the information sharing and coordination between stakeholders play a substantial role in improving the governance in the value chain and bringing higher income's opportunities to the poor farmers.

Table 11: Process, Product and Functional upgrading strategies

	Producer	Processor	Trader	Wholesaler	
Process	<ul style="list-style-type: none"> <li>- Efficient use of the resources (soil, seeds, fertilizer)</li> <li>- Appropriate agricultural practices (right time per activity, improve the existing crop rotation practice)</li> <li>- Technical support through the DoA</li> <li>- Implementation of Agro-forestry with soil and water conservation structures               <ul style="list-style-type: none"> <li>- Use of leguminous/multipurpose trees as source of green manure and soil stabilization</li> </ul> </li> <li>- Collective registration as Forest User Group</li> <li>- Reduce losses in transport (alternatives to the plastic bag)</li> </ul>	<ul style="list-style-type: none"> <li>- Reduce losses in transport (alternatives to the plastic bag)</li> </ul>	<ul style="list-style-type: none"> <li>- Reduce losses in transport (alternatives to the plastic bag)</li> </ul>		
Product	<ul style="list-style-type: none"> <li>Introduce high quality seed</li> </ul>	<ul style="list-style-type: none"> <li>Increase the skills on processing dried ginger</li> <li>Develop facilities for processing drying ginger</li> </ul>			
Functional	<ul style="list-style-type: none"> <li>- Establish Ginger Association</li> <li>- Develop skills for the function of grading, packing</li> <li>- Networking activities</li> </ul>	<ul style="list-style-type: none"> <li>Establish of ginger Growers Group</li> <li>Networking activities</li> </ul>	<ul style="list-style-type: none"> <li>- Networking activities</li> </ul>	<ul style="list-style-type: none"> <li>- Networking activities</li> </ul>	

## 5. BAMBOO VALUE CHAIN

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### 5.1. Overview:

Bamboo has been widely known as the “poor men's timber” or the “Green Gold” in Myanmar, due to its fast growing and easy regeneration characteristics. It has important direct and indirect economic and environmental benefits, such as providing shoots for food, culms for housing, furniture and handicraft products and contributing to soil and water conservation. Bamboo can play an important role in the reduction of wood consumption and the protection of forest and environment. Also it has a great potential in contributing to poverty alleviation and sustainable development of rural economy.

Myanmar accounts with around 102 species of bamboo, and 18 have been identified as commercially important by INBAR.

Myanmar's rural life is strongly connected to the bamboo plant, as it is utilized in many ways including the housing and other construction; handicraft, furniture, food production, fishing, pulp and paper industry, even as water pipes, etc. Bamboo is a favourite material for the handicraft manufacture. Many household items like fruit trays, lampshades, fancy baskets, pen

holders, jewellery boxes, flower vases are made from bamboo. Furniture made of bamboo includes dining tables, corner and rocking chairs. Bamboo is indispensable in the fishing industry, as fishermen rely on bamboo as material for making rafts, fish traps, fishing rods, outriggers of fishing boats, and for fish pens. In Myanmar there are around 30 items of NTFP and bamboo is one of the main one, contributing to 30% of the NTFP's revenue.

Bamboo has a great potential to upgrade the living standard of the rural poor and to alleviate the poverty through the development of the technical know-how for processing bamboo products with a market oriented approach. At the same time, efforts should also be made in the management of the resource; the natural bamboo forests, increasing plantations in a sustainable way and reinforcing the conservation the diversity of species

The processing of bamboo in Myanmar is mostly traditional, technology and the market have not been well developed and therefore its potential is still unseen. Bamboo has been classified as minor forest product and was neglected by the Forest Department in Myanmar. The bamboo industry needs to rethink the sector. Its importance becomes more noticeable as the demand of bamboo increases (in their multiple forms) due to the increase of population and tourism.

New technology and modern machineries are being used for making bamboo chopsticks, parquets, panelling, blinds, furniture, charcoal, bamboo vinegar, preserved bamboo shoots (cans), etc. The production of high quality bamboo parquet, bamboo panelling, bamboo blinds, bamboo chopsticks, bamboo handicrafts, bamboo charcoal, preserved bamboo shoots, etc. are in progress in most Asian countries. Particularly, China is rapidly developing those industries and the bamboo sector contributed US\$ 1,135 million to the Chinese economy in the year 2012.

Bamboo young shoots are known locally as "**Hmyet**" there are a nutritious vegetable. The succulent shoots are highly nutritious and palatable to most Myanmar and some foreigners (Thai, Chinese, and Japanese). Besides, being a delicacy among urban people, bamboo shoot is considered as a staple food for many rural households in Myanmar; because of its high carbohydrate and protein contents. There are about eight species of bamboo which are preferred for shoots, namely Kyathaung, Wabo (Kyalo), Hmyin, Wanwe, Thaik, Wanet, Htiyowa, and Wabomyetsangye. Among these eight species, the more favourable and worthy for the bamboo shoots production in large scale are; Hmyin, Thaik, Wabo and Kyathaung.

Although Myanmar has a great potential in bamboo resource, with approximately 5.4 million acres of forest bamboo (2010), the total return is comparatively very insignificant accounting only 695,234 million MMK (data from the Forest Department, 2014).

The exports of raw bamboo (culms) have gradually been increasing since 2005, from 1,149 million culms in 2005 to 1,346 million culms in 2011, representing a growth of 26% in 5 years.

### 5.1.1. Existing practices

#### ***Bamboo Production***

In the project villages, bamboo is found not only at the forest area, but also in home yards. More than one third of the total households have already established bamboo plantation in their home yards, mainly established by their parents or grandparents.

According to the findings of Key Informants Interview, the average number of clump per HH is 4-5 and the average number of culm /clump is 20-24. The average numbers of bamboo culm established per household is 80 to 120 and the bamboo shoot growing around the clump in the home yards is never cut off. According to the findings of Forest Department, it should be noticed that local people consumes 120 culms<sup>8</sup> of bamboo per household per year.



Bamboo producer and processor

Around 50% of the bamboo plants are infected by a pest, the stem borer, resulting in losses of large amounts of raw materials or early damage in bamboo products. Due to low quality of bamboo and poor infrastructure (especially road), the raw bamboo market is limited. In the project area, bamboo is therefore mostly used for home consumption as building material, fencing and farming tools.

#### ***Bamboo propagation***

Although the bamboo plantations have been established for many years, some households tried to cultivate new bamboo plants in their home yards. A limited number of species is growing in the project area and farmers are to some extent not aware of the value added products and the high potential of bamboo market. Farmers shown interest for bamboo cultivation, but there is a lack of knowledge about suitable species for cultivation, technical know-how for production of planting stock and plantation methods.

The most commonly used propagation technique for bamboo is rhizome propagation or offset propagation, which is a traditional vegetative propagation method. A bamboo offset is the lower part of a single culm usually with 3-5 nodes (i.e. about 1 to 1,5m) with the rhizome basal and roots attached. The rhizome attached to this culm is separated at the rhizome neck. Offsets

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<sup>8</sup> Khin May Lwin and SeinThet. A GLIMPSE OF TRADITIONAL BAMBOO PROCESSING TECHNIQUES AND PRODUCTS IN MYANMAR

are collected and planted into a small pit during the rainy season. However, no more than 10% new bamboos succeed due the following reasons;

- Rhizome and roots are damaged, when digging out the offset, as they are not well separated
- The timing of extraction could be wrong. Offsets should be collected and planted from February to April, which is just before rainy season. In this moment the nutrient reserves in the rhizome are at their peak. This will help to sustain the new plant so that they are capable of establishing new roots and transfer these food reserves to the new shoots during rainy season. If rhizomes are collected later, in the late rainy season after the new growth has started, they usually fail to establish.
- They did not immediately wrap the underground rhizome and roots of the offset in banana leaves, gunny bags or sacking containing with moist sawdust or straw for transportation.
- Inadequate size of a pit that should be 60 x 60 x 60 centimetres, and lack of fertilization, like farm yard manure and / or a chemical fertilizer mixed with soil
- Damage to rhizome buds during extraction and transportation

### ***Bamboo processing***

Project villages have rich bamboo resources and a long history of bamboo processing and utilization. Bamboo products are all made by hand and bamboo is still being used in the old traditional style. Normally bamboo processing is done at off season and it could be grouped into the following four main product groups:

- (a) Bamboo strips making
- (b) Bamboo Buildings
- (c) Bamboo Weavings
- (d) Bamboo Shoot Production.

#### ***(a) Bamboo strips making***

In project villages, it is found that a considerable number of people are involved in the bamboo strips making and for such people the income from the sale of bamboo strips is a source of household income in the off season.

For many people who are socially and economically disadvantaged like landless farmers, older people and persons with disability, the income from the sale of bamboo strips is at least some source of income during summer season, when no major income activity is developed.



Women producing strings

Generally one year-old locally available bamboo culms are collected for bamboo strips making, because of their long internodes and thick culms. The process for bamboo strips making are cutting short, removing nodes, splitting culms and striping. The bamboo strips are used as tying things for low cost bamboo based construction.

*(b) Bamboo Buildings*

In rural areas of Myanmar, especially at hilly regions, the people traditionally used bamboo to build houses. In the bamboo building, the ground floor is used to serve as a store house. The upstairs served as living rooms because of dry and ventilated. Bamboo poles are also used as foot bridges over creeks and rivers in the rural areas. Three year-old bamboo culms are mainly used for building purposes and small bamboo culms are also used in making bamboo fence.

*(c) Bamboo Weavings*

Job opportunity is very limited from February to April. At that time, some farmers are involved in the bamboo weaving business. According to the Key Informant Interview and Focus Group Discussion, majority of the people who are involved in the bamboo weavings are male. The culm of bamboo is hard, tough and flexible. But it is easy to be cut into strips for weaving. Through cutting, node removing, scraping, splitting and other operations, bamboo strips and threads are produced. Using these strips and threads, craftsman can weave out various bamboo crafts by hand. Their main traditional products of bamboo weaving are bamboo mat, bamboo wall and baskets.



Bamboo products(different types of baskets)

*(d) Bamboo Shoot Production.*

Bamboo shoots are mainly collected in the village forests by women and children in the rainy seasons for own consumption and small scale marketing. One of the respondents from Focus

Group Discussion informed that they have to walk more than 1.5 hour to collect the bamboo shoots in the forest and the road to the forest is too steep. Unsustainable way of collecting bamboo shoots can reduce the quality and quantity of the natural regeneration of bamboo. As a consequence, the local people would have to travel longer distance for bamboo shoot collection. They can collect not more than 10 viss per day. During one rainy season, approximately only 60 days are effective for bamboo shoot collection, 20 days for bamboo shoot processing and 20 days for marketing. The average sale of bamboo shoots per HH per season (4-5 months) is about 400 viss.

The nature of collecting bamboo shoots is simple; shoots are cut with a knife when grown about 5-20 cm above the ground, depending on the species. The shoots are collected and transported in baskets (up to 10 viss) to the village. The same day bamboo shoots are boiled and shredded, as fresh bamboo shoot final product. Villagers have not had experience in preserving bamboo shoots, even the simple salted preservation.

### ***Bamboo marketing***

Raw bamboo market in the project area is limited due to low quality and poor infrastructure (especially road). Small amount of bamboo is sold to the buyers that arrive to the village from Heho and Nyaung Shwe (approximately 4 times a year), to neighbour villagers and to processors of baskets and mats within the village.

Bamboo strips are sold to the 5 day market in off season for additional income of the households. As the bamboo strips are widely used as tying things, the demand is stable, however price is very low -only 500 MMK per viss and no profitable, however poverty and the lack of income during summer seasons drive farmers to make strips as a source of income.

The productivity of the bamboo mat, bamboo wall and baskets produced in the project villages is significantly low compared to the productivity obtained by producers of Chaungnipauk, a neighbour village. It is observed higher quality so processors regularly commercialized their products in the 5 day market, whereas project villages have limited marketing outside of the community.



Bamboo products at Heho's market

Women sell regularly fresh bamboo shoot at the 5 day market of Heho during rainy season. The prices of the bamboo shoots are; however, lower in rainy season as the offer is higher. The average price of boiled fresh bamboo shoot is about 800 MMK per viss (minimum 600 MMK and

maximum 1000 MMK). However, boiled fresh bamboo shoot production is a popular activity for generating income, realized by women during the rainy season. The product –collected in the forest- is practically process with zero cost, therefore the income from the sale is especially important during the monsoon months when poor households face higher food insecurity; so this activity contributes to alleviate food insecurity in hilly marginal areas.

### 5.1.2. Gender

In the bamboo value chain, women of the project area are involved mainly in collection and marketing of fresh bamboo shoots and to certain extend in processing added value products as mats and baskets.



Many women have skills in making bamboo mats and baskets for domestic purposes and few are involved in processing for marketing.

Women making a basket

Women are in charge of the activity of collecting Non Timber Forest Products (NTFP), like mushroom, elephant foot yam, bamboo shoot and medicinal plants, several days in the week during the monsoon season. The extraction is uncontrolled in the forest and, in some cases, at the end of the monsoon bamboo shoots start to be scarce.

In the village, women prepare the bamboo shoot –as fresh- following traditional methods and the sell in the 5 day market, as an alternative for getting income.

Women consider this activity as an opportunity for getting regular income, which contributes to the HH economy, however they have also expressed that the topography, distance are inconvenient for this activity and the decrease of availability sometimes.

## 5.2. Mapping Value Chain

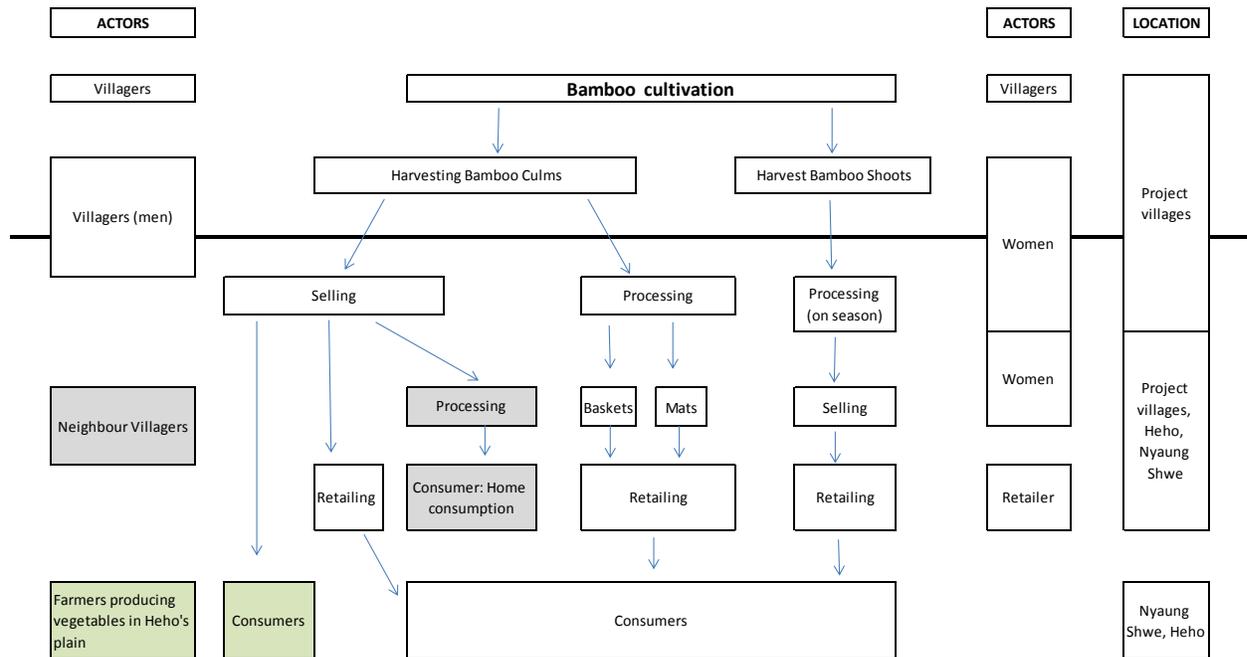
### 5.2.1. Functions, Actors and Marketing Channels

In the project area there are three products commercialized of the bamboo value chain, culms of bamboo (for construction or processing), the added value baskets and mats and the bamboo shoots. Below are represented the actors and functions for the 3 products in the villages:

Figure 10: Actors and function for bamboo shoot processors, weavers, bamboo culms producers

VALUE CHAIN FOR <b>BAMBOO SHOOT</b>				
<b>FUNCTIONS</b>	Production	Processing	Selling	Retailing
<b>STAKEHOLDERS</b>	Vulnerable Women		Women/Village BB Shoot Group	Retailer
<b>ACTIVITIES</b>	Growing at the homeyard	For <b>Seasonal marketing</b>	Transport	
	Harvesting	Washing	Selling	
		Boiling		
		Packing		
VALUE CHAIN FOR <b>BASKET, MAT</b>				
<b>FUNCTIONS</b>	Production	Processing	Selling	Retailers
<b>STAKEHOLDERS</b>	Men	Men/Women		
<b>ACTIVITIES</b>	Growing	Purchasing poles	Transport	
	Harvesting	Processing		
VALUE CHAIN FOR <b>BAMBOO CULMS</b>				
<b>FUNCTIONS</b>	Production	Selling	Retailers	
<b>STAKEHOLDERS</b>	Men	Men		
<b>ACTIVITIES</b>	Growing	Transport		
	Harvesting			

Figure 11: Bamboo Value Chain and market channels at the project area



It is unknown the volume of bamboo plants involved in each channel, it has some limitations as two channels could be measured with the same unit - units of bamboo plants, however the bamboo shoot needs to be measured with another unit, most probably weight.

### 5.2.2. Added value through the chain

The Table 12 shows the added value of some bamboo products produced in the project area. A deeper study of the designs and specific market could provide with answers to which product could be recommended to develop deeper.

Table 12: Added value for weaving products

Item	Cost for input	Income	Gross Profit	Daily income	B/C
<b>Bamboo Mat</b>					
Bamboo mat (18*9 ft)	1,500	5,400	3,900	3,900	2.6
Bamboo mat (27*4.5 ft)	5,000	16,000	11,000	5,500	2.2
Bamboo mat (12*4.5 ft)	6,000	14,000	8,000	4,000	1.3
<b>Baskets</b>					
Bamboo basket (big)	2,000	6,000	4,000	4,000	2
Bamboo basket (medium)	1,500	5,000	3,500	3,500	2.3
Bamboo basket (small)	2,000	6,000	4,000	4,000	2

### 5.2.3. Constraints and possible solutions

A resume of constraints and possible solutions for three of actors downstream the value chain (producers of culms, weavers and bamboo shoot processors).

Table13: Constraints and possible solutions on the bamboo value chain

	Input	Bamboo producer	Weavers (basket, mat,..)	Bamboo shoot
<b>Constraints</b>	Lack of varieties resistant to pest and diseases	Around 50% of culms are affected by pests, diseases Lack of knowledge for best cultivation practice and bamboo management	Traditional Practice Lack of skills to upgrade the added value products Lack of skills of more profitable products	Traditional Practice: collection from the forest is far Lack of skills for preservation Lack of facilities
		Poor marketing skills	Poor marketing skills	Poor marketing skills
<b>Potential Solution</b>	Advice/support from Forestry Department for purchasing seedlings	New varieties resistant to pest and diseases Training on cultivation techniques and maintenance of bamboo plantations Training on marketing	Advance training Training on new designs and new products Training on marketing	Training on Marketing. Establishment of bamboo producers/processors group Training on marketing

## 5.3. Analysis

### 5.3.1. SWOT analysis

Consultants have analysed the value chain according to the strengths, weaknesses, opportunities and threads at the different stages, from collection/production, processing, marketing and the business environment. This has been a continuous analysis from all the

data collected, secondary data, and analysis of the local context. Main features are in Figure 12.

Figure 12: Strengths, Weaknesses, Opportunities and Threats for Bamboo

Strengths	Weaknesses
<p><b>PRODUCTION</b></p> <ul style="list-style-type: none"> <li>• High demand of bamboo culms and bamboo products</li> <li>• Climatic suitability and traditionally cultivated</li> <li>• Positive environmental effect: forest protection and better micro-climate in the villages by increase of biomass</li> </ul> <p><b>PROCESSING</b></p> <ul style="list-style-type: none"> <li>• High demand of bamboo products</li> <li>• Communities have experience in producing added value products</li> <li>• Off seasonality of some products (e.g. Baskets, mats)</li> <li>• Low cost inputs for processing</li> </ul> <p><b>MARKETING</b></p> <ul style="list-style-type: none"> <li>• Local demand is high</li> <li>• Off season opportunities for incomes (production and/or marketing)</li> </ul>	<p><b>PRODUCTION</b></p> <ul style="list-style-type: none"> <li>• Presence of a pest infection in current plantations</li> <li>• Lack of knowledge of best cultivation techniques</li> <li>• Only few varieties in the area</li> </ul> <p><b>PROCESSING</b></p> <ul style="list-style-type: none"> <li>• Lack of advanced skills for producing added value products</li> </ul> <p><b>MARKETING</b></p> <ul style="list-style-type: none"> <li>• Lack of good infrastructure (road)</li> <li>• Lack of linkage with the market for some added value products (furniture, etc.)</li> </ul>
Opportunities	Threats
<p><b>PRODUCTION</b></p> <ul style="list-style-type: none"> <li>• Opportunity to increase income of the poor with home garden production</li> <li>• Low investment and high return</li> <li>• Opportunity to introduce a variety resistant to pest and diseases</li> <li>• Increase forest natural regeneration (positive environmental effect for water and soil conservation)</li> </ul> <p><b>PROCESSING</b></p> <ul style="list-style-type: none"> <li>• Opportunity to preserve bamboo shoots for off season market.</li> <li>• Opportunity to improve skills for producing bamboo products</li> <li>• Job opportunities producing bamboo seedlings</li> <li>• Opportunity to standardize standards, grades of bamboo poles</li> </ul> <p><b>MARKETING</b></p> <ul style="list-style-type: none"> <li>• Opportunity of creating Bamboo Shoot association</li> </ul> <p><b>ENVIRONMENT</b></p>	<p><b>PRODUCTION</b></p> <ul style="list-style-type: none"> <li>• Assuring extension work for assuring high survival of seedling production</li> </ul> <p><b>PROCESSING</b></p> <ul style="list-style-type: none"> <li>• Willingness for sharing processing facilities</li> </ul> <p><b>MARKETING</b></p> <ul style="list-style-type: none"> <li>• Infrastructure has not improved</li> </ul> <p><b>ENVIRONMENT</b></p>

<ul style="list-style-type: none"> <li>• Collaborative support of the Forestry Department</li> <li>• No restrictions to use and manage bamboo.</li> </ul>	<ul style="list-style-type: none"> <li>• Policies changes regarding management of bamboo</li> <li>• Supply from Forestry Department of inappropriate trees, such as eucalyptus.</li> </ul>
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**5.3.2. Cost Benefit analysis**

The production of bamboo at home yard is a proposal with strong weight in gender and environmental approaches. The bamboo cultivation in the home yard aims to reduce the extraction of bamboo shoots from the bamboo natural forests decrease the burden for women in collecting going to the forest (1-2h), increase the quality and diversity of bamboos shoots for marketing and increase a better environment in the villages by increasing vegetation.

A cost benefit analysis for Bamboo home yard cultivation system includes both the production and commercialization of culms and salted processed bamboo shoots, shows potential gross profit among 450,000 to 525,000 MMK after 3 years.

Table 14: Cost Benefit analysis of product of home yard bamboo plantation after 3 years

Detail	Year 1	Year 3			Strategy 1	Strategy 2	Strategy 3
	No.	No.	Unit price	Income (MMK)	Selling all BB shoot during rainy season	Selling all Salted BB Shoot OFF season	Selling half of BB Shoots as Boiled during rainy season + half BB Shoots as Salted on OFF season
					Income (MMK)	Income (MMK)	Income (MMK)
<b>Initial Inputs</b>							
No of bamboo to be planted in Home Yard	50						
<b>Outputs</b>							
No of marketable Bamboo (after 3 years)		150	2000	300,000	300,000	300,000	300,000
Boiled Bamboo Shoot (after 3 years)		150	1000	150000	150,000		75,000
Salted Bamboo Shoot (after 3 years)			2000	300000		300,000	150,000
<b>Income after 3 years</b>					450,000	600,000	525,000

Considering that the costs of cultivation for bamboo shoots are practically zero in inputs, once the plantation has been established in the home yard, and then the gross profit would be very similar to the net profit.

The processing of boiled bamboo has additional costs like the cost of boiling the product and the transport. As this product is sold in the 5 day market as bulked product they can use plastic boxes for transport, which are available locally

The processing of salted bamboo shoots incurs in minor costs as it only needs to be boiled and preserved in salt. Additionally, for marketing purposes, there is the cost of a plastic bottle or plastic pot with screw lid as packaging and the label.. Plastic pots with wider bottle neck can facilitate the filling process.

The transportation cost ranges 25 MMK/viss to Heho and 40 MMK/viss to Aungban. In overall the costs of production and transport per viss of salted bamboo shoots is really low.

As the product is packaged, there are not losses by damages during transportation; therefore there is scope for marketing in near Township markets as there is a high demand for the product due to its popularity.

### 5.3.3. Market opportunities and Market requirements

Bamboo has a great potential as it is an essential product in rural areas. A vast amount of population in Myanmar depends to some extent in bamboo for basic needs such as housing (construction, wall mats, and mats), farming materials like baskets and mats for harvesting and for an endless list of uses. The figures 13 and 14 show the trend during the last 15 years.



Figure 13: price trend of raw bamboo (culms)

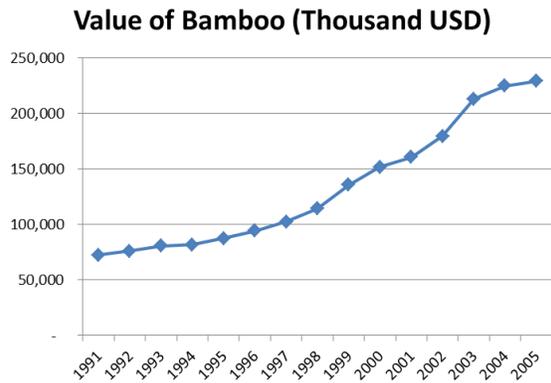
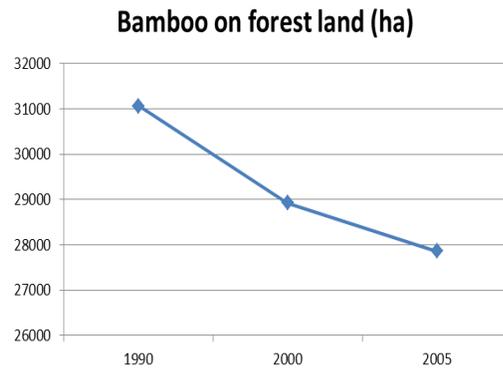


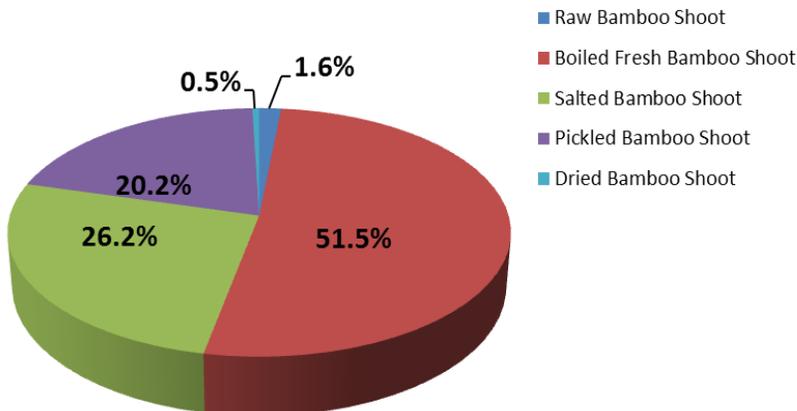
Figure 14: Size of bamboo Forest in Myanmar



There is a great opportunity for bamboo producers as soon they can accomplish with quality and market requirements, as price trend increases meanwhile the offer is decreasing, situation that should bring high revenues for bamboo producers.

Additionally, the market for bamboo shoot is healthy and active with a range of added value products found in the domestic market, as a raw, boiled fresh, salted, pickle and dried.

Figure 15: Share of market of the added value bamboo products



As a seasonal product, bamboo shoots are harvested during rainy season, so only the preserved bamboo shoot is available all year round. The price of the processed bamboo shoots varies in the market through the year reaching higher prices in winter and summer seasons. Therefore, this added value product of the bamboo can be seen as an opportunity for poor household to obtain a higher income during winter and mostly summer season. Furthermore, it appears

highly desirable for the poor households to have income during summer season to support their livelihood and/or for the monsoon cropping season.

#### **5.4. Leverage points**

##### *Process Upgrading:*

- Increase the cultivation area at the home yard
  - Reduction of the extraction at the forest
  - Higher quantity next to the house, reduces women workload
- Tour visits to villages with traditionally good bamboo production, processing and management
- Training in marketing

##### *Product Upgrading:*

- Introduce varieties resistant to pest and diseases
- Introduce varieties attractive for bamboo shoots production
- Increase the skills on bamboo shoot processing and preservation
- Develop facilities for the processing
- Training on more competitive design for baskets and mats

##### *Functional Upgrading:*

- Establish a Bamboo producers and processors Group
  - Collective organization of transport
  - Collective Marketing of the products
  - Information sharing

#### **5.5. Upgrading strategies**

##### **Table 15: Upgrade strategies for actors (producers and processors)**

	Producer	Processors
<b>Process</b>	-Increase the cultivation area at the home yard -Tour visits to villages with traditionally good bamboo production, processing and management - Training in marketing	--Increase the cultivation area at the home yard -Tour visits to villages with traditionally good bamboo production, processing and management - Training in marketing
<b>Product</b>	-Introduce varieties resistant to pest and diseases -Introduce varieties attractive for bamboo shoots production	-Increase the skills on bamboo shoot processing and preservation -Develop facilities for the bamboo shoot processing -Training on more competitive design for baskets and mats
<b>Functional</b>	-Establish a Bamboo Producers/Processors Group	-Establish a Bamboo Producers/Processors Group

## 6. RECOMMENDATIONS AND ACTION PLAN

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### 6.1. Ginger

#### Recommendations

In overall the recommendations for the value chain development have a strong weight for the production of ginger and also in the marketing, focusing to enhance the flow of information and knowledge of markets. In the hilly fragile environment of the project area and the marginality of the farmers

- Project should promote good agriculture practices for seed selection and preservation through demonstration plot.
- Good agriculture practices for seed selection and preservation should be incorporated under the curriculum of Farmers Field School and train local ginger growers on best practices.
- Project should implement demonstrations plots with agro-forestry principles
- Project should organize field days to the demonstration plots to create awareness in the project villages about the best practices.
- Project should conduct the varietal trial and develop a supply chain for locally adaptable improved variety through seed bank approach.
- Project should conduct the fertilizer trial at demonstration plots.
- Project should promote appropriate soil nutrition practices, with strong emphasis to natural fertilizers.

- Project should introduce leguminous trees (e.g. *Giricidasepium*) as leaf-green manure, preferable as seedling or stick due to the short period left to end the project
- Project should strongly promote cover crops and green manure for soil fertility and soil erosion control, maybe even to facilitate some seeds with a Seed Bank approach
- Facilitate scheme to have access to soft loans to farmers.
- Project should organize contact farmer as community extension service providers through Farmers Field Schools.
- The seed rhizomes should be stored properly in pits under shade
- Project should facilitate the training on better grading and sorting practices and encourage the use of bamboo basket to protect from quality losses
- The appropriate technology on ginger drying should be introduced
- Demonstration with Simple trial (varietal trail, fertilizer trial, agriculture practice) in FFS
- Locally adaptable quality seed production
  - Introduce new variety
  - Seed multiplication
  - Establishment of Seed Bank system
- Technology transfer
  - Good agricultural practices
  - Environmental practices for sustainable agriculture (Through demonstration/farmer field school approach)
- Training on dried ginger production
- Develop facilities for the drying processing under environmental parameters
  - Energy Saving Stove (ESS) for boiling the ginger
  - Drier facility (multipurpose) See Annex 2 for details
- Grading, brushing and packaging at village level
- Increasing opportunity of employment to the target group
- Use of bamboo basket for transportation to reduce losses (breakage)
- Collective marketing through project organization in ginger grower group
- Training on Marketing Principle
- Build awareness on Importance of Market Information
- Regular Contact with Department of Agriculture for market information
- Provision of weekly market information through ginger grower group
- Stakeholder Workshop on Ginger Market Trend
- Organize the ginger grower group and build their capacity
- Strengthen the networking with stakeholder

## **Action Plan**

ACTIONS	2015												2016											
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12			
1 Purchase of high quality seeds (with sharing knowledge with DOA and State Agricultural Institute)	█																							
2 Share knowledge with DOA and State Agricultural Institute		█																						
3 Purchase of <i>Gliricida sepium</i> seedlings or sticks for hedgerows for 1) beneficiaries, 2) Demonstration plots and 3) FFS			█																					
4 Develop the model for appropriate ginger production for the demonstration plots (agricultural system), budget, factors to be measured				█																				
5 Develop the curriculum for FFS: varietal trial, fertilization trial					█																			
6 Establishment of FFS with several trials (varietal, fertilization)						█																		
7 Contact/Key farmer as community extension service providers							█																	
8 Establishment of Demonstration plots (agro-forestry) and field visits								█																
9 Establishment of Seed Bank System									█															
10 Seed Multiplication										█														
11 Training on grading											█													
12 Training on processing dried ginger												█												
13 Establishment of Facilities for processing dried ginger													█											
14 Registration of Forest User Group (ginger growers with <i>Gliricida sepium</i> )																								
15 Facilitate scheme of soft loans (Forest Group)																								
16 Training on marketing																								
17 Establishment of the Ginger Growers Group (3G)																								
18 Strengthen the networking with stakeholder																								
<i>Bi annual meeting (previous planting and previous harvest approx.)</i>																								
<i>Study collaborative strategies among farmers</i>																								
<i>Linkages with Exporters</i>																								
<i>Regular collection of prices with DOA and sharing</i>																								
<i>Linkages with State Agriculture School (exchange visits)</i>																								
19 Advocacy meetings																								

## 6.2. Bamboo

### Recommendations

- Project should provide with new varieties of bamboo resistant to pest
- Project should provide varieties attractive for bamboo shoot production, like Kyathaung, Wabo (Kyalo), Hmyin, Wanwe, Thaik, Wanet, Htiyowa, and Wabomyetsangye. Among these eight species, the more favourable and worthy of production in large scale are; Hmyin, Thaik, Wabo and Kyathaung.
- Project in coordination with the Forestry department and the Myanmar Bamboo Lovers Network should provide training on best practices of bamboo cultivation; and organize tour visits to villages with good tradition in production, processing and management of bamboo
- Project should create linkages with the Myanmar Bamboo Lovers Network and support producers and processors in participating in the network
- Project should provide training on bamboo shoot processing
- Project should provide facilities for adequate processing bamboo shoots under environmental and low external inputs principles: energy saving stove for boiling the bamboo, plastic containers for transporting the bamboo shoots and hygienic facilities, where to process the bamboo shoot. See Annex 3 for details.

- Project should provide training for more the production of more competitive mats and baskets designs
- Project should provide training on marketing skills and the requirements that each added value product has in the market
- Project should promote the research of new local markets that are at feasible distance of the project area, like Aungban, Kalaw, Taungyi
- Project should facilitate the creation of a Bamboo Producers and Processors Group, with several aims: to promote collective marketing and transport of the products, sharing information between members and establish links with other stakeholders to support the improvement of the sector
- Project should conduct a specific market survey to search the highest profitable products in the Inle tourist site.

### Action Plan

Actions	2015												2016											
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12			
Provision of new varieties of bamboo resistant to pest																								
Provision of varieties attractive for bamboo shoot production																								
Coordination with the Forestry department and the Myanmar Bamboo Lovers Network for training on cultivation																								
Establishment of bamboo nursery																								
Support linkages with the Myanmar Bamboo Lovers Network and organize tour visits																								
Training on bamboo shoot processing (fresh boiled and salted) according to quality standards																								
Establishment of facilities for adequate processing of bamboo shoots																								
Provision of collective/individual kits for processing activities																								
Market survey study for search high profitable products within the Inle lake tourist market																								
Advance training for more competitive mats and baskets (advanced designs)																								
Training on marketing skills and market requirements																								
Establishment of a Bamboo Producers and Processors Group																								

## Annex: Clarification

1. Based on your meetings with township DOA, which DOA level/department is appropriate to provide technical trainings for ginger?

During 1990s, some research activities related to ginger varietal improvement and cultural techniques were implemented at Potato and Ginger Research Farm under Extension Division of Department of Agriculture. This farm was located in Heho. Currently, ginger is not recognized as major crops in Myanmar and research activity on ginger crop has been terminated for 20 years.

At township and district level, there is no resource person who has past experience and proven skill in ginger cultivation. All Agriculture degree holders have only basic knowledge on ginger. They could share the general knowledge on ginger cultivation. However, Director of Department of Agriculture should be contacted for the training on ginger cultivation. He could provide the most reliable resource person.

As the project is in 4 villages under the administration of Naung Shwe Township and one village in Kalaw Township, it seems logical to promote coordination among both DOA with the recommendations from the State level for an efficient implementation of the training instead of individual Township level trainings.

2. Which kinds of plastic container may be the best for bamboo shoot in project areas?

There are 2 products are proposed to produce:

- A. Boiled bamboo shoots that are sold few days after harvested and just after they are boiled

As it is sold in bulk in the 5 day market, it can be transported as they currently with the bamboo basket or in plastic box with good lid that secures hygiene during transport.

- B. Salted bamboo shoots, also boiled, but preserved with salt and stored until off season

As it will be sold as an off season product, it can be stored in plastic recycled drinking water bottle or in plastic pot with screw lid. A wider bottle neck would facilitate the filling process resulting in less time and better presentation for its market with a good label; however it may incur in higher cost. It is needed further detailed analysis of the costs and the market that want to be reached, as the recycled drinking water bottle costs only 20 MMK.



3. According to recommendation for introducing of bamboo shoot varieties, is it possible to get shoot yield from newly introduced varieties before December 2016?

If the bamboo is propagated in 2015, the seedling can be transplanted in 2016. After one year of transplanting, it is possible to produce the bamboo shoots. Therefore it will not be possible to get bamboo shoots by December 2016, according to the explanation in point 5.

4. Could you include a list of villagers interviewed?

Included in Annex 1 of the report

5. As bamboo takes three years to grow, for the sake of the project period, would you recommend utilizing existing bamboo resources, replenishing with the new varieties described in the report?

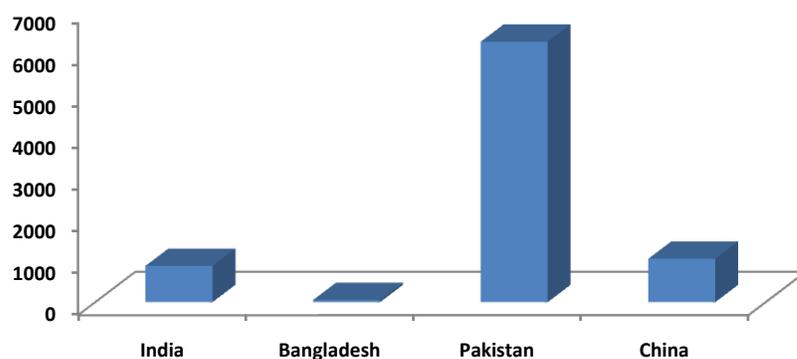
It is suggested that training on bamboo propagation methods should be conducted in May, 2015. After conducting the training, the bamboo propagation should be done in the rainy season of 2015. It takes about 7 to 10 days for shooting and 80 to 90 days for rooting. Therefore propagated bamboo should be kept in nursery. In the rainy season of 2016, the seedling can be transplanted at the homesteads.

6. Value chain is more about identification of market and quality requirements first, and then support target communities to meet those requirements. Somehow, we got an impression that most of the recommendations made in the study report are focused on supply side with more emphasis on production. If demand is higher than supply and the villagers have comparative advantages than those who produce ginger in other parts of the country/world, then it is perfectly fine. But this needs to be highlighted clearly in the report. Otherwise, there should be equal emphasis on market assurance.

As ginger is used as a spice in culinary preparation in Myanmar, the average per capital consumption of ginger is assumed as 330 gram per year<sup>9</sup> and annual local consumption of ginger is 20,000 metric tons in Myanmar. According to the available data from International Trade Centre, 8224 tons of ginger was exported in 2010. It was 27% of the total production. Therefore, local consumption was estimated as 53% and seed storage was 20%.

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<sup>9</sup>AungSoe. If the population is 80 million in Myanmar



As seen in figure, the major export markets of Myanmar Ginger in 2010 are Pakistan, China, India and Bangladesh because the buying price of ginger from Myanmar is lower than the local price. Myanmar ginger imported from Myanmar is cheaper than domestically grown ginger. It is used for the production of Chinese medicines.<sup>10</sup>

Due to favourable climatic conditions and increased demand in domestic and export market, ginger farming has gained popularity among farmers in mountain areas. Ginger is cultivated in hilly area of Shan State, Chin State, Rakhine State and Kachin State. The total cultivated area of ginger in Myanmar is estimated at about 9,000 acres (3,644 hectares)<sup>11</sup>. Among them, more than 80% of the ginger cultivated area is found in Taunggyi District<sup>12</sup>, Southern Shan State where HIMALICA project is located. In terms of production, the estimated total ginger production in Myanmar in 2014 was 30,000 mt and 26,400 mt (88%) was from Southern Shan State.

Aungban has become an important hub of wholesale market for ginger, due to the easy access for buyers and exporters to collect large amount of ginger and also the favourable location and infrastructure for its transport by truck to main centres for export –through Yangon, Sittwe and Muse-and for domestic market -through Mandalay, Sitway, Pyay and Monywa. The proximity of the HIMALICA project’s villages to Aungban hub is a comparative advantage for the production and marketing of ginger, a crop that has already shown good adaptation to the climatic conditions in the area.

The project villages have comparative advantages than those who produce ginger in other parts of the country because of its favourable climatic conditions, increased demand in domestic and export market and available access to the biggest ginger market.

7. They mentioned about possible value added products (candy juice etc) for ginger but is there market for those and what potential/uniqueness do communities have to be competitive in the market place is not clearly highlighted. Would be good to know what the size of production in our selected site is and what volume is sold to which market.

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<sup>10</sup> *International Trade Centre. Overview of the markets for selected tropical fruits and vegetables in China*

<sup>11</sup> Interview with Deputy Director General of Department of Agriculture.

<sup>12</sup> Interview with Director of Department of Agriculture, Southern Shan State

According to the findings from focus group discussion and some key informant interviews, the total ginger production of the project villages could be estimated in 238 mt. Among them, 53 mt (23%) is stored for seed rhizome and 182 mt (77%) is sold to the market (170 mt to Heho market and 12 mt to Aungban Market).

8. The analysis (particularly the ginger one) is more driven by export market scenario with clear explanation of knowledge gap, market uncertainties and gaps in market information. However, it would be more useful if the analysis consider the local (Heho, Inle) market situation and opportunities to link up with big traders/exporters based in Yangon

There are two Townships namely Kalaw and Nyaungshwe in the project area. Regarding administrative, these two Townships are under the Taunggyi District. The total population of Taunggyi District is 1,073,466 in the year 2014<sup>13</sup>. The demand for domestic use of ginger for the population of Taunggyi District is 354 mt only. However, the production of ginger is 22,990 mt in 2014. Therefore supply is more than the local demand. Being ginger surplus area, ginger is widely traded at the local market of Heho and Aungban. Heho and Aungban become ginger markets for domestic and export.

Nyaungshwe market is only for domestic that means ginger is traded for local consumption only. Compared to Heho and Aungban market, the market volume of ginger at Nyaungshwe market is too small.

Especially, Aungban is the main source of ginger supply in Myanmar for export and majority of the big traders and exporters based in Yangon buy the large amount of fresh ginger and dried ginger at Aungban Market.

According to the Key Informant Interview with exporter, it is informed that they are willing to buy the ginger from the project villages. They said that they could offer the current price of Aungban/Heho markets and they will take responsibility for transportation. MIID plays a vital role in catalysing the exposure among the different actors (exporters and farmers) as well as facilitating actions that can bring better conditions for the farmers. It will be essential the support to farmers from MIID in all of the networking activities in order to assure that actions are leading to strengthen the position of the poor. The establishment of the ginger grower groups should be a starting point from where to develop many of the networking activities recommended.

As exporter has expressed the interest of establishing direct relationship with the farmers that could lead to better price for farmers as it seems that in the project villages exporter could obtain the ginger they require, both in terms of quality and quantity. It is recommendable that the HIMALICA project facilitates the linkage among exporter/buyers based in Yangon and the farmers.

In addition, there are several recommendations focusing in strengthening farmer's position, such as networking with stakeholders and Stakeholder workshop on ginger market trend.

Farmers should be receiving training (in production and marketing) and information on market trends, which should contribute to build their capacity for better interaction with other stakeholders during networking and workshops activities. The establishment of the ginger growers group should also bring farmers in a stronger position for negotiating with traders and exporters. Additionally, closer relationship with DOA and regular information on prices are also important points to start to implement as farmers through the ginger growers group could start building their confidence for the negotiation with traders and exporters.

9. Need to describe process (tools applied/actors involved etc) followed for SWOT analysis; cost-benefit analysis etc, and interpretation of figures such as how revenues flow from consumers to producers (Figure is not clear what proportion of profit margin is accrued at which node of the chain, ref my comment in the attachment)

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<sup>13</sup> 2014 Myanmar Population and Housing Census

Please see Cost Benefit Analysis in the report

10. Cost-benefit analysis by category of ginger growers – it seems that households are categorized mainly based on land holding (poor HH – 3 acres; moderately poor hhs – 5 acres and rich hhs – 7 acres but their respective net profits are 15 times more in rich hhs as compared to poor hhs. This needs further analysis with evidences and explain why this is so?

In order to be aware on the constraints in value chain, 30 ginger growers are interviewed at field visit. Household are categorized based on not only land holding size but also type of households, ownership of draught animals, productive assets and household durable.

	Unit	Poor HH	Medium HH	Rich HH
No of HH	%	43%	50%	7%
Average Land holding (ha)	ha	1.00	2.00	3.00
Ginger cultivated area (ha)	ha	0.12	0.40	0.71
% of ginger cultivated area from total land	%	12%	20%	24%
Average Seed Use	kg	245	652	1,141
Average Productivity	Seed to seed ratio	4	6	8
Average yield per hectore	kg/ha	8,052	9,780	12,856
HH Average Production	kg/HH	978	3,912	9,128
Seed stored for 2015	kg/HH	308	960	1,304
Selling	kg/HH	670	2,952	7,824
Labor		Family labor	Family+hired	Family+hired
Land preparation		Man power	Man/buffalo	Buffalo
Use of Compound (15:5:5)	bag/HH	0.7	2.3	4.5
Use of Urea	bag/HH	0.8	2.5	4.5
Use of Compound (15:5:5)	kg/ha	144	144	158
Use of Urea	Kg/ha	329	313	317
Total cost of production	US\$/HH	155.6	1,034.0	1,830.0
Total cost of marketing	US\$/HH	35.4	141.6	330.4
Total Income	US\$/HH	510.0	2,040.0	4,760.0
Gross profit	US\$/HH	354.4	1,006.0	2,930.0
Net profit	US\$/HH	319.0	864.4	2,599.6

As shown in table, the average ginger cultivated area of poor HH is only 0.12 ha that is 12% of their total cultivated land. Regarding ownership of draught animal, they have no buffalo. Being small land area of ginger cultivation, family labors is mostly used. They use compound and urea fertilizer and the amount used is 144 kg/ha of compound and 329 kg/ha of urea.

The land ownership of rich HH is 3 times more than of the poor HH. Therefore, rich HH could keep longer fallow period may be more than 4 years, and they could select the cold soil for ginger cultivation. The majority of the ginger growers prefer cold soil, which means more fertile and more moisture, because of direct sunshine is reach only on afternoon.

Compared to cultivated area, the average ginger cultivated area of rich HH is 0.57 ha that is nearly 6 times larger than the ginger cultivated area of poor HH. In the regard to land preparation, hoeing on the steep slopes is very common for poor HH while well off ginger growers use buffalo for ploughing. When furrow is made with hoe, the depth of the furrow is about 15 cm only. If land preparation (ploughing) and furrowing are done with buffalo, it can make proper depth of furrow. Refer to literature, ginger gives high yield when planted at a depth of 30 cm.

Labor is needed at the time of land cleaning, land preparation, planting, weeding and harvesting; ginger cultivation is labor intensive. The ginger cultivated area of poor HH is too small (only 0.12 ha), they mostly used family labor. However, the well-off ginger growers used both family labors and hired labors.

Regarding fertilizer, buffalo dung is the main source of nutrient for the plant nutrition but it is mostly used for vegetable cultivation for poor HH. Only well of HH that own the buffalo use buffalo dung for ginger cultivation. As mentioned above table, it should be noticed that well off ginger growers used more compound fertilizer and urea fertilizer.

The productivity of the ginger may vary based on the years of fallow period, soil fertility of their land, affordability on use of draft cattle at ploughing and furrowing, availability of fertilizer use and amount of fertilizer application, proper use of good agriculture practices and skill use of sufficient labors at critical period of crop season.

11. Would be useful to give gender disaggregated data / information in all respects possible such as different actors/stakeholders and key informants consulted; roles and functions at different levels of value chains etc.

In the project area, ginger growers as well as traders, male mostly dominates the household. According to the findings of baseline survey, 81% of household head was found to be a male. It is seen that women are mainly involved in major activities related to the production of ginger such as planting, preparation of farmyard manure, weeding and harvesting. These activities require more labor and greater time involvement of women. The processing of ginger, i.e., cleaning, boiling and drying, is also mostly done by women, and is equally labor intensive and tedious as most of the activities are done manually.

The roles of men are prominent during land preparation and transportation activities. Men mostly have their role in pricing and they usually owe income from selling. However, decision on ginger cultivation is mostly done jointly. Depending upon the available resources, excluded and marginalized people are equally involved in ginger cultivation.

At traders' level, male are leading the trading activities, however, many firms have their own family members and hired labor as source of labor. More than 90% of the employees who are working for cleaning, sorting, grading and packaging are female.

There is not a clear-cut role defined in terms of access to resources between male and female. They seem to be involved equally while making decisions on cultivation and marketing. On the other hand, usually male gets control over the benefits, but most of the income/benefits go to the family basket for the welfare and need of the family members-that are jointly decided in majority of the cases.

Both men and women are in general not restricted while accessing the enabling factors at macro level as it could be reflected in terms of cultural settings, values and norms. General belief and value of male member's domination in accessing the enabling factors are slowly changing also in the favour of female members in the family, mainly at the household level.

Relation of stakeholders KII disaggregated by gender

Stakeholders	Total No of KKI	No. Female
Traders and Buyers	5	2
Authorities (DOA, FD)	5	2
Exporters	1	
Wholesalers and Retailers	3	
Research Centres	2	
Private companies	2	2
Processors (out of village area)	1	1
Networks	1	1
<b>TOTAL</b>	<b>20</b>	<b>8</b>

12. Major leverage point that would uplift the chain has not come out strongly. Where the project can hit to improve relationship and trust among producers, and between producers and traders/collectors. Strengthening vertical linkages part has been missing in the recommendation for ginger and touches to some extent for bamboo. It would be nice if we would know who are the other local actor engaged in promotion of ginger and bamboo (meso and macro level actor mapping)

Before 2000, there is no ginger export market in Myanmar<sup>14</sup> and ginger is cultivated only for domestic use. Ginger has been exported since 2001 and its export market is monopolized by traders who have good contact to Indian traders. The price of the ginger has been completely controlled by Indian traders for nearly one decade. Export market had just begun to take off in 2010, when it had a boom exporting 8,224 tons of ginger.

#### Ginger Export Volume (Tons)

Country	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
India	665	959	2,029	1,892	112	0	75	377	263	870
Bangladesh	1	70	96	36	0	0	0		0	51
Pakistan	0	0	576	4,347	1,623	225	0	2,912	136	6,247
China	17	0	20	52	21	0	0	70	504	1,041
Japan	0	308	556	8	5	7	2	35	7	5
Saudi Arabia	102	0	107	0	0	0	0	0	0	0
Singapore	0	14	121	259	0	19	0	0	0	0
Malaysia	108	15	41	123	208	5	16	0	0	10

Source: International Trade Centre

After 2010, many new traders and exporters have been involved with ginger trading. Most of them are middle age and educated. They may be potential stakeholders for strengthening vertical linkages. In order to improve relationship and trust among producers, and between producers and traders/collectors, project should facilitate to conduct the biannual workshops and stakeholders should be invited. During the workshop, ginger growers may get the chance to know the market requirement and price trend of ginger. Traders and exporters also get the opportunity to get direct contact to producers.

<sup>14</sup> AungSoe. If the population is 80 million.

13. Capacity building, enterprise development part is missing in action plan. Also institutional strengthening and governance aspect specific to our area has not be reflected in the action plan

Revised in the report

14. Possibility of engaging private sector could be explored. Are there any interested agribusinesses/spice factories interested to source ginger from target village with direct supply chain arrangement? Would it be possible to connect any souvenir shops/restaurants/construction company with our target village for supply of bamboo based products

Myanmar Belle Dehydrated Vegetable Factory is located at Wayonepin Village, Heho Township. They made contract farming with the more than 1000 cabbage producers from 15 villages. They provide the seeds, fertilizer and technology package to the farmers. During field visit, they expressed their interest to make the contract farming for dried ginger in future.

Fresco Farm, is also located in Heho. They have their own organic production selling directly to the supermarket chain City Mart in Yangon and delivery to home through vegetable box scheme. It could be discussed.

Green Hill is a project supporting Taunyo villages with organic agricultural training and also marketing organic production, which it is sold in a small shop in Yangon. Despite the linkages with Japan, there is no intention to export to Japan. Volume is really small for a market opportunity for the villages; however it could be discussed.

For bamboo, it would be necessary a specific market research to analyse which kind of bamboo product could have more opportunities in the tourist area of Inle Lake. Many retailers sell bamboo products; however it should be specifically analyse a selection of potential products, in order to have evidence that the production of those products could make a difference in the HH income.

## ANNEX 2: MULTIPURPOSE DRIER FACILITIES

At village level for the purpose of drying ginger, garlic, tomatoes, etc.

### MATERIALS:

Structure:

- Bamboo poles for the infrastructure
- Transparent plastic for the walls and roof of the green house
- Cement for the ground
- Digital thermometer with atmospheric humidity

*Optional*

- Fan
- Small solar system to operate the fan

Working structures:

1. Mesh trays for drying products:
  - Bamboo poles for the structure of the tables (legs and frame of top table)
  - Metal mesh for the top surface of the table(See design from Practical Action: [www.practicalaction.org/technology-to-preserve-food#article\\_downloads](http://www.practicalaction.org/technology-to-preserve-food#article_downloads))
2. For manipulating products
  - Bamboo tables
  - Smooth top surface for packing

### ADDITIONAL INFORMATION:

1. It is convenient a ventilation system, through:
  - a. Windows done with bamboo and the same transparent plastic
  - b. By installing the plastic walls in a way that can be rolled up
  - c. Solar fan
2. Tables at approximately 70- 80cm height; women can manipulate products in standing position or sitting in higher chairs
3. Hand washing system should be outside of the facility. The Tippy Tap system for example (used in Northern Shan) is very affordable, saves water and allows keeping hands clean as there is no need to touch a tap.



### ANNEX 3: BAMBOO SHOOT FACILITIES

At village level for the purpose of processing bamboo shoots during rainy season

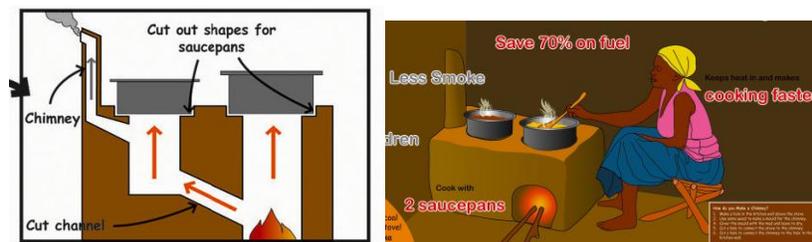
#### MATERIALS:

Structure of the Facility:

- Bamboo poles for the infrastructure
- Bamboo roof with canalizations and collection or raining water
- Bamboo mat panels (treated) for ceiling to keep hygienic conditions
- Rain water storage
- Plastic for walls with windows for ventilation
- Cement for the ground

Working infrastructures and equipment:

3. Energy Saving Stove for boiling the bamboo shoots. It can be constructed with bricks and cement. To save women time it would be convenient a big size. As it will be used during rainy season, it should be under roof area and with chimney. It can be built up by a mason or a skilled person.



4. Tables for manipulating products
  - Bamboo tables
  - Smooth top surface (for cutting and packing)
  - High chairs
5. Hand washing facilities. The Tippy Tap system allows keeping hands clean as there is no need to touch a tap. It could be adapted inside the facility with a basin pouring the water outside.



6. Ceramic Myanmar made water filters (optional). Can be purchased from ThistAid at a very affordable price.

7. Bamboo poles for the construction of basic shelves to storage kitchen materials, containers.

**ADDITIONAL INFORMATION:**

4. It is convenient a ventilation system, through:
  - a. Windows done with bamboo and the same transparent plastic
  - b. By installing the plastic walls in a way that can be rolled up
5. Tables at approximately 70- 80cm height; women can manipulate products in standing position or seating on high chairs, avoiding working near the floor to keep hygienic process
6. Top surface of the tables would be recommended of plastic easy to wash after use.
7. All measures in place to keep hygienic conditions.