Royal Government of Bhutan

Ministry of Agriculture and Forests

Department of Forests and Park Services

Social Forestry and Extension Division

Case study

Rural enterprise development of NWFPs

Wild harvest of Cymbopogon flexuosus and the distillation of lemon grass oil

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Foreword

The role of non-wood forest products in Bhutan has evolved over the years from subsistence to commercialization; from small scale, domestic use to items of trade and export. A good number of enterprises have risen in recent times, which utilize NWFPs in one form or another and have found markets internally as well as through export. Products such as essential oils, herbal teas, soaps, to name a few, are of NWFP origin, manufactured within Bhutan and entering competitive markets around the world. Rural communities have also had their capacities developed to apply basic processing techniques to their harvests to reap better returns than previously possible.

As these upcoming enterprises rely on mostly wild NWFPs at the moment, it is important that we understand the value chains that make up these products and reduce the pressure on natural resources; to ensure their sustainability in the long run. Required interventions must be learned in order to avoid depleting our resources and provide long term benefits to those in more disadvantaged parts of the country.

Regarding this, the Social Forestry & Extension Division has carried out case studies for various key non-wood forest products in order to better understand and highlight the constraints faced in sustainably managing and trading these, said NWFPs. These case studies were carried out though literature review, followed by primary data collection through interviews and focus group discussions with traders & harvesters in select areas of Bhutan and finally analysing these acquired data to come up with results and insights.

It is therefore my pleasure, to impart the knowledge gained through these extensive exercises so that the future of Bhutan's NWFP resources as well as NWFP based enterprises may be secured and significant strides may be taken towards achieving economic self-sufficiency.

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1. Introduction

Lemon grass grows naturally in the chir pine forests of the eastern Dzongkhags of Mongar, Luentshe, Trashigang and Trashiyangtse (Prommegger et al. 2005). It belongs to the family Poaceae (Gramineae), and the genus has about 55 species. Cymbopogon flexuosus, known as East Indian lemongrass, is the relevant species for commercial use in Bhutan.

Lemon grass is distilled to obtain lemon grass oil which contains an essential oil known as “citral”. Citral is of primary commercial value and has a wide range of applications in cosmetic, toiletry, perfumery, pharmaceutical and food industry. Lemon grass oil is highly valued in the international market and therefore is in considerable demand and is a widely sought commodity (Chhetri and Tenzin, 2012).

The distillation of lemon grass has become a major source of income for a number of rural communities in Eastern Bhutan (Peldon, 2017). Moreover, lemon grass has been identified as prioritized NWFPs in the category of medicinal and aromatic plant species with great potential in the export market (Tobgay, 2008).

2. Methodology

Firstly, a literature review was conducted on Cymbopogon flexuosus and the distillation of lemon grass oil in Bhutan. Secondly, primary data was collected through interviews with collectors of Cymbopogon flexuosus (wild harvest) and oil distillers in Dramedtse Gewog in Mongar. Interviews were conducted with members of the Community Forests (CFs) Dozam CF (6 women, 3 men) and Phuensum CF (6 women, 3 men) in Dramedtse.

Further, formal and informal discussions were held with a variety of stakeholders throughout Bhutan (e.g. Forestry Officials, Bio Bhutan, RAMCO, and others).

2.1. Study area

Lemon grass, which can be used for essential oils production, grows profusely under the chir pine stands. The lemon grass is an important natural resource for the people. Some of the crops grown are rice, maize, wheat, potato and vegetables. The major sources of cash income are vegetables and citrus fruits. Lemon grass also provides supplementary income to the people.

For the purpose of the case study, farmers of Gewogs Chaskar, Dramedtse & Thangrong in Mongar and Udzorong in Trashigang, who distilled (currently, in the past) lemon grass oil, members of the Community Forests where Lemon Grass was sourced from as well as members of the LG Co-operative were interviewed.

3. Results

3.1. Geographic distribution and species diversity

Lemon grass grows naturally in the chir pine forests of eastern Dzongkhags. Currently, it is collected and distilled into lemon grass oil in Chaskar, Dramedtse, Thangrong Gewogs in Mongar and Udzorong in Trashigang (Table 1).

Gewog	**CFs and lemon grass collection areas**
Chaskar, Mongar	CF Orphung and State Reserve Forest (SRF)
Dramedtse, Mongar	CF Phuensum and CF Dozam
Thangrong, Mongar	CF Panglem Ngarpentang Cherub and SRF
Udzorong, Trashigang	CF Bepam

Table 1: Wild harvest of lemon grass in Mongar and Trashigang

A major challenge is the occurrence of a second species of lemon grass known as Sofi species. The quality of lemon grass oil from Sofi species is, according to the interviewed, of inferior quality, however, at times mistakenly harvested for oil distillation.

3.2. Wild harvest

The distillers form groups of 5-6 people for the wild harvest of lemon grass. Interestingly, it is the distillers who decide who harvests lemon grass and not the CFs. The collectors of lemon grass are either paid a daily wage or their payment is based on the amount of lemon grass harvested (wage per drum load). The main season for the wild harvest of lemon grass is from July to October.

In the Phensum CF, the distillers paid daily wages to the collectors of lemon grass. Women were paid Nu. 400 per day, while men are paid Nu. 500 per day. The daily wage also includes breakfast, lunch and dinner for the collectors. In one day, 4-5 backloads of lemon grass can be collected by one person; for women of around 30-35kg and for men of around 40-50kg. In the Dozam CF the distillers are paid Nu. 400 per drum load. For one drum load, five women backloads or four men backloads are required. In one day, around five drum loads are collected. This also sums to a daily wage of around Nu. 500 per day.

In the Phensum CF, the distillers may engage up to 15 lemon grass collectors for the first month of distillation but only 5-6 collectors in the second and third months. In the Dozam CF, 3-4 collectors are collecting lemon grass for one distiller for up to two months. Normally, the lemon grass collectors are members of the respective CF, but sometimes also outsiders are hired by distillers for the wild harvest of lemon grass.

All interviewed CF members agreed, that the daily wage for the wild harvest of lemon grass is minimal. On the one hand, CF members argued that it is better to earn at least a minimal wage than staying home with no income. On the other, harvesting of lemon grass is also considered a sin by some; on the lemon grass there are many insects which are killed during the distillation process. Nevertheless, if the price for lemon grass oil would be higher, then better daily wages could be paid to collectors and more people would engage in wild harvest of lemon grass.

In addition, distillers may only employ experienced lemon grass collectors, as they are able to harvest more lemon grass in a day. The lemon grass is cut by using a traditional sickle and the imported saw sickle is not widely used, because of the danger to cut oneself. After harvest, the lemon grass is bound with ropes to the back and directly transported to the distillation site.

In practice, no systemic harvesting of lemon grass is conducted in the CF's area. Normally, lemon grass is collected around the respective distillation sites where collectors respect each other's traditional collection areas and boundaries.

The collectors of lemon grass apply sustainable harvesting guidelines. The collectors only harvest the immature and green stocks of lemon grass, but not mature and dried stocks. Usually, they collect all stocks in a spot if they are all still immature. The lemon grass is cut around 6 inches from the ground. In the Dozam CF, the interviewed members are annually briefed by Bio Bhutan on sustainable harvesting guidelines.

Based on the experiences of the interviewed, there is a good regeneration of lemon grass, if it is harvested annually. Furthermore, the collection of lemon grass helps to reduce forest fires (removing the fuel) and the growth of chir pine is also improved.

Pictured below, Distiller has set up a unit near a river to take advantage of the constant flowing water as well as the road for steady supply of raw materials

The biggest challenge in the management of lemon grass resources are invasive weed species such as Chromolaena odorata. Lemon grass resources are decreasing because of increasing weed species in the CF areas. In earlier years, it was possible to harvest lemon grass from within a 6m radius, but today, the radius of lemon grass has decreased to around 2m according to interviewed members. So far, the CFs did not undertake specific management practices to get rid of the weed species. However, while harvesting lemon grass also these invasive weed species are cut.

Finally, interviewed members also noted that after forest fires lemon grass grows better, as there is less competition by invasive weed species.

3.3. Processing and value addition

In Phensum CF there are currently four active distillers, whereas one distiller formed a distiller group. Of the interviewed members, one woman was identified as individual distiller and two men as members of a distiller group of total three members. In Dozam CF there are currently six active distillers; five are CF members and one distiller is from a neighbouring Gewog.

In both CFs, there used to be more distillers in the past; in Phensum CF 20 distillers and Dozam CF 18 distillers, respectively. The distillers were not able to pay the wages of lemon grass collectors while remaining profitable in business, as the price for lemon grass was too low. All the interviewed (including former) distillers argued, that if the price for lemon grass oil would be higher, they could pay higher wages and thus make the collection of lemon grass more attractive. Other reasons for the decrease in the number of distillers are to be found in the access and supply of water and firewood which are used for distillation of lemon grass oil.

Out of four distillers in Phensum CF, two distillers owned their own distillation drums, whereas two distillers rented drums from other CF members. The distillation drums were mostly purchased during the Essential Oil Development (EOD) programme for around Nu. 38’000 and are still available in both CFs. The price to rent a distillation drum ranges from Nu. 3000-5000 per season, depending on the duration of distillation.

The first step before starting distillation of lemon grass oil is the identification of a suitable distillation site. The main criterion for selection is the availability of water. For example, one drum owner of Phensum CF gave up distillation of lemon grass oil, as no distillation site near the house with supply of water could be identified. A drum owner of CF Dozam stopped distillation of lemon grass after buying 40 bundles of water pipe but not being able to turn a profit with the distillation of lemon grass oil. The group of distillers from Phensum CF set up their distillation site near the Mongar-Trashigang national highway. This was in many ways turned for the better as the group could, for example, bring the required firewood by vehicle to the distillation site and also market their produce on the road side.

In CF Phensum, first the distillation site is identified and reserved by the distiller, then the permit from the CF for the distillation of lemon grass oil is

obtained. In CF Dozam a suitable distillation site is identified in discussion with the chairperson after obtaining the permit from the CF for the distillation of lemon grass oil. In both CFs, the distillers pay a royalty of Nu. 1500 per drum and year, and outsiders Nu. 2000 per drum and year.

The distillation of lemon grass includes the following steps:

1. Identify distillation site, main criteria is access to water. Some distillers may also arrange around 9-10 bundles of water pipe.

2. Set up the distillation site and install the distillation drum(s)

3. Arrange the firewood at the distillation site

4. Continuous collection of lemon grass. Normally, lemon grass is not stored but directly used in the distillation process. The set up a temporary sheet for the collected lemon grass is, however, important, as the distillation process takes place during monsoon.

5. Continuous distillation of lemon grass; 30-35 litres of water are filled in the distillation drum together with the lemon grass. The distillation of lemon grass starts after the drum has been heated over fire for around 24 hours. Every three hours new water and lemon grass is added to the drum. One full drum gives around 1 litre of lemon grass oil, thus around 1 litre of lemon grass oil is produce every three hours.

For the distillation of lemon grass oil, the distillers depend on help being a continuous process; during day time one person can manage the distillation process, in the night two persons are needed in shifts. Some distillers have help from family members, others relay on helpers based on a daily wage of Nu. 400 per day/night.

Pictured above, Demonstration of extracting lemon grass oil using a distillation drum.

3.2.1. Firewood

For lemon grass distillation substantial amounts of firewood are required. So far, distillers of lemon grass were only allowed to collect dead/fallen trees in the CF's area. The collection of firewood is thus critical for the distillation of lemon grass oil.

The amount of firewood required was approximately three truckloads per season. The distillers did not buy until today firewood from outside their CF. However, the distillers were only able to distil lemon grass oil as long as firewood was available. Some distillers also employed labourers for the collection of firewood. Normally, firewood collectors are paid Nu. 400 per day. In addition, the transportation of firewood to the distillation sites is a challenge for the distillers. Few distillation sites were near the road and firewood could be brought to the site by vehicle. To the other distillation sites, in the forest, firewood had to be carried by manpower.

With the inclusion of timber and firewood harvesting in the revised CF Management Plans, the availability of firewood will increase. Both CFs in Dramedtse envisage firewood rights of three standing trees per household, based on a royalty of Nu. 40 per standing tree.

In the CF Phensum, one distiller obtained 80 kg of lemon grass oil. The group of three men distilled in total 320 kg of lemon grass oil. In the CF Dozam, the three interviewed distillers have produced 190 kg (two months), 173 kg (one and a half month) and 44 kg (one month), respectively. In average, around 1.2 kg of lemon grass oil refers to approximately 1 litre of lemon grass oil.

3.4. Product diversification

Not much product diversification is done by the farmers as they lack capacity to create finished products. Most, if not all of their production of lemon grass oil is sold to Bio Bhutan. A few trainings had previously been given to farmers in the co-operative to produce lemon grass based soap, however as the co-operative has been dissolved as of this moment, production has stopped.

3.5. Marketing

Most of the lemon grass oil is sold directly to Bio Bhutan. Bio Bhutan pays Nu. 1300 per kg of lemon grass oil. The lemon grass oil is transported by the distiller to the selling point at Serichu, Mongar from where it is sold to Bio Bhutan. The distillers fill their lemon grass oil in containers, bought from the market in Trashigang for Nu. 300-400 per container. Bio Bhutan, however, uses its own containers and lemon grass oil is refilled into their containers at Serichu. Bio Bhutan pays to distillers on the site and in cash. In addition, Bio Bhutan provides an advance of Nu. 10’000 to distillers and also provides water pipes at Nu. 800 per pipe (instead of Nu. 3000).

Normally, the whole production of lemon grass oil is sold to Bio Bhutan. The distiller group from CF Phensum sold 238 kg to Bio Bhutan, however, 82 kg of lemon grass oil directly at the road site near their distillation unit. The price at the road site is Nu. 2000 per litre of lemon grass oil. Around 50-60 customers bought 1-2 litres of lemon grass oil while on route. The lemon grass oil is sold in 1 litre mineral water bottles. According to the distiller group, the buyers included predominately people from the tourism industry.

Most of the interviewed have limited knowledge for what lemon grass oil is used, where Bio Bhutan sells its products and at what prices. They solely know that lemon grass oil is used as perfume, soap and to apply to the skin.

The production of lemon grass oil is labour intensive; however, it provides an important contribution to household’s income. In average, the share of

income from lemon grass oil accounted to 25-50% of household's total income. As the distillers don't necessarily do record keeping, this information has to be dealt with precaution. The main income in Dramedtse Gewog is from potato, followed by orange, vegetables, maize and poultry.

1.3.1. Organic certification for Bio Bhutan

Members of CF Phensum had very limited knowledge on organic certification of lemon grass oil. According to them, there was so far no monitoring or organic controlling in their CF area. In contrast, members of CF Dozam explained that once a year some foreigners come to interview the chairperson and do some monitoring and field evaluation for organic certification.

Interestingly, only CF Dozam has been certified as organic. Bio Bhutan also sources lemon grass oil from CFs without organic certificate. On the one hand, CF Dozam expects some incentives from Bio Bhutan from their organic certification. On the other hand, group members don't want to complain, as without Bio Bhutan their product would not be marketed.

1.3.2. Cooperative of lemon grass

So far, only owners of drums were members of the lemon grass cooperative and not necessarily the distillers of lemon grass oil. The membership was voluntarily, and the membership fee Nu. 500 per year. All the interviewed members of the lemon grass cooperative confirmed, that they rarely met and that they were not aware how their membership fee was used nor about management activities of the cooperative. Before, the lemon grass oil used to be sold also to the cooperative for the production of soaps and other value-added products. However, the cooperative was dissolved and is currently not operational.

According to RAMCO, the cooperative of lemon grass was suspended in 2017. For 4-5 years the cooperative was not functioning well. The main issue was the loss of trust among members due to mismanagement, poor governance and financial issues. With help of RAMCO the cooperative should be revised soon. A meeting was planned for January 2019.

3.6. NWFPs Management Groups

The CF Dozam was formed in 1997 as the first CF in Bhutan. Originally, degraded land was handed over the CF with the main aim to rehabilitated and conserve natural resources for future generations. Today, the members of CF Dozam harvest lemon grass (Cymbopogon flexuosus) and amla (Phyllanthus emblica) for income generation. In its revised Management Plan, CF Dozam is planning to also include timber and firewood harvesting for subsistence.

The CF Phensum was formed in 2008. The CF was established for community-based natural resource management of lemon grass resources. In the last revision of the its Management Plan, CF Phensum also included timber and firewood harvesting for subsistence.

4. Discussion

i. Occurrence and wild collection

Cymbopogon flexuosus is found over large areas in the eastern Dzongkhags. It is a characteristic species in chir pine forests, especially on sandy or gravelly, sloping areas (FAO, 1996). Chir pine forests are found in the deeper dry valleys of Bhutan at an altitude range of 900-1800masl (DoFPS, -). Cymbopogon flexuosus grows in dense clumps up to 2 meters in diameter and has leaves up to 1 meter long (Prommegger et al. 2005).

Table 1: Non-exhaustive list of lemon grass occurrence in Bhutan

Dzongkhag	**Gewog**	**Source**
Luentshe	Tsengkhar	Tobgay, 2008
Mongar	Chali, Chaskar, Dramedtse, Drepong, Kengkhar, Mongar, Narang, Ngarshang, Saling, Tsakaling, Tsamang	Tobgay, 2008
Pemagatshel	Shummar, Zobel	Tobgay, 2008
Trashigang	Udzorong, Bartsham, Yangneer, Khaling	Tobgay, 2008
Trashiyangtse	Ramjar, Tongzhang	BIOC, 2015
Punakha	Talo	Tobgay, 2008
Tsirang	Patala	Tobgay, 2008
Wangdue	Nahi	Tobgay, 2008

The growth and biomass production of Cymbopogon flexuosus are more important where the crown density of chir pine is low. The economic life of Cymbopogon flexuosus is about 8 to 10 years. According to research data, the oil yield from 1ha of Cymbopogon flexuosus area in the wild is up to 9kg (Prommegger et al. 2005).

While the local people believe that forest fires stimulate the growth of Cymbopogon flexuosus, research findings indicate that they favor the growth of weeds such as Lantana spp. and Stipa spp. leading to declining yields of Cymbopogon flexuosus (Yangzom et al., 2008). Recent research indicates that prescribed burning maximizes the short-term return from Cymbopogon flexuosus distillation but may lead to a decline of Cymbopogon flexuosus and dominance of competitors in the long term. Thus, research advices to not use prescribed burning frequently and avoid it on open sites with Chromolaena odorata present (Darabant et al., 2017).

However, forest fires lead to an acceleration of the decline of the firewood resources required for the distillation process of Cymbopogon flexuosus. Firewood is sourced through the collection of chir pine and broad-leaved trees based on issued permits, or through supplies from Forest Management Units. Moreover. The CFs Management Plans have led to a reduction of both disputes as well as forest fires in the Cymbopogon flexuosus regions (Yangzom et al., 2008).

Cymbopogon flexuosus has to be harvested just before the grass flowers and according to following guidelines (DFES, 2011):

- Collect Cymbopogon flexuosus at maximum 2 times per year.
- Cut the grass at a height of 20 cm.
- Leave at least 3 to 4 flower stalks / tillers per entire clump.

ii. Processing and value addition

It is important to note that Bhutan is an exceptional case where lemongrass is collected from the wild for the production of essential oil, thus has an added advantage of being organic in nature (Peldon, 2017).

ii.a History of lemon grass distillation

Initiated in 1981 by a private firm, Bhutan Aromatic & Phytochemicals, an affiliate of Tashi Commercial Corporation, and later supported by the Ministry of Economic Affairs through the Essential Oil Development

Programme (EODP), the industry produced 115 tons of lemongrass oil from 1998 to 2007 and is the first example of the industrial use of NWFPs in Bhutan (Yangzom et al. 2008). The company operated a big distillation unit in Kurizampa and supplied a large number of smaller distillation units to the farmers of Mongar, Trashigang and Luentshe Dzongkhags. In 1990 the FAO-supported project "Production of Essential Oils by Small Holders in Remote Areas" was operationalized and two essential oil distilleries were established at Pakhadrang (Mongar District) and Lungtenzampa (Trashigang District). In 2003, Tashi Industries Corporation quitted lemon grass business temporarily, therefore 270 active mild steel units were not operated any longer (Prommegger et al. 2005).

The Dozam CF Management Group in Dramedtse Gewog, Mongar was the first community forest approved and handed over to the community in 1997 for the sustainable management of lemon grass resources (Peldon, 2017). The already available management plan and resource assessment, the by-laws, the excellent community organization in Dozam CF and the interest of the distiller group provided an ideal platform for the Bio Bhutan enterprise to venture into the organic certification of lemongrass oil. Bio Bhutan is a pioneer enterprise that produces and markets natural and organic certified products from Bhutan since 2005 (Yangzom et al., 2008).

The Dozam CF is a member of the established Lemon Grass Cooperative. The Lemon Grass Cooperative was initially formed in 2007 with the support from EODP. In 2011, the Lemon Grass Oil Primary Cooperative was registered under the Cooperative Act of Bhutan, 2009. The Lemon Grass Oil Primary Cooperative is located at Serichu village, Dramedtse Gewog, Mongar. In Dramedtse gewog there are 429 households out of which 64 households (60 male and 4 female) are involved in the cooperative's business (DAMC, -).

ii.b. Lemon grass oil

Lemon grass contains citral, its major constituent. It is used in the perfume, soap and cosmetics industries. Lemon grass also forms the starting material in the manufacture of synthetic Vitamin A. It is also used in pharmaceutical preparations, such as pain balm, disinfectants, and mosquito-repellent creams. The oil quality of lemongrass is judged by its citral content and its solubility in alcohol. It bears reddish-yellow to reddish-brown colour, with strong, lemon odour properties (FAO, 1996).

Essential lemon grass oil can be used to produce multiple products for bath, skin care, body care, shower gel, bathing bars, home fragrances and in aromatherapy. Alternatives arrangements; domestic market or niche markets within the country must be created to export lemongrass oil (BIOC, 2015).

ii.c. Lemon grass distillation

The cost of production of lemon grass oil is calculated based on costs per kg of oil. The total labor cost for the distillation of one kilogram of lemon grass oil was estimated at Nu. 371 (2007), including the depreciation of the distillation unit, operating costs including wage rates of operators, grass and firewood collectors, and the purchase of firewood for distillers located at the roadside (Yangzom et al., 2008).

Moreover, only owners of distillation units that are located away from the road are allowed to collect firewood within the CF. Distillers located next to the road are required to purchase firewood from allotted Forest Management Units. One truckload comprising twelve cubic meters, or 3 to 4 tons of wood, costs approximately Nu. 4000 and is sufficient to distill between 30 to 40 kg of lemongrass oil (Yangzom et al., 2008).

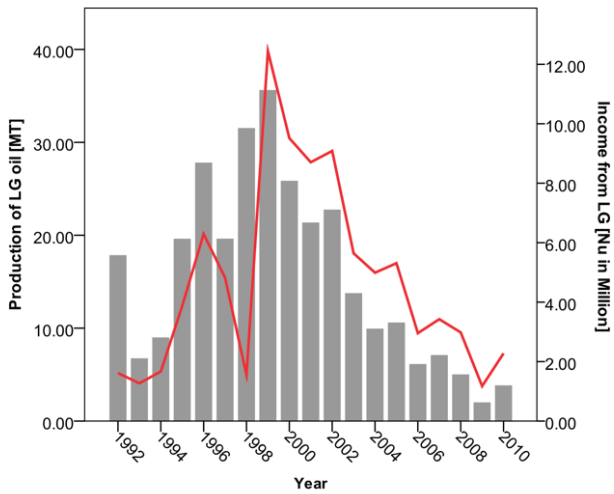

Figure 1: Production of lemon grass [MT] and income gross generated [Nu in million] in eastern Bhutan (source: Chhetri and Tenzin, 2012)

Since 2006, farmers are paid Nu. 600 (=USD 13.2) per kilogram of organic lemon grass oil. This premium price is approximately 20% above the price paid for conventional oil. In 2009, price paid by Bio Bhutan for organic certified the oil remained at Nu. 600 despite problems with the international demand due to the global recession and the consequent lower demand (Krug, -).

In 2007, five distillers in a total CF area of 358 hectares (the Dozam CF represents 0.7% of the potential area of 50,000 hectares of chir pine forests with associated lemongrass in the Eastern districts) produced 1.2 tons of lemon grass oil, which accounted for 14% of the average production of 8.9 tons in 2007 (Yangzom et al., 2008).

The annual production by the Lemon Grass Oil Primary Cooperative was in 2012 5244.5 liters lemon grass oil. The income generated from the sale of lemon grass oil was Nu. 3,933,375. The sale of lemon grass oil increased when Bio Bhutan started exporting it to Vossen & Co, a Belgian company specialized in trading essential oils. This resulted in the export of about 5.5 tons of lemon grass oil to the Belgian company between 2007 and 2010. Unfortunately, due to the European economic crisis, the company stopped ordering more oil (iBEST, 2017).

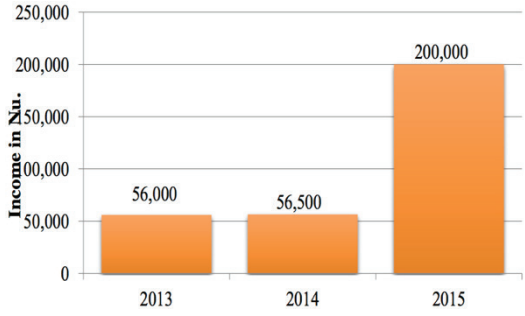

Figure 2: Income generated in Nu. from lemon grass from 2013-2015 (Peldon, 2017)

The market based organic certification scheme for lemongrass was introduced to improve the resource management, processing of lemongrass oil and opening access to export markets. Figure 2 shows the income earned from lemongrass oil for the year 2013-2015 (Peldon, 2017).

3. Marketing

Attractive payment schemes of Bio Bhutan, including advance payments of Nu. 20,000 per distiller at the beginning of the distillation season, a higher price of Nu. 600 in comparison to Nu. 550 and Nu. 531 per kg lemon grass oil, and the cash down payments at the time of delivery have encouraged the CFs distillers to opt for organic management practices. The seasonal income of distillers of the organic management group was in the range of Nu. 32,000 in comparison to Nu. 9,300 for the distillers of the conventional group (Yangzom et al., 2008).

However, the seasonal income earned by the individuals (operators, grass and firewood collectors) is low given the hard work of often 11 to 12 hours a day and reflects an imbalance of benefit shares for the stakeholders. This is of even more concern in regard to female workers. In comparison to male collectors, they must compensate for the lower weight carried per backload through an increased frequency of trips from the grass collection site to the distillation unit. Yet, the lack of other income opportunities, especially for women who have to attend to their families, obliges them to abide by the current payment system. (Yangzom et al., 2008).

In 2005, reported lemongrass oil distillation industry created about 900 to 1300 jobs in about three months especially in four eastern districts. The study also showed that about 30% of the total share of the income of the farmers was from lemon grass distillation industries which were 12 % of the total work share. The study also found that 70.6% of the total work forces were women. The study also reported that the distillation unit owners earned between Nu 20,000 up to Nu. 120,000 annually. Currently, there was declined in lemon grass oil production the decline may have been attributed to availability of off farms jobs to farmers in various development projects (Chhetri and Tenzin, 2012).

In 2009, twenty distillers were actively distilling lemon grass oil with the collaboration of grass collectors, firewood collectors and drum operators. thus, the industry employed 234 people, and the total production of organic oil reached 2 tons. The introduction of organic certification has a direct impact on income generation of rural households engaged in the distillation of essential oils, and the industry generated US$14 400 (profit share of US$3.6 x 2 tons of production) for 234 people (Krug, -).

Bio Bhutan has opened niche markets in Asia, Europe and the United States worth US$150 000 and sold organic lemon grass oil at CIF26 rates of US$20-23 per kg of oil. The higher price offered for organic certified oil from wild collection made it possible to increase the profit of organic distillers to US$3.6 per kg with a 30% profit, as compared to US$2.4 per kg with a 13% profit for conventional distillers (Krug, -).

In 2015, Kuensel reported that distillers extract about 80 liters of lemon grass oil (4 liters of lemon grass oil in 24 hours), of which 50 liters were sold directly to Sanam Phendey Tshogpa? and an income of about Nu. 45'000 was earned. Moreover, an additional Nu. 50,000 could be earned at the site by selling lemon grass oil to commuters along the highway. Nevertheless, with the overhead cost, there was not much profit from the business. A challenge is the difficulty in getting helpers or workers especially during the transplantation and harvest seasons with most farmers busy in the fields. Helpers in the distillery were paid Nu 500/24 hours, lemon grass collectors Nu 250/10 hours. The Lemon Grass Oil Cooperatives recorded about 170 members from Trashiyangtse, Trashigang, Luentshe and Mongar and produced more than 14 metric tons of lemon grass oil, however, the cooperative is seeing a drop in its members from Trashiyangtse (Kuensel, 2017).

In 2018, an increase in the price of lemon grass oil has helped to revive oil extraction business in Mongar. A kilogram of lemon grass oil fetched Nu 1,300, which is higher by Nu 200 from the earlier price. Some distillers stared again after they stopped distillation for two to three years as it was not profitable. Oil extraction was reported difficult, as firewood is needed and distillers have to go far to fetch water. However, Bio Bhutan supports distillers with cash advance and on cost sharing basis for materials and they buy whatever distillers produce. A major challenge remains to get workers to cut the grasses (BSS, 2018).

According to Department of Forests and Park Services, in 2016, a total of 2360 litres of lemon grass oil was supplied and Nu. 1475 Royalty revenue generated (DoFPS 2016). In 2017, 319 litres of lemon grass oil was supplied and a Royalty of Nu. 1595 generated (DoFPS, 2017; NSB, 2018). However, Bhutan have imported essential oils and resinoids; perfumery, cosmetic or toilet preparation worth of Nu. 388,133,873 (388 million), thus Bhutan export is very less as compare to imports. (iBEST, 2017)

5. References

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