Essential oil production contributing to climate resilience in Nepal

Producer organization: Laliguras Herbal Women Group

Nepal - Climate Resilience Case Study No. 6

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Forest and Farm Facility

Adhikari, A., Shah, R. and Poudyal, A. (2020) Essential oil production contributing to climate resilience. IUCN, Kathmandu, Nepal and IIED, London, UK.

Acknowledgements
This case study was commissioned using a template prepared by the International Institute for Environment and Development (IIED) financed by the Forest and Farm Facility (FFF) a co-management partnership between FAO, IUCN, IIED and Agricord. The FFF is supported by the governments of Sweden, Finland, Germany, Norway, the Netherlands, the European Union, and the United States of America. The case study has been reviewed by Duncan Macqueen IIED and revised by the author and laid out by Geraldine Warren of IIED.

The authors expresses sincere gratitude to: IIED, UK; all the people who supported the preparation of this case study in spite of the lockdown because of COVID-19 pandemic situation; Dr Prahlad Thapa, Country Representative and Mr. Sharad Adhikari, Finance Officer, IUCN Nepal Country Office for encouragement, technical guidance and support and co-operation; all key informants and members from Chisapani CFUG, Chisapani CCHPI members and LHWG members for their commendable works and for sharing valuable information and their experiences; Dr Narendra Man Babu Pradhan, Programme Coordinator, IUCN Nepal Country Office, and Mr. Janak Acharya, Programme Officer, FECOFUN for their excellent coordination role; and finally, to the community people from Bardaghat Municipality, Sarawal and Palinandan Rural Municipalities involved in this FFPO and its climate resilient business model.

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EXECUTIVE SUMMARY

Within the Chisapani Community Forest Users Group (CFUG), the Laliguras Herbal Women Group (LHWG) run a small-scale enterprise for processing herbal plants and extraction of essential oil called Chisapani Community Herbal Processing Industry (CCHPI). This small-scale business model was initially established to achieve the dual goals of economic benefits and sustainable management of forest resources including underutilized forest land. The enterprise focused on the marginalized, disadvantaged and most vulnerable members of the community by providing them opportunity to become managers of the small-scale enterprise and ensuring direct livelihood benefits to them.

Climate change has begun to affect the livelihoods of farmers in communities such as Chisapani, bringing more variable rainfall, extreme weather events (both storms and floods and droughts), and related crop failures, pests, and diseases. In this context, enterprises such as CCHPI have become increasingly important as a source of climate resilience, and have themselves had to build climate resilience, which has involved diversification of the natural resource base (more aromatic plant options), the economic business propositions (hiring out distillation equipment and investing in new business ventures), and the social support networks (new partnerships and customers).

In terms of the ecological resource base, this was expanded from its original location in what was technically forest land, to include also farming land, and then farming land of different agro-ecological types. This helped in ensuring production of diversified resources and products tapping into different production characteristics of different ecological sites. Then, the enterprise also increases their production options by incorporating alternative species, which started from Patchouli cultivation and later expanded to Citronella, Chamomile, Lemongrass, Mentha, Palmarosa and Wild turmeric.

As regard the economic model, the enterprise initially ran with only one distillation plant. But this was later scaled up to incorporate two additional plants, which provided more opportunities for operating CFUGs by providing distillation facilities to other producers from neighbouring CFUGs to use the plant upon paying a utilization fee. At the broader level of the CFUG, the successful enterprise model has now also been copied with the formation of other enterprise groups which enhance climate resilient livelihoods by incorporating other climate resilient practices in their CF. Among the broader memberships of the CFUG there are now groups pursuing sustainable tourism, fish farming, renewable energy, scientific forest management, conservation and management of wetland and prohibition of haphazard mining.

In terms of diversified social networks, the group also extended their reach. They facilitated linkages between expanded producers and vendors and buyers, thereby also increasing their network and capacity on negotiation. Their reaching out to neighbouring communities increased their financial return by making more efficient use of their distillation plants. This has generated co-benefits by providing year-round employment opportunities to two staff members, empowering them economically and making them more resilient. The LHWG and hosting CFUG also extended advisory and capacity building services in peer learning activities sharing their learning and experiences in essential oil production and its potential resilient business options in the region, often in collaboration with Divisional Forest Authorities.

As a result of these diversification strategies, the LHWG enterprise provides resilient livelihood options to the most vulnerable groups among CF members, demonstrating a case of climate resilient sustainable business model.

1. INTRODUCTION

The global climate is now changing fast. Forest loss is a major factor contributing to this change. But climate change is also now causing forest loss, through droughts, fires, pest, and disease outbreaks. However, there exist huge knowledge gaps in understanding of climate resilience amongst people whose life and livelihood revolve around forest landscapes. In an FFF knowledge demand survey of 41 FFPOs in six countries, demand for knowledge on 'climate resilience' was the top priority. The 1.5 billion smallholder farmers of the world are the most vulnerable to climate change. But they are also uniquely placed to help do something about it. Lessons derived from different global interventions indicate that building diverse business models could contribute to building climate resilience. Additionally, the important co-benefits of these intervention help to soak up more carbon to mitigate further climate change.

This case study is funded by the International Institute for Environment and Development (IIED) through second phase of Forest and Farm Facility (FFF) programme as part of the preparation for upcoming international conference in the context of the UN decade of Family Farming on "Inclusive business models investing in diversification for climate resilience" at Hanoi, Vietnam. The FFF programme helps to organize and empower Forest and Farm Producer Organisations (FFPOs). FFF believes FFPOs to be the "missing links" that are needed to translate Sustainable Development Goals (SDGs) and nationally determined contributions (NDCs) on climate into practice.

The FFF focus is in ensuring a more pronounced role of FFPOs in landscape level mitigation and adaptation. FFPOs offer particular advantages for building local climate resilience because of their inherent diversity: in what their smallholder members' plant (agro-ecological diversity), the multiple value chains that result (economic diversity), and the potential social inclusion and social networks they develop (social diversity). FFPO businesses embody greater diversity and equity, pursuing market opportunities for a diverse basket of their members' products. Rather than focus on profit maximisation alone, they have a wide set of environmental, social, and economic goals. Nurturing diversity is fundamental for building resilience in social–ecological systems and is an important and effective climate change adaptation strategy for agriculture and managed forests (Hou-Jones and Macqueen, 2019).

1.1 NAME AND VISION

A women's group comprising 16 members, each of whom are already members of the Chisapani Community Forest Users Group (CFUG), are known as the Laliguras Herbal Women Group (LHWG). LHWG run a small-scale enterprise for processing herbal plants and extraction of essential oil called Chisapani Community Herbal Processing Industry (CCHPI).

Among the 16 women members, four are landless and rest of the members have small areas of farmland ranging from 0.01-0.06 ha including the land occupied by their house and home gardens. The land left for production is relatively small and they only grow some vegetables in their home gardens. But their land does not allow to produce medicinal and aromatic plants (MAPs) and so the women must lease land for MAPs farming.

The registration of group businesses depending on community forest resources is still challenging in Nepal so the CCHPI business is not legally registered. The enterprise was established with the following objectives.

- to cultivate herbs such as Chamomile, Mentha, Lemongrass, Citronella, Palmarosa, Eucalyptus, Curry plant etc. in unused, barren and degraded land of Community Forests (CF) and private lands and produce aromatic essential oils, different types of Ayurvedic medicines, ashes and beauty products including soap, perfume etc. from these different types of herbs.
- to market and distribute these products within and outside the country by or through various dealers, sub-dealers or agents and bring foreign currency in the country.

The vision of the business is to conserve and sustainably manage the forest, environment and biodiversity including and especially unused barren forest land within the CF and providing employment opportunities to improve the livelihoods of the poor, Dalits and disadvantaged groups of people have developed a special program of herbs cultivation, harvesting and distillation of medicinal

and aromatic oil while also rehabilitating the forest and preventing encroachment of CF land by land grabbers.

1.2 LOCATION

The business is located inside the Chisapani CF i.e. Bardaghat Municipality. The Chisapani CF lies in the Nawalparasi district covering Bardaghat Rural Municipality (RM) five wards, Sarawal RM two wards and Palinandan RM one ward. The total area of the Chisapani CF is 495.76 ha (it was initially established with 160 ha and later in 2016 a further 335.76 ha of land was handed over).

The forest is concentrated on the Northern part from the East-West highway up to the foothill of the Churia. The settlement ranges from the Southern part from the forest up to 18 km far, all the way to the Indian border. The CF is bordered by Chisapani and Mainachaur River in the east, London Bridge and Alawal, Kamero and Birta River in the west, Jalkumbhi River in the north and Mahendra highway in the south. The forest type is natural sal forest but both natural and planted species can be found here. The forest vegetation cover comprises of roughly 70 per cent of natural Sal (*Shorea robusta*) forest with significant number of trees, poles, and saplings in addition to a moist deciduous vegetation type of the Terai region. After the sal the dominant forest species are Asna (*Terminalia tomantosa*), Jamun and Sisoo (*Dalbergia sissoo*) (planted).

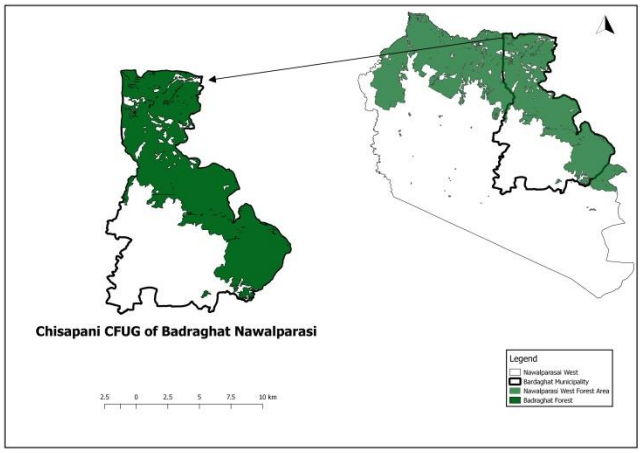


Figure 1: Map of Chisapani CFUG

To run the essential oil business, the women group cultivated perennial grass species (Lemongrass, Citronella, Palmarosa, Chamomile) in the unused and degraded forest land and seasonal species (Mentha) on private land. The land that is used for perennial grass species is provided by CFUG to the women's group without any charges. The private land is under lease agreement for each season for which the group must pay USD 123 per hectare for each season. The current available resources are still insufficient with respect to the oil extraction capacity of the group's distillation plants.

1.3 FOUNDATION AND MEMBERSHIP

The Chisapani CF was established in the year 1997 with the objective of protecting and conserving forest resources by custodian communities. The CF was formally registered and handed over to the user groups in the year 2009. The (then) District Forest Office (DFO) of Nawalparasi District registered and approved the constitution of the Community Forest Users Group (CFUG). The total number of households in the CF is 3,350 with the total population of 18,550 including 9,421 males and 9,129 females. Ethnic groups include mainly *Adibasi* (Tharu), *Janajati* (Gurungs, Magars, Newars), *Dalits* (Disadvantaged and socially excluded) and *Terai* basi all residing in the area. The CFUG Executive Committee (EC) consists of 27 members out of which nine are women. The committee members are representative from various castes and ethnic groups like *Brahmins, Chhetris, Adibasi, Janajati, Dalits and Terai basi* etc.

At its formal registration in 2009, most of the forest land had been encroached by the people causing degradation of forest and its resources. To rehabilitate and protect the degraded forest land the CFUG started exploring opportunities to motivate more sustainable management based on income generation. In the year 2013 AD, a private company named Chaudhary Biosys Nepal Pvt. Ltd. (CBNPL) proposed supporting the CFUGs with investment in initiating the micro enterprise which potentially would create employment and income generation opportunities for the poor members of CFUG and rehabilitate the forest through plantation of herb i.e. Patchouli (*Pogostemom cablin*). The CFUG accepted the proposal and the CBNPL started producing Patchouli by leasing the 10 ha of unused, barren forest land. Initially the company paid for the lease as they came there to make

business, but when the company eventually left, the LHWG members did not have to pay because they formed from within the CFUG.

The CBNPL company initially engaged poor and marginal women to work as daily wage-labour in the different activities of herb production. During the time of Patchouli cultivation, the company also helped the women to form a nine member, socially inclusive, women business group. The women group was then capacitated in business development and management including cultivation, harvesting, processing, packaging, marketing of the product and networking with national and international traders. The group was divided into three subgroups and each group was allocated 3.3 ha of land for herb cultivation. A set of distillation units with vessels, condensers, boilers, and receivers were also installed and handed over to CFUG by CBNPL for patchouli processing. The goal was to create employment and direct income opportunities for very poor women.

Later, the women's group (now called the Laliguras Herbal Women Group – LHWG) was expanded to include 16 members. In collaboration with the company the group started a plantation of herbs in an expanded area (40 ha) for which no lease had to be paid because it fell within the CFUG. The group added more species of aromatic plants i.e. Lemongrass, Palmarosa, Chamomile and Citronella. Initially, CBNPL assured the group with a buy back guarantee for their products. In this way, a small-scale group enterprise was initiated by CFUG in collaboration with private company.

As the group developed, the initiative was later supported by a national program called the Livelihood Forest Program (LFP) through their Interim Forest Project (IFP) for strengthening of enterprise. IFP provided an investment of NRs US$ 2450. The grant fund was provided to the CF. Followed by this support, the organisation International Development Enterprises (IDE) Nepal supported matching funding of a further US$ 1225 to supplement a CFUG investment of about US$ 5725 for the establishment of distillation plants. Furthermore, CBNPL contributed US$ 18000 to buy one mobile distillation unit set with the capacity of processing 1200 Kg of raw materials per year. Different organizations including Wildlife Conservation Nepal (WCN) further supported by building the capacity of LHWG including towards organic certification of their products.

By 2020, 85 ha of unused and barren forest land within the Chisapani CF was planted with different herb species i.e. Palmarosa, Patchouli, Lemongrass, Citronella, wild turmeric and different grass species such as Stylo, Napier, Broom grass etc. by the women's group. Membership rose at one time to 62 but then declined again – with labour being met through daily wage labour agreements. In the year 2016 the company CBNPL left the area. The producer groups then built a collaboration with another private company named Himalayan Bio Trade Pvt. Ltd. (HBTPL) in the year 2017 with an agreement covering three years. From the year (2020) they are registered in Bardaghat Municipality and have also receive their Permanent Account Number (PAN).

The provisions for membership in the group are very transparent and it is clearly stated that if any interested CFUG member would like to become the member they could buy shares in the business. The current value of share is about US$ 1 per unit. Currently, the business is linked with seven other neighbouring CF women groups. These seven CFUG women's groups are linked through the WCN program implemented in the area with the objective of to promote a model for regional environmental well-being through viable green enterprises. An agreement was reached whereby these other CF groups could us the distillation plants for oil extraction. The existing CF received payment proportionate to their production quantity.

The work of the Chisapani CF is recognised in Nawalparasi district as one of the first CF groups to incorporate inclusive approach to CF business development, in which the rights of the all the CF users including distant users, Dalit and marginalized groups has been considered and advanced. The benefits generated from the CCHPI business enterprise are distributed among the LWHG group members after deducting the salary costs for the CFUG distillation plant operator staff and wages of labour if any.

1.4 BUSINESS PROPOSITION

The CCHPI enterprise run by LHWG produces essential oil from various herbal plants (Mentha, Citronella, Patchouli, Chamomile, Lemongrass) and some of the herbal medicines. The essential oil is sold to the private sector. Additionally, herbal medicine is sold locally, mainly purchased by

community members. The CCHPI business has been also providing processing services (distillation units for oil extraction) to other nearby CF members and groups who are involved in cultivation of Medicinal and Aromatic Plants (MAPs) and Non-Timber Forest Products (NTFPs). Currently they have three distillation units in operation.

To date, the business is completely managed by LWHG in collaboration with CFUG. LWHG is responsible for production and collection of raw materials and the CFUG is responsible for extraction and marketing of the product. Few members of the group are not able to engage actively as they are getting older and their young family members are migrated abroad for better employment opportunities. But the group has made flexible considering the participation of the founding members. If the founding members (16 women members) are unable to contribute their time by themselves, they can hire other people as a labour for the cultivation of MAPs and participate in the business.

1.5 MARKET CONTEXT

Initially, the LHWG was engaged in the cultivation and harvesting of different MAP and NTFP species and extraction of the oil. At first the extracted oil from the plant was bought mainly by national level private company CBNPL, but since 2017 by other private companies, primarily HBTPL but also Everest Aroma Pvt. Ltd. (EAPL). LHWG has been supported by NGOs and collaborative partners in linking with the private companies. Currently the LHWG has built a strong partnership with HBTPL for the period of three years with a contractual agreement whereby HBTPL agrees to buy all the products produced by the group and provide inputs and technical services as required. The company agreed to pay prices for the essential oils based on the national price determined by government. So, the LHWG members bring MAPs to the CFUG for distillation and are paid from the sales (minus the salary costs of the distillation plant operators). Some of the proceeds are used by LHWG to run a saving and credit program for their members.

The LHWG works in close partnership with the executive committee of the CF, which also helps facilitate the collection of raw materials from other CFUGs for oil extraction and facilitates linkages with the private companies to sell their products. The CFUG charges US$ 20 per distillation vessel for oil extraction carried out by other CFUGs, and handles sales, handing over the sales money to the concerned groups. The US$ 20 distillation charges taken by CFUG are used to pay for the salary of the distillation operators and any remaining money is used for other social development activities.

2. THE NATURE OF THE CLIMATE CHANGE THREAT

Climate change is a global phenomenon, and it has become a real threat to people who depend on natural resources and has long-term effects on both their food security as well as in people's livelihoods. Climate change impacts are critical in a mountainous country like Nepal, as water, land and forests are vital natural resources. Agriculture is the mainstay of the Nepalese economy and provides employment to 65 per cent of the economically active population. Agriculture and forestry sectors contribute 26.5 per cent of the total GDP. Only about 20 per cent of the total area is cultivable; another 44.8 per cent is forested; most of the rest is too mountainous for cultivation of any sort (GoN, 2019). The most critical impacts from climate change include more variable precipitation that leads to floods, landslides, and droughts (Castillo *et. al.* 2014).

2.1 PERCEIVED THREATS

Although climate change is global phenomenon the intensity of impact is localized and differs from one place to another. It affects the livelihoods, assets, infrastructure, and different resources including economic income generation. There are adverse impacts on people, natural ecosystems and agricultural land, and the ecosystem services they provide (GoN 2011).

The most vulnerable sectors include those directly linked to the livelihood of local people – namely agriculture, forests, and water. On the agricultural land, the main crops grown there are rice, maize, wheat, mustard, lentil, and seasonal vegetables. Almost 80 per cent of the total population also depend on forests for daily fuel wood supply. Additionally, approximately 42 per cent of the fodder for livestock is extracted from Nepal's forests (MOPE, 2004). Most of the households are smallholders

and their livelihood involve subsistence agriculture and livestock farming, in different combinations. There are limited irrigation facilities, so most people depend on rain-fed agriculture systems and a few used deep boring waters for their crops. Some youth are also doing vegetable farming by leasing the land in the area and some are doing cow and goat farming.

The community of the Chisapani CF area perceive several climate related threats which are listed below:

- increased number of extreme weather events
- landslides in the upstream area and floods in the lower plain of downstream area,
- strong wind and storms,
- heat waves, drought, and subsequent forest fires,
- thunderstorms that bring hailstones
- untimely, irregular, heavy, and intense rain,
- changes in the monsoon pattern i.e. sometime earlier, sometime late, sometime no rain for the longer period and increase in temperature.

The irregular patterns make it difficult for them to decide at what time to start agricultural production and intercultural operations, which is critical in terms of production and productivity. Likewise, change in temperature, solar radiation and precipitation affect the crop production in terms of quality and quantity, water scarcity, livelihood security and overall affecting the socio- economic aspect of the area. Agriculture practices such as vegetable production demand more consistent supplies of water and the production is hugely affected by extreme weather events like hailstorm, heavy rain, and dry periods. Due to these rainfall irregularities crop production suffers, and farming family suffers food shortages. Because of low purchasing capacity and lack of skills to earn income from other activities except agriculture, farming families faces food insecurity.

Similarly, the loss of infrastructure from landslides in upstream areas and flooding in downstream area destroys their forest and farm resources and impedes market access.

In heatwaves when there is no rain for a longer time the result is drought, and this deteriorates the soil condition (the soil become harder). Dry conditions demand more costly soil preparation operations and delays cultivation. The change in rain patterns (extreme rainfall followed by droughts) also causes a gradual reduction in the ground water table with less recharging of aquifers, and a depletion of wetland resulting in destruction of aquatic plants and fish habitat, drying of water sources/springs which causes water scarcity for irrigation. Dry soils are subject to increased soil erosion which degrades the land condition. These trends mean a higher chance of forest fires.

Due to temperature rises, farmers express that the climate has also become favourable for the positive growth of invasive species such as Crofton weed, Siam weed, Broadleaf botton weed in forest land and Blue billygoat weed, Bermuda grass, *Kane jhar, Mothe* in farm land, which encroach and also diminish the growth and natural regeneration of the useful forest resources and production and productivity of farm resources. Major crop such as paddy is increasingly becoming vulnerable to new kind of pests (for example American army worm) and disease and scarcity of water during plantation time. Paddy is thus highly affected by changing weather events. Likewise, Mustard is also affected by new disease and high rain during the time of harvesting which reduced the quality and production of crops.

The change in temperatures also leads to shifts in agro-ecological zones and many species are at risk of losing habitat. There is a higher chance of migration and disappearance of natural plants and wildlife animals and ultimately loss of biodiversity.

Under this scenario, producing essential oil in forest land and farmland during fallow period increases the diversity of crops and correspondingly diversity in income generation options. This diversity helps to build the adaptive capacity of the people and increase the resilience of farming communities as well as broader society. Additionally, vegetables are also susceptible to heavy rain, dry spells, and hailstone.

Women are the primary managers of natural resources in Nepal to sustain their livelihood, therefore are hugely affected by impacts of climate change. Therefore, the LWHG is also suffering from the impact of climate change in terms of both forest and farm resources. So, they think that there is

necessity of diversified income sources as well as diversified raw materials for their MAP enterprise. For the diversification of income sources, LWHG are planning to initiate a vegetable farming business in the group's farmland and the CFUG is planning to initiate a sawmill business in the forest land. Diversified sources of income will help the CFUG and its productive groups to increase their resilience.

2.2 IMPACT ON FOREST AND FARM RESOURCES

The CF users have been feeling the impacts of climate change in threats to their agriculture. In Nepal, the major source of livelihood in the communities are subsistence crop and livestock farming, in different combinations. Those subsistence systems also require or also depend on forest resources (e.g. for fuel wood and animal fodder). As there is inter-linkage between forest and farm resources, the effect of climate change on one resource may have impacts in other areas. Climate change has observed effects on phenology and survival of plants and the breeding behaviour and survival of animals. The general impacts include decreased production and productivity of agriculture and livestock. Over time there are also significant negative impacts on soil fertility and the related quantity and quality of food, feed and fodders and biodiversity.

Climate change also threatens to impact forest resources through decreasing timber yields and lower regeneration of natural forest species, MAPs and NTFPs. We have already noted the increased chance of forest damage from the increased frequency and intensity of fires, and of the encroachment of invasive alien species which compete with the forest species for nutrients, along with the incidence of new forest pests and diseases.

Due to the drying of water sources, water collection for irrigation purposes (and other household uses) becomes inadequate. In some cases, livestock suffer due to irregularity in the climate i.e. very hot or cold climate troubles the livestock, decreasing production and causing suffering from new diseases.

Ultimately, the combined effects raise costs of production and the sales price of commodities produced in the farmland and lowers the benefits derived, which may adversely affect the farm revenue, employment, and income of the community. Therefore, the community dependence on alternative and diversified sources of income (forest and farm) would be good strategy to address this situation. So, community engaged in alternative livelihood sources have higher resilience than the community who do not so engage.

2.3 IMPACT ON BUSINESS AND FINANCE

A large proportion of marginal farmers have small landholdings, limited irrigation, low income levels, limited institutional capacity, and greater dependency of agriculture on climate-sensitive natural resources that increase the degree of vulnerability (Regmi and Adhikari, 2007). Most of the people in the community of Chisapani are hill migrants and reside close to the forest so have high dependency on forest resources. Most of the community members have small farm sizes and there is limited irrigation to improve productivity. That ultimately impacts of climate change are to reduce the productivity of forest and farm resource-based enterprises.

The members of the essential oil enterprises have also observed the effects of climate change on their resources and are anticipating severe impacts in their forest and farm business in future if the climate change trends continue. The essential oil enterprise managed by the LHWG are directly or indirectly impacted by climate change, with uneven rain patterns and subsequent dry conditions that causes droughts. These patterns require increased labour inputs for land preparation and other intercultural operations on hard and dry soil. When the rains do come, weeds compete more strongly with crops and require more time and energy. The households cultivating MAPs and NTFPs thus have difficulty managing land because of irregular rain pattern. The current social structure of farming households is comprised mainly of women and elderly members as youth have migrated to cities and other parts of the world for employment, forcing the farming households to spend more money on hired labour – which reduces profits.

Ultimately, these impacts increase the cost of production for both forest and farm resources which mean the benefit from the business will be reduced. One member of LHWG indicated that climate change has been already been felt in their business. Because of this, some of the members could

neither hire labour nor could do it themselves, therefore currently they are not actively involved in the business i.e. although they are member of the enterprise group they do not produce NTFPs, therefore could not receive any income. Furthermore, because the members not producing the MAPs/NTFPs do not receive income, they also become ineligible to receive loans from the group.

The secretary of enterprise, Ms. Mankumari Chhetri, said that:

> *"the plant species which they are growing for the business required water in the initial phase of their growth i.e. planting, weeding, for good growth and production but at the end of plant maturity stage water is harmful for the amount of oil production. But the rainfall trend is completely opposite and adverse, (as we have not irrigation facility and depend on natural rain), there is no rain during the initial phase of production. We receive heavy rain at the time of maturity and at harvesting time, which decrease the amount of raw materials production as well as decrease quality because of decreased oil content in these crops. The oil extracting from those types of materials are of low quality as well as low amount of oil production that ultimately reduces the income generation for the business."*

Because they have directly observed the deterioration of quality and quantity of oil production year by year, the members of the group hesitate to increase their investment in essential oil enterprises. The members from the neighbouring CFUGs, who started growing NTFPs in their own CF and private land, also observe the problems of LHWG, and may also start to feel risks for further investment into the cultivation of NTFPs and expanding their production units.

If the trend continues, the raw materials for the efficient operation of extraction plant will be scarce. This causes a reduction in the amount of oil extraction and reduces the enterprise income of CFUG. As climate change also impacts other forest and farm resources, the management of livestock also become difficult due to uncertain condition of forage and fodder and their collection from both forest and farms. This will potentially impact land and the livestock production and the income from livestock production also reduced. In summary, the overall capacity and incentive of the group to invest in further developing the essential oil business will be reduced.

2.4 IMPACTS ON VULNERABLE GROUPS

Both men and women feel the impacts of climate change in a similar way but in this case women are impacted more severely as women tend to be more resource poor, or landless, are more vulnerable than men and their livelihood depends on the natural resource management and their investment in the business.

From 2020, to increase production to make up for climate related shortfalls, the business has also started to cultivate NTFPs on private farmland by renting the land during the fallow period. This production group was open to include vulnerable groups who are interested to join. The vulnerable group could engage in the business as there is no need of investing money to engage in cultivating the NTFPs as the group will manage to pay the rent of land and all other cost of operation from the production of oil. After deducting the cost of production, they will distribute the remaining income to all the members equally. For addressing the concerns of most vulnerable groups, they are trying to engage them in promotion of agroforestry practices in the CF area and engaging them in the labour work in the business.

3. THE RESPONSE OF THE BUSINESS AND FINANCIAL MODEL TO IMPROVE CLIMATE RESILIENCE

To improve climate resilience, the business group is diversifying their production system, both in terms of natural resources used, but also in terms of economic diversification - planning to start investment in other sectors for the smooth operation of business such as vegetable farming, fish farming etc. They are also diversifying their social networks and partners. These three elements will diversity their source of income and increase their capacity to cope with the adverse impact of climate change.

3.1 AGRO-ECOLOGICAL DIVERSIFICATION

Recent data shows that the farm sizes in Chisapani have been decreasing. But international data indicate that as the farm sizes decrease the diversity of agricultural production increases (Herreo *et al.* 2017, IPBES, 2019, FAO, 2012 as cited in Hou-Jones and Macqueen, 2019). Biodiversity on land managed by indigenous peoples and local communities is declining less rapidly than on other lands, making smallholders and indigenous peoples the world's stewards of climate-resilient crop varieties, breeds, and tree species. Following the establishment of distillation unit for essential oil extraction, a national NGOs named WCN supported the enterprise group for the promotion of agroforestry in their CF. The documentation of this intervention indicated that the agroforestry systems has contributed to establish more resilient production systems that have helped the communities adapt to climate change (NCF, 2016).

Furthermore, the business also was able to link with other nearby CF women groups by exchanging their learning's and providing them distillation services for their products. The neighbouring CFs has also established separate women groups for cultivation of different NTFPs and they are growing variety of species suitable at different agro-ecological zones.

The Chisapani CFUG has thus expanded and scaled up production beyond their CFs as well as diversifying the species by tapping into different agro ecological characteristics, which support the business through diversification of products as well as enabled the business to adapt to climate threats.

When they began the business, they only cultivated patchouli but later they added different MAP species and other tree and grass species. The MAPs for oil extraction purposes are now including: Cinnamomum, Drumstick tree, Eucalyptus, Camphor, Citronella, Chamomile, Lemongrass, Palmarosa, Wild turmeric, Mentha etc. As mentioned, the LWHG group is also now planning to develop a group vegetable business by leasing private land and doing both seasonal and off seasonal farming. Furthermore, they developed the business plan which suggests for diversification of products in distillation units, so the CF has introduced plantation of new species such as Wild turmeric, Cinnamomum, Eucalyptus etc. in their CF area.

3.2 ECONOMIC DIVERSIFICATION

The essential oil extraction business also opens the avenue for economic diversification by using a wider range of forest and farm resources. LHWG with the technical support of Division Forest Office (DFO) and facilitation of CFUG started cultivation of herbal plant Mentha in private rented land for the fallow period only and initiated plantation of different herbal species inside the CF area. Likewise, there is wetland along the highway boarder of CF area where the CF members hope to create a subgroup for fish farming and integrate that with banana cultivation and boating facilities to give further economic benefits.

The facilitation of other nearby and neighbour CFUGs women groups and other interested communities for NTFPs cultivation, extraction, and marketing of oil from their products has added a further source of income. The CF Executive Committee (EC) plays a coordination role only but the CF also gets benefits for the distillation plants as they charge money (US$20/vessel) for oil extraction. The plant provided two permanent jobs as plant operators.

Furthermore, LHWG has also started saving and credit program within the enterprise group initiated by using money from essential oil selling. So that the members also get financial benefits as well as financial loans which create investment opportunities to them. Indirectly, this has led to more members being attracted into the livestock production busines and many have started rearing of livestock as the availability of fodder and forage increased after the conservation and management of CF by LHWG. Members have been able to get income from selling their livestock products such as milk, ghee, meat etc. Furthermore, they have started to sell thatch grass and timbers locally.

3.3 SOCIAL DIVERSIFICATION

The experience of creating this business also helped the CFUG understand how best to diversify social networks and to provide social services to other marginalised, disadvantaged, vulnerable and poor groups of the CFUGs. The CFUGs intervention in enterprise helped to build their knowledge on forest and environmental issues, business issues, and climate change issues. The process of addressing these challenges helped to build internal capacity to solve group issues among the users including distant users. Social cohesion has improved as the enterprise groups take part in equitable sharing of benefits arising from the enterprises. The benefit generated from the selling of oil is distributed among the LWHG group members and the other seven producer women groups members (proportionate to their production).

There has been an increase in employment opportunities for poor and marginalized people through involving them as wage labour, paid accordingly by the group. Based on the experiences and learning's the members have also started community farming of Mentha which helped them to receive extra income without financial investment.

The initiation of business has also created an opportunity for women groups to become involved in social development activities as the CF income is invested in community social development activities such as roads construction and maintenance, schools infrastructure and furniture, eco-tourism activities, short-term loans for the poor and disadvantaged people, donation for poor people, development of parks etc. Some percentages of CF income are invested for social activities of the area. There are collective decisions on how, where and in which social activities the forest-generated income is spent. Women group's members opinions are for the first time considered for making these decisions. As the business has been run by the poor and vulnerable groups of people, it also increased their access (and ability to buy) forest resources such as timber, fuel wood, fodder and essential oil (for medicinal purposes). These same people have increased access to information.

The members also improved opportunities and platforms for mutual understanding - "knowing each other" – through socialisation, get togethers, networking events, sharing of joys and grievances and so on. After the involvement in the business, the women groups have had the chance to connect and interact with different government, non-government and private sectors officials such as DFO, municipality and rural municipality, national and local NGOs, herbal trade companies etc. from which they are able to get technical as well as financial support for their business to address issues on climate change adaptation and mitigation at local level.

Their work and learning's are now shared in different forums. Stories are published about the CFUGs' work in national newspaper dailies as given in the example. The story, which was published on 14th July 2014, highlights how the Chisapani CFUG has been working as a demonstration site and a source of inspiration for many other forest groups on REDD+ in the region (RECOFTC, 2018). The enterprises have given local women more responsibilities and freedoms because in the past women didn't have the courage to ask their husbands and other family members to even go out of their houses but now they are not only go outside of their houses also involved in a lot of social activities such as group meetings, participate in different events such as workshops, trainings etc. Similarly more than financial return, their value in the community has elevated as they are recognised as entrepreneurs more than somebody's wife but now they have their own identity as people recognise then by their name and their work which gave them a lot of confidence and pride.

नमूना वनको बन्दै चिसापानी सामुदायिक वन

Figure 2: News of CFUG

3.4 OTHER RESILIENCE MEASURES

The LHWG members have also started to use drip irrigation systems in farm land, converted their cooking practices through Improved Cooking Stoves (ICS), installing bio gas plants (which reduced the pressure on forests for fuel and also helped women to save time and prevent from indoor air pollution). There has been a clear move towards agroforestry system development in degraded forest areas as well as their farmland.

The people from the flood plain areas started to use water storage tanks to protect the drinking water during the flooding seasons. Likewise, to increase the water availability to animals as well as forest and farm resources they have been protecting wetlands and building walls to conserve the water harvesting ponds along the Mahendra highway of forest area. This has increased the availability of water during dry season for wild animals and their livestock and even helped them to prevent or fight forest fires.

The damage of agricultural crops by wild animals is also decreasing as they can take water from the ponds and wild fruits from the conserved forests such that wild animals do not enter farmland in search of food and water.

The CFUG also practiced the Scientific Forest Management (SFM) technique in 160 ha of forest land so they adopted regular routing of silviculture operation inside the CFUG. They have established a nursery and regularly carry out plantation of trees inside the CF as well as their private land.

They have been involving in river bank protection by planting bamboo and eucalyptus tree species along the river bank and forest border as a wind breaker and have prohibited contractors and labourers from collecting sand and stones from the river bed, in order to prevent flood. They also diversify their raw materials for the purpose of oil extraction by planting Cinnamomum and Eucalyptus species.

3.4.1 PARTNERSHIPS

The CFUG have been receiving technical and financial assistance from different government and non- government institutions and even from development agencies in the form of different projects and programmes from the beginning of their business. They are working together in partnership with these institutions – and those partnerships have been made possible by their organisation as a strong group.

The DFO have provided regular technical backstopping as well as financial subsidies in. The DFO has been regularly providing forest management training and helping CFUG to operate the business and forest management practices.

Different NGOs and programme namely Resource Identification and Management Society (RIMS) Nepal, LFP, Multi Stakeholder Forestry Programme (MSFP), Federation of Community Forestry Users Nepal (FECOFUN), WCN, IDE Nepal, Forest Action Nepal, CBNPL, HBTPL, Bio energy Pvt. Ltd., etc. have been providing technical as well as financial support to them. This helps the CFUG to strengthen their intuitional capacity and further help in networking and collaboration with different institutions working in climate change, environment, and biodiversity conservation issues.

The technical support received from these organisations are helping to build capacity on forest resource management, financial management, business value addition, social mobilisation, fund mobilisation, gender and social inclusion, climate change adaptation and mitigation, nursery establishment, NTFPs cultivation, agro-forestry promotion, SFM, operation and maintenance of distillation plants, procedures for efficient oil extraction, hygiene standards, processing and packaging methods, knowledge on marketing etc.

Similarly, these partnerships have provided financial support in installation of distillation plants, bio-gas plants, ICS, nursery establishment, seedlings, intercultural equipment and group fund etc. and also linked their business with private sectors i.e. HBTPL for the marketing of their products.

Furthermore, they have partnership with the local government line agencies, youth clubs, schools, and colleges also to build opportunities for youth. The CFUG is now a mature institution. They have very clear governance systems and benefit sharing mechanisms. The CFUG also supported the producer groups in building linkages and accessing capacity building and funding support.

The LHWG group have consistently worked and overcame challenges and have emerged as mature producer group with clear mechanism, roles, and responsibilities. And both the CFUG and LWHG worked in the group as an institution; they can best utilise the opportunities and partnerships from

different programs and agencies. So institutional strengthen also play crucial role in building the resilience in the society.

3.4.2 CUSTOMERS

The customers of their business are local community members and a private company i.e. HBTPL and EAPL. As the business is a small or micro enterprise, the product is produced in small quantities and their products are bought by national level vendors based on the contract drawn with the company. The business utilises only 20 per cent of essential oil extraction distillation plant capacity due to insufficient raw materials.

3.4.3 MARKETING STRATEGY

The LHWG oil products are differentiated from others as the products have added value of organic certification, the quality is high, and the production sustainable compared to others. The resources are sustainably harvested from the forest as guided by an operational plan and monitored by Divisional forest authorities.

Currently, the group are getting a fair price of the product based on the contractual agreement the producers have with HBTPL. HBTPL has fixed the price based on the price determined by a government authorized Nepali company called Herbs Production and Processing Pvt. Ltd. (HPPCL) run in collaboration and agreement with government. However, due to current inadequate scale of production, the producer does not have much advantage when negotiating prices or exploring alternative buyers. Until now, they have not been able to utilize the three distillation plants to their full capacity due to unavailability of raw materials. This is one of the factors causing hesitation in formulating and adopting full fledges market promotion strategy for their products.

But, in relation to this case study, the producers feel that their business is established considering the climate vulnerabilities and adopting climate resilient approaches even though the amount of production could be increased and more value could be added to achieve a higher price from the competitive market. The product could also potentially be promoted better considering its distinct origin and producers.

The product has been directly contributing to both human and ecosystem health, particularly health of the CF. The product has further supported the livelihood enhancement of marginalized, disadvantaged, and poor women, who are involved in the production and processing of this product, by providing opportunity of income generation. Additionally, the benefits of business are directly channelled to the community and social development activities of the area.

4. CONCLUSIONS

4.1 MAIN CONCLUSIONS

Sustainability of business enterprises depends on many factors, but for community-led small enterprises sustainability often depends on the level and period of external business supporting services received by the community. They required continuous support for business enterprise development services along with financial, technical, and technological support till the community gain confidence. Business enterprises based on CF resources are expected to contribute to achievement of the social and employment goals set out by the CFUGs and so they should help by providing an enabling environment to run the business. It is well recognised that the future ecosystem health and diversified service provision and its availability, stable economic returns, favourable climate conditions, proper management and business planning and market linkages are all important factors for the viability and success of business enterprises.

4.2 INVESTMENT CHALLENGES

Enterprises run solely by community groups (from marginal, disadvantage and poor group) with basic level of education face multiple investment challenges in terms of their business sustainability. Therefore, to mobilise nature, finance, and partnerships towards a more climate resilient strategy, the

most important thing is existence of specific government business support agency, or potential collaboration with business incubating institutions in order to provide dedicated support to business enterprise development services which is lacking right now.

Furthermore, the business service providing institutions should be able to provide support or link to institutions that can provide capital investment for business operations, help them to develop capacity for record keeping. Training on different aspects of business enterprise development and marketing of the products should be forthcoming for a period of at least seven years.

4.3 BENEFITS AND THEIR DISTRIBUTION

The most benefitted people from this business enterprise have been marginalised, disadvantaged and poor people, especially women. Furthermore, other vulnerable groups such as disable, elderly people, poor men, CFUG members including adjoining CFUG and women groups are benefitted from the business. The CF opens for the nine months in a year: Falgun to Baisakh (Mid-March – Mid May) for the collection of grasses and twice a year during Baisakh – Jestha (Mid-April – Mid June) and Mansir (Mid November – Mid December) for the collection of fuelwood.

For the cultivation of NTFPs a few independent groups have been formed across the landscape and priority has been given to the people from poor and vulnerable groups. For transparency of equitable sharing of benefits received from the business enterprise as well as CF products, a separate monitoring sub-committee has been formed and established and based on the monitoring committee recommendation the benefits are distributed equitably. The CFUG members also received the benefit in the form of salary for their time contribution while collecting and processing of raw materials. The clarity and transparency of these measures has been a key part of the overall success.

REFERENCES

Castillo, C., Robines, L., Poudel, A., Lomac-MacNair, K. and Gajewski, C. (2014) The impact of climate change on forests and biodiversity and current adaptation practices: A Case Study of Nepal. Sambriddhi: Journal of Development Studies, Kathmandu, Nepal

GoN (2011) Climate Change Policy. Government of Nepal, Kathmandu, Nepal.

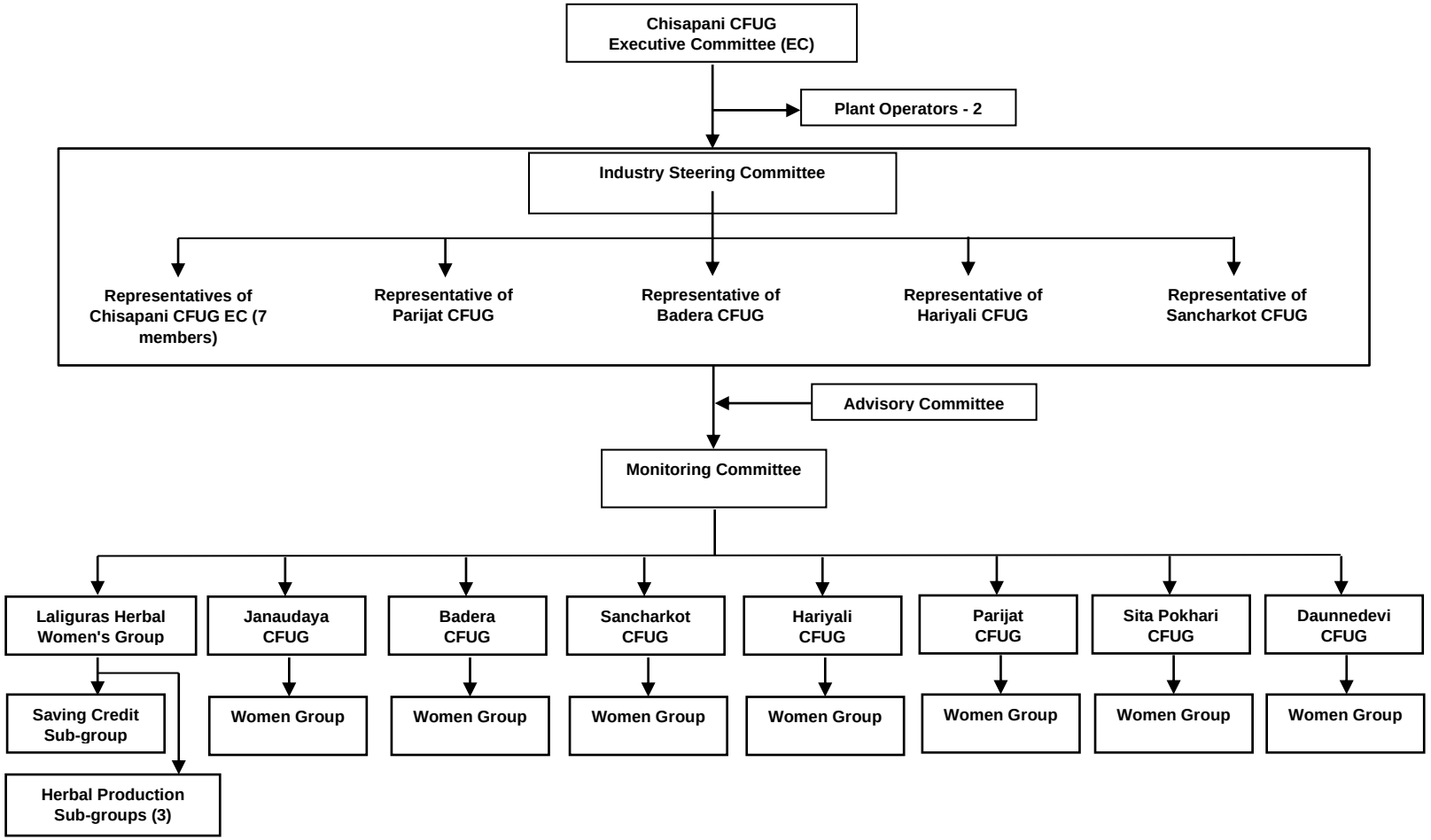
GoN (2019) Economic Survey of Nepal (2018/2019). Ministry of Finance, Kathmandu, Nepal.

MoPE (2004) Nepal Initial National Communication to the Conference of the Parties of the United Nations Framework Convention on Climate Change July 2004. Ministry of Population and Environment, Kathmandu, Nepal.

NCF (2016) Final Report - Public. Developing low cost community based innovative solutions to mitigate and adapt with climate change while creating viable local business solutions, Nepal.

RECOFTC (2018). Community initiation for scientific forest management. Retrieved from: https://www.recoftc.org/en/nepal/stories/community-initiation-scientific-forest-management

Regmi. B. R. and A. Adhikari. 2007. Human Development Report 2007/2008 - Fighting Climate Change: Human Solidarity in A Divided World - Country Case Study–Nepal, Human Development Report Office, Occasional Paper No 57

Hou-Jones, X. and Macqueen, D. (2019) Thriving in diversity: Smallholders organizing for climate resilience. Retrieved from http://pubs.iied.org/17732IIED

Annex 1 – Organisational diagram of Chisapani Community Herbal Processing Industry