

CASE FOR SUPPORT

Layer Farming for Adaptation

Cultivating and marketing high value crops to improve food security, enhance livelihoods and adapt to climate change in Nepal.



A climate change adaptation project by The Glacier Trust.
In partnership with the Himalayan Community Development Forum.

The Glacier Trust
74 Treaty Street, London, N1 0TE
www.theglaciertrust.org
UK registered charity (no. 1124955)



Executive Summary: Layer farming for adaptation (LFA)

Cultivating and marketing high value crops to improve food security, enhance livelihoods and adapt to climate change in Nepal.

The **Glacier Trust** (TGT) has partnered with the Himalayan Community Development Forum (HICODEF) in south-central Nepal since 2009. Over the last three-year period, since June 2016, £27,655 has been spent to enable climate change adaptation in the remote mountain villages of the Siwalik range. This work has enabled 1,615 people to increase their resilience to the growing impacts of climate change.

Our new project, **Layer farming for adaptation (LFA)**, will take our work to a higher altitude and more remote location. We will reach a further 1,901 people, across seven villages, in an area of dangerously low food security. Only 56 out of the 260 households have enough food to last nine months or more. Climate change and economic inequality are exacerbating these problems significantly.

This project will prioritise families with less than six months of food security and those most socially and economically disadvantaged - women, women-headed households (out-migrated husbands), the poor and those socially excluded by caste.

Coffee cultivation as a climate adaptation strategy

Across Nepal's Himalayan foothills, coffee is being grown as a climate change adaptation and livelihood improvement strategy. TGT's projects with Eco Himal Nepal in Solukhumbu (east Nepal) are already successfully working in this way. With support from the Marr Munning Trust, we have recently transferred this model to Kavrepalanchok (central Nepal). Through the LFA project we will introduce this methodology in Nawalparasi in partnership with HICODEF.

The model pioneered in Solukhumbu, has been refined to create the five-year LFA project tailored to Nawalparasi. The project has been designed by TGT and HICODEF in close collaboration with farmers in each of the seven villages and all relevant local government institutions. Eco Himal Nepal and Swiss INGO, HELVETAS have also provided expert advice and support.

Layer farming, Agro-Forestry and Education

Coffee will be grown using the organic 'layer farming' method, inter-cropped with fruits, vegetables and other high value crops to improve income, diet and resilience to climate change. Through this project, we will enable farmers in to grow coffee commercially for the first time.

We will also work with local primary school children and teachers to give them practical and theoretical knowledge of ecosystem-based adaptation and environmental conservation.

By the end of year five 35,000 coffee trees, with the potential to produce 5,000 tonnes of green coffee bean per year, will be planted. Farmers will be closely supported by one full time and two part-time staff as well as up to six agricultural apprentices.

Budget requirements

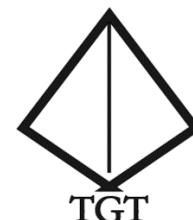
Phase one of this project will run for a minimum of two years, in three villages. It will cost **£12,208 in year one** and **£11,985 in year two**. We anticipate extending the project to the remaining four villages in year three, four and five at a cost of £12,500/year. We have secured £4,000 for this work from Orbis Pictus trust and a £2,000/year funding commitment through our partnership with UK based company Volley First. Donations from our regular individual supporters will provide further funding, currently projected to total £3,000/year.

We require a minimum of **£3,500/year of additional funding** to guarantee the project's success.

For more information and to support this project, please contact TGT Co-Director (UK), Dr. Morgan Phillips: morgan.phillips@theglaciertrust.org



Project partner:	HICODEF
Annual cost:	£12,500
Project location:	Nawalparasi, Nepal
Project length:	5 years
Remoteness:	Medium-high
Altitude:	800m – 1,350m
Land area:	243 hectares
Villages:	7
Households (HHs):	260
Female population:	1,018
Male population:	883
Food security:	Low
Up to 3 months:	89 HHs
Up to 6 months:	115 HHs
Up to 9 months:	43 HHs
12 months +:	13 HHs



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1. The Glacier Trust (TGT)

The Glacier Trust (TGT) was founded in 2008 by Mr Robin Garton to enable climate change adaptation in Nepal. We are a UK registered charity (no. 1124955) and work in close partnerships with a small selection of trusted NGO organisations in Nepal.

TGT creates positive change through training and technology in some of the most remote villages in Nepal. Our work is innovative, delivered in partnership and guided by the expressed needs of the communities we support.

Our higher education programme enables UK and Nepali post-graduate students to conduct primary research in climate change adaptation in the field. Our adaptation projects also support agricultural students to train 'on the job' in adaptation and livelihood enhancement. This work helps us to develop the next generation of climate change adaptation professionals.

As well as our interventions at the micro level of the village and our higher education programme, we also seek to influence climate change adaptation policy and practice at a national level.

TGT's credentials and *qualification to act* are expanded on in Annex 3 (p. 18).

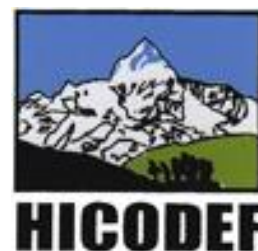


2. Himalayan Community Development Forum (HICODEF)

The Himalayan Community Development Forum (HICODEF) was formed in 1999 in the Nawalparasi district of south-central Nepal. It is not-for-profit, officially registered non-governmental organisation affiliated with Nepal's national Social Welfare Council, NGO Federation and National CBR Network.

Based in the southern Nepali town of Kwasoti, HICODEF have an exclusively local focus with projects ranging from climate change adaptation and agricultural entrepreneurship to education, primary health, safer migration and cooperative business.

HICODEF have worked in partnership with TGT since 2009. Our most recent project (2016-19), ECCLA (Enhancing Community Capacities for Learning and Adaptation to Climate Change), focused on three village communities in Deurali, Nawalparasi. Through the ECCLA project 1,615 people have benefited from farmer field school training; marketing and climate change awareness workshops; a new water supply system; and the creation of links to local markets.



3. Project location

Nawalparasi is in south-central Nepal and borders India. This project will focus on seven villages on the upper slopes of Siwalik mountains which rise up from Nepal's extensive Terai plain to form the first foothills of the Himalayas.



Figure 1: The project will run in seven villages across the Siwalik mountain range in Deurali, Nawalparasi, south Nepal.

The seven villages in the target area are: Lahape, Dhoubadi, Repaha, Pokhari, Mathillo Baseni, Durlunga and Charghare in eastern Nawalparasi. The altitude ranges from 800m to 1,350m above sea level. Despite being between 10km and 30km from the Mahendra Rajmarg national highway, these are very remote villages. Monsoon rains and swelled rivers frequently make the few dirt roads that service the area impassable; often for several months of the year.

HICODEF's most recent survey found that across the seven villages, there are 260 households, home to 1,018 females and 883 males. The majority of people living here are very low-income subsistence farmers.



Figure 2: A farmer drives a flock of goats in Lahape village, east Nawalparasi, April 2019. Credit: HICODEF.

4. The case for action

This is an area of dangerously low food security, only 56 out of the 260 households in the target area have enough food to last nine months or more, the remaining 204 are highly vulnerable to the unpredictability of climate change, political change and remittances from relatives working in faraway urban areas or abroad.

The lists below highlight some of the environmental, social and economic challenges people here must contend with:

4.1. Environmental challenges

- Climate hazards like drought; unpredictable and unusual rainfall; high winds; landslides and extreme temperatures are becoming more common;
- These climate change effects create conditions that attract new insect pests and plant parasites that can devastate crops and trees;
- The land is dry, fragile and increasingly susceptible to soil erosion as intense rainfall and high winds arrive more frequently;
- Forest degradation is high, deforestation rates are accelerating, slash and burn practices continue;
- Water sources are inadequate and, in several cases, unsafe; no facilities for irrigation are present;
- Chemical pesticide use is common, there is very little awareness about the harmful effects of this for human and environmental health;
- Awareness on climate change and environmental problems is low.

4.2. Social and Economic challenges

- The majority of people are under-privileged and below the international poverty line;
- Living standards are below average for Nepal;
- Social stigma (gender, class, caste-based discrimination) still exists;
- The majority of the population are subsistence farmers, working small plots for basic crops;
- Out migration and youth migration are high; adult males typically leave the district, or even the country, in search of work;
- Local manual labour jobs, for those who can find them, are insecure and often dangerous;
- Education is a low priority, schools are very poorly resourced and several hours walk for some students, especially at Secondary level;
- A lack of seasonal agricultural labour means that the amount of land left fallow is increasing.

Many of these problems and challenges overlap and reinforce each other; it is a complex system. The drivers of climate change and serious poverty are far beyond the control of the people of Nawalparasi, many are beyond the control of Nepal as a state and certainly small NGOs like TGT and HICODEF.

This does not mean that TGT and HICODEF cannot address some of the problems identified above; we can solve or ease problems around lack of awareness, deforestation, insect pest infestations and living standards.

For larger problems, the task is adaptation. We can enable individuals and communities to adapt to the environmental and social changes that they face. In this way, we can improve lives despite the onset of global climate breakdown and the prevailing winds of the global economic system.

5. Project aims and activities

Across Nepal's Himalayan foothills, coffee is being grown using the 'layer farming' method as a climate change adaptation and livelihood improvement strategy. TGT projects with Eco Himal Nepal in Solukhumbu (east Nepal) are already successfully working in this way; we have recently transferred this model to Kavrepalanchok (central Nepal) with support from the Marr Munning Trust; and will now introduce it in Nawalparasi in partnership with HICODEF through our new project Layer farming for Adaptation (LFA).

The model we have pioneered in Solukhumbu, has been refined and enhanced to create the LFA project, tailored to Nawalparasi. Activities are designed by TGT and HICODEF in close collaboration with farmers in each of the seven villages and all relevant local government institutions. Eco Himal Nepal and Swiss INGO, HELVETAS have also provided expert advice and support.

A key additional element of our LFA project is a schools engagement programme. Through it, we will introduce young people to layer farming and help nurture a sense of environmental care at an early age. Learning activities will be practical and delivered in collaboration with teachers and parents.

5.1. Project aims

Over the initial two-year phase, we will:

- Increase the environmental knowledge and skills of 115 primary school students;
- Train 90 farmers in the layer farming method of growing high value cash crops;
- Create three coffee growing working groups in three villages;
- Enable at least 30 farmers to grow and sell coffee commercially;
- Improve the diets, earning potential and climate change resilience of at least 90 families.



Figure 3: TGT funded coffee training workshop at Densa AFRC, Solukhumbu, January 2018. Credit: The Glacier Trust.

5.2. Project team

LFA will be delivered by a full-time Programme Coordinator, supported by HICODEF's Executive Director and TGT's Nepal based Co-Director (see Annex 2 for full details).

5.3. Activities

Section 4.1 (above) listed the environmental challenges that climate change is exacerbating in the target area. There is no perfect way of adapting to climate change, but coffee production is a viable option if well planned and carefully implemented.

This section summarises the key activities to be delivered by our partner NGO HICODEF over the initial two-year phase of this project (more detail is provided in Annex 1 and 2). During the initial two-year phase, work will focus on three of the seven villages, with priority given to those families with food security of less than six months.

Project activities, led by HICODEF's Programme Coordinator, will focus on enabling farmers to grow, nurture, harvest and process coffee using the layer farming method.

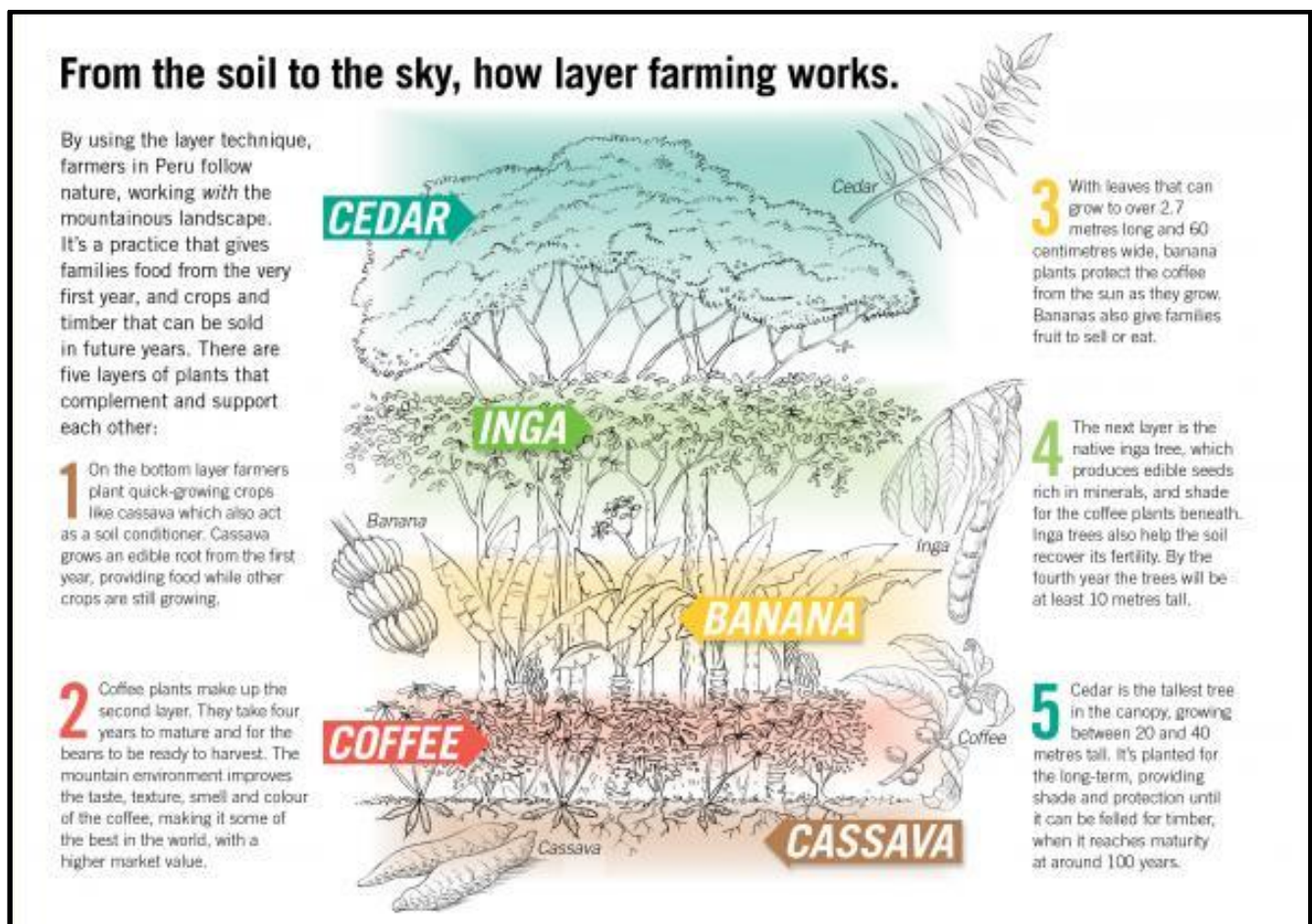


Figure 4: How layer farming works. Source: <https://practicalaction.org/cloud-forest-project>

To achieve the project aims we will enable the following key activities (full details on the project rationale and activities are provided in Annex 1 and 2):

- **Group formation** - Three coffee growing working groups of between 25 and 35 individuals will be formed.
- **Training on 'layer farming', coffee production, harvesting and processing** - Each group will receive a two-day detailed coffee production, harvesting and processing training course.
- **One-to-one support for 90 farmers from HICODEF staff and volunteers** - The project's Programme Coordinator and volunteer apprentices who will visit farms regularly. Instruction will be one-to-one and/or in

small groups. Volunteers will learn ‘on the job’ by assisting farmers with the physical tasks such as planting, pruning, digging, watering and harvesting.

- **Schools engagement** - TGT’s UK Co-Director (an expert in environmental education) and HICODEF will work together to design a schools engagement programme for all primary schools in the target area. In the initial two-year phase, the project will engage with three primary schools (approx. 115 pupils). The programme will be delivered by the Programme Coordinator with support from HICODEF student volunteers.
- **Stakeholders meeting** - Stakeholder meetings will be held every six months to bring together HICODEF, TGT, local government staff, representatives from the three groups, members of the local farmers cooperative and primary school teachers.
- **Marketing workshop** - By year two, some farmers will be ready to sell coffee and other produce to local and national markets. To enable this and to ensure products reach the market in the most efficient and profitable way, HICODEF will coordinate a marketing workshop for farmers, local government officials, traders, the local cooperative group and TGT staff. The primary aim of the workshop will be to agree on a way to get produce from the villages of the target area to the market.
- **Exposure visit** - Also, in year two, TGT will work with NGO partner Eco Himal Nepal and HICODEF to organise an exposure visit to Deusa Agro Forestry Resource Centre (AFRC) in Solukhumbu (eastern Nepal), which has been coordinating commercial coffee production since 2016. Nine farmers and two HICODEF staff will travel to Deusa AFRC for a learning exchange visit.

5.4. Equipment and resources

To enable climate change adaptation, the activities listed above are vital. They ensure the appropriate governance and organising infrastructure are in place and develop the skills and knowledge farmers need to start growing and selling new crops. However, communities also need resources and equipment to turn their knowledge into action. TGT will not simply buy resources and equipment for the farmers. We know that it is important to engender a sense of ownership, TGT will therefore only support farmers to purchase the resources and equipment they need:

- **Seeds and seedlings** - Individuals and the schools will be supported to purchase the seeds and seedlings required to become successful in layer farming and agro-forestry. The project will support up to 100 farmers in the initial two-year phase.
- **Ground and shade crops** - Coffee is only one product of layer farming and agro-forestry. Ground and shade crops are vital and allow farmers to also produce fruits, legumes and vegetables for sale or to improve diets. The project will support farmers to grow ground crops like ginger, turmeric and a variety of root vegetables.
- **Coffee processing and agro-forestry equipment and tools** - Farmers involved in the project will be given 50% match funding to purchase key agro-forestry and coffee processing equipment (coffee pulping machine pictured above).



5.5. Monitoring and Evaluation

Starting with a detailed baseline survey, regular monitoring, supervision and data recording will be conducted by HICODEF throughout the project. All monitoring work will feed into the learning and reflection process that is crucial to the implementation of the project. Results will be analysed by HICODEF and TGT and reported on at stakeholder meetings. Any issues or problems will be identified through this process to help find and deliver solutions. Successes will also be highlighted to ensure positive results are understood and replicated.

6. Budget

A detailed budget for the initial two-year phase of this project has been developed in partnership with HICODEF, with input from local government officials and coffee farming specialists. A summary budget for year 1 and 2 is presented below:

	Year 1	Year 2
3 x Group formation	£177.46	-
Ground and shade crop support	£485.92	-
3 x Two-day coffee training workshop	£686.62	£686.62
Seed and seedling support	£457.75	£457.75
Equipment	£1,271.83	£338.03
Marketing workshop	-	£88.03
Exposure visit to Deusa AFRC	-	£929.58
Stakeholders meeting	£78.87	£78.87
OJT volunteer expenses	£320.28	£320.28
Schools engagement	£887.32	£887.32
Monitoring and Evaluation	£697.18	£352.11
Total programme activity cost	£5,186.62	£4,261.97
Programme Coordinator FT (HICODEF)	£3,661.97	£4,028.17
Executive Director 0.2 FTE (HICODEF)	£1,007.04	1,107.75
Accountant 0.1 FTE (HICODEF)	£457.75	£503.52
Co-Director UK 0.1 FTE (TGT)*	-	-
Co-Director Nepal 0.1 FTE (TGT)*	-	-
Total staff cost	£5,126.76	£5,639.44
Travel, Insurance, Stationary, Communication, Office (HICODEF)	£1,894.37	£2,083.80
Travel, Insurance, Stationary, Communication, Office (TGT)*	-	-
Total operations cost	£1,894.37	£2,083.80
TOTAL	£12,207.75	£11,985.21

**The Glacier Trust has a '100% to our projects' fundraising pledge. This is made possible by three specific grants that cover TGT's core costs including travel, salary and office overheads. This enables us to commit 100% of all other funds to our project work in Nepal.*

We have secured £4,000 from Orbis Pictus Trust for this work and a £2,000/year funding commitment through our partnership with UK based company Volley First. Donations from our regular individual supporters will provide further funding, currently projected to total £3,000/year.

We require a minimum of £3,500/year of additional funding to guarantee the project's success. 100% of your grant or donation will be spent in Nepal on project delivery.



7. Reporting

HICODEF will produce quarterly reports for TGT and other key stakeholders. These reports will list major achievements, challenges, key learnings and future plans. HICODEF will also deliver a detailed annual report, with results, images and case studies. External coffee specialists visiting the target area will be asked to produce a full

report and recommendations. TGT will publish all reports in the project reports section of The Glacier Trust website for full transparency.

To support this project, please contact:

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ANNEX 1: Project rationale

Responding to climate change and economic inequality

HICODEF have been working in Nawalparasi since 2000 to address the multiple challenges faced by people living in Nepal's Siwalik hills (see section 4). TGT have been supporting them to do this since 2009. So far, we have been able to address some of the basic needs, but to enable Nawalparasi to adapt more permanently to climate change and build resilience to future natural disasters, the development process needs to move on. If it does not, people here will remain in poverty and become increasingly vulnerable to the impacts of climate change.

A1.1. Introduction

In 2018, TGT invited staff from HICODEF and two Nawalparasi farmers to attend a two-day training workshop in Solukhumbu, where another TGT partner, Eco Himal Nepal, are pioneering the layer farming of coffee in a similar hillside context. The visit was supported by Hupsekot Rural Municipality, Nawalparasi, who have identified the target area as a 'coffee pocket' that they will help develop. During the visit the farmers and HICODEF staff were able to see first-hand how significant a difference agro-forestry can make in remote mountain communities.

Coffee, as well as other high value crops, have been introduced in Solukhumbu as a climate change adaptation and livelihood improvement strategy. It is working, farmers there are growing coffee commercially and, thanks to layer farming methods, diets are also improving as fruit trees, root and ground vegetables are intercropped with coffee plants.

Local farmers in Nawalparasi have already been exposed to coffee farming, both through the visit to Solukhumbu, but also thanks to previous local government projects. The environmental conditions are suitable thanks to the altitude, aspect and climatic conditions. Climate change is having an impact on these conditions, but with the support this project will offer, these impacts can be adapted to and taken advantage of.

Most of the coffee trees that are currently growing in the seven villages have been left to go wild, in some cases farmers are not even aware that they have coffee trees growing on their land. There are reasons for this. Whilst coffee farming can be beneficial as an adaptation and food security strategy (see section 5.2) and in generating significant income (see section 5.3), it requires a specific skill set (section 5.4), specialist equipment (section 5.5) and a reliable route to market (see section 5.6). This project will enable all of this to happen.

A1.2. Cultivating coffee as a climate change adaptation strategy

Section 4.1 listed the environmental challenges that climate change is exacerbating in the target area. There is no perfect way of adapting to climate change, but coffee production is a viable option if well planned and carefully implemented.

Coffee trees support themselves with shallow roots that fan out just below the surface. As well as feeding nutrients to the main tree and holding it in place, these roots help to bind soil and therefore act to counter the soil erosion problems that are intensifying as a result of climate change.

Coffee trees need shade to stay healthy and thrive; farmers intercrop them with fast growing taller trees, for example the banana tree. This agro-forestry method does two important things. Firstly, it replaces more vulnerable agricultural practices, whereas vegetable and rice production require large volumes of water, coffee and other high value crops can survive and continue to grow if water supplies dry up for extended periods.

Second, when agro-forestry is introduced on land that was previously ploughed or barren, it has a transformative effect on the local environment; it is regenerative. Trees produce oxygen and provide shade; air temperatures are noticeably lower and air quality higher in wooded environments. As temperatures rise, this cooling effect on the micro-climate is significant and highly beneficial for humans and animals.

There is an indirect effect of a switch to agro-forestry too. Coffee and other crops produced in this way can be commercialised. Increased wealth, even when it is modest, makes other things possible. The income generated can

be invested in other climate change adaptation projects like water harvesting, insect control, polytunnels and landslide prevention.

Finally, trees have a far stronger carbon dioxide absorbing capability than rice and cereal crops that are commonly grown on terraces in Nepal. So, as well as being a climate change adaptation strategy, agro-forestry has a beneficial climate change mitigation effect. This approach comes under the broad category of ecosystem-based adaptation (EbA).

A1.3. Income potential for small scale organic coffee farmers

At a global level, climate change is predicted to have a catastrophic impact on coffee production in the coming decades. Some countries are more vulnerable than others, experts have predicted that production in Ethiopia, Nicaragua, Tanzania and Guatemala could all decline dramatically. The advice from coffee experts is to move production away from the equator and to higher ground. Nepal has the potential to gain a significant comparative advantage. The market for high altitude Nepali coffee is expanding domestically and internationally. It is considered a speciality drink and consumers are drawn to its unique taste.

Until coffee farmers are able to roast their own coffee (something we are planning to enable them to do in the coming years), they will sell it in 'parchment' form by the kilo. In Solukhumbu, farmers are currently selling coffee parchment at 500 Nepali rupee / kg (£3.40 / kg) and typically produce 50kg per year when they start, increasing to 200kg per year once their trees are more established. We can expect farmers in Nawalparasi to achieve similar volumes and prices. They will be enabled to create a reliable and just route to market (see section 5.6) through this project.

Around 150 trees are currently growing in the target area, but there is huge potential thanks to the amount of barren land available at the coffee growing altitudes. An initial survey of the target area reveals that there is enough land to grow up to 35,000 coffee trees. When fully mature, these trees could produce 5,000 tonnes of coffee beans per year. With careful planning and implementation, this will have a transformative effect.

A1.4. Capacity building for coffee farming using the 'layer farming' method

The 'layer farming', agro-forestry, method has been enthusiastically embraced in Solukhumbu and we will train farmers in this practice in Nawalparasi. It is essential to follow this method to avoid the problems associated with monocultures and to keep the coffee tree cool enough to survive rising temperatures. This is ecosystem-based adaptation (EbA). Figure 4 (see page 8) explains the method, as practiced in Peru, South America

In Nepal, the crops at the different levels will vary according to what is best suited in each locality. HICODEF will work closely with farmers in Nawalparasi to trial different crops at the different layers, but will stick to the layer farming principles. Vital for the health of the coffee tree is the amount of shade provided by trees at the upper levels. Too much shade and the coffee tree will not receive enough sunshine to drive the photosynthesis process. Too little shade and farmers risk exposing their coffee tree to too much direct heat, which can lead to significant withering of leaves and cherries, as well as creating an attractive breeding ground for insect pests.

The beauty of the layer farming method is the potential to produce numerous crops on the same patch of land. Cash crops are intercropped with vegetables, fruits, legumes and nuts that can improve diets locally.

A1.5. Providing specialist equipment for growing, harvesting and processing coffee

We learned during the development of our agro-forestry work in Solukhumbu that one piece of relatively inexpensive equipment can make a significant difference to the prospect of coffee farmers. Coffee beans are found inside red coffee cherries, removing the red fruity layer is the first step after harvest. Lacking equipment, farmers have to use their hands to remove each cherry, one at a time, it is a long and laborious process.

Understandably, the effort this requires is off-putting, many farmers do not judge it to be a good use of their time. The equipment needed, a hand turned pulping machine, can make all the difference. In Solukhumbu it has had a

transformative effect, farmers are able to strip their entire harvest of coffee cherries in a matter of minutes, rather than several long hours or days. By introducing simple hand turned **coffee pulping machines** to be shared amongst coffee farmers across the seven target villages we will make coffee production viable.

In addition to the pulping machines, we will also provide clippers and knives for pruning and money to buy equipment such as baskets for harvesting; buckets to wash and sort the cherries; and drying racks to ensure each bean has the optimum moisture content. Coffee trees produce more cherries and therefore more beans when they are well pruned; a well-kept coffee tree is short with branches that grow horizontally out from the middle. With the right training and equipment, we will enable the farmers to maximise the potential of each tree and process the bean to the high standard of the roasteries they will sell to.

A1.6. Developing a just and reliable route to market

We believe the coffee industry will only be truly just when those producing the raw materials receive a higher proportion of the profits generated by its sale than is the case for most coffee farmers today. The Glacier Trust is working towards this goal through all of its coffee producing projects in Nepal.

The journey of a coffee bean from tree to cup is a long one, with numerous stakeholders all of whom seek to benefit financially. The farmer who toiled to grow, harvest, wash, dry, carry and prepare coffee parchment often receives the smallest proportion of the income generated from the sale of a cup of coffee. Coffee producing nations often fair badly too. Value is added to coffee at two key moments in the chain, when it is roasted and when it is mixed with hot water. Coffee is usually exported before it is roasted, so very little profit is generated in the country of origin.

The Glacier Trust is seeking to address this problem. In partnership with Eco Himal Nepal we have already developed a relationship with Nuwa Coffee Estate who have a roastery in Nepal capital city, Kathmandu. Coffee from our project work in Solukhumbu is roasted by Nuwa Coffee Estate and sold on to cafés and supporter of The Glacier Trust. This is one route to market we can enable for farmers in Nawalparasi in partnership with HICODEF.

We will also work with HICODEF to create a route to market more locally in Nawalparasi, it may be that farmers can achieve a higher price for their coffee parchment that way. HICODEF has strong links with a local women's cooperative, Lekbhasi, who purchase agricultural products to sell on to wholesalers. In the initial phase of this project, HICODEF will help farmers to make the market links through Lekbhasi. As coffee production expands, HICODEF and TGT may also enable farmers to organise into their own coffee cooperative, with the potential to roast and sell their produce independently.

As coffee will be produced using the layer crop method, farmers will also produce other marketable fruits, nuts, legumes and vegetables. HICODEF will train farmers in how to bring these goods to market more efficiently to maximise earnings.

A1.7. Action-learning at school

Levels of knowledge on global environmental and climate change issues are low across the target area. Adults involved in the layer farming programme will develop awareness and working knowledge in these areas through their involvement in the project. However, we believe strongly that learning on these issues needs to begin at an earlier age.

There are six primary schools in the project area that currently serve 232 pupils. Over the five years, starting with three schools in years 1 and 2, the HICODEF team will engage with teachers and pupils to ensure the next generation begins to develop an understanding of the causes and effects of climate change and other environmental issues. The learning will be as hands on as possible and complemented by classroom activities designed and delivered in partnership with teachers. Children will engage in litter picking activities to improve their sense of care for the environment, they will be supported to grow their own plants on school grounds and invited to participate at key stages of the coffee farming process.

ANNEX 2: Project team, activities and equipment

A2.1. Project team

The project will be delivered by a full-time Programme Coordinator, supported by HICODEF's Executive Director and TGT's Nepal based Co-Director.

Additional support will be provided by a team of six agricultural students, who are mentored by HICODEF's Programme Coordinator and Executive Director. The students are from local secondary schools and technical colleges who are affiliated to the Nepal Government's Council of technical education and vocational training (CTEVT) and partnered with HICODEF. The students are required to complete a six-month work placement as part of their agricultural technician qualification, the placement serves as 'on the job' training (OJT). The involvement of these OJT Volunteers in the project dovetails with TGT's Higher Education programme which exists to develop the next generation of climate change adaptation professionals.

A2.2. Baseline survey

The HICODEF team will conduct a detailed baseline survey to establish the exact demographics of the target area, the economic and social status of each household; the quality and availability of the land; the current health of existing coffee plants; and the environmental conditions of the target area.

A methodology for collecting and analysing agricultural production will be co-designed and developed by HICODEF and the individuals who will be involved in the project.

A2.3. Group formation

Due to the geographical spread of villages and households across the target area, it is important to organise farmers into working groups. During the initial two-year phase, three coffee growing working groups of between 25 and 35 individuals will be formed. There will be an emphasis on female representation, with a target of achieving gender balance across all three groups. HICODEF will lead on the formation of these groups, ensuring they have robust governance structures. Once formed, the working groups will be given a legal identity through registration with their Rural Municipality department, making them eligible for government support.

A2.4. Training on layer farming, coffee production, harvesting and processing

This activity is core to the programme; training will be delivered by the Programme Coordinator, with extra support from the Executive Director, external coffee specialists and TGT staff. Each group will receive a two-day detailed coffee production, harvesting and processing training course. The course will be run by trained HICODEF staff at a 'field' location convenient to the group. All three groups (approx. 90 farmers) will attend a two-day training workshop in year one and another in year two.

The training will focus on:

- Nursery establishment, teaching farmers how to grow coffee from seed to sapling;
- Transplantation, to ensure seedlings can be transferred from the nursery to the field;
- Layer farming, with a particular focus on creating the optimum shade conditions for coffee;
- Water management, ensuring farmers manage water resources carefully and in line with climate challenges;
- Harvesting, teaching farmers how and when to harvest their coffee cherries;
- Pulping; farmers learn how to use the hand turned coffee pulping machine to remove fruit layer;
- Drying; preparing drying racks and teaching how to ensure coffee beans maintain the right level of moisture content ready for storage and sale in parchment form.

In addition to the training workshops, all 90 farmers will receive day to day support from the Programme Coordinator and volunteer apprentices who will visit farms regularly. Instruction will be one-to-one and/or in small groups. Volunteers will learn 'on the job' by assisting farmers with the physical tasks such as planting, pruning, digging, watering and harvesting.

A2.5. Stakeholders meeting

Stakeholder meetings will be held every six months to bring together HICODEF, TGT, local government staff, representatives from the three groups, members of the local farmers cooperative and primary school teachers.

Purpose of meetings:

- Improving connections between key stakeholders;
- Development of shared understanding of each stakeholders' strategic objectives;
- Opportunity for formal feedback to HICODEF, TGT and local government on progress of project;
- Reflections on project strengths and weaknesses;
- Dissemination and sharing of learning;
- Presentation of data and KPIs

HICODEF will co-ordinate, chair and report on all stakeholder meetings.

A2.6. Schools engagement

TGT's UK Co-Director (an expert in environmental education) and HICODEF will work together to design a schools engagement programme for all primary schools in the target area. In the initial two-year phase, the project will engage with three primary schools (approx. 115 pupils). The programme will be delivered by the Programme Coordinator with support from the OJT Volunteers. Key activities will include:

- 2 x litter picking and local environmental care events per school;
- 1 x assembly and 2 x workshop per school on coffee production and climate change adaptation;
- 1 x exposure visit to coffee growing area for up to 30 pupils per school;
- Ongoing support to develop simple pupil-led kitchen garden for each school.

A2.7. Seed and seedlings

In addition to practical training and advice, individuals and the schools will be supported to purchase the seeds and seedlings required to become successful in layer farming and agro-forestry. HICODEF will collaborate with farmers, schools and local government to achieve this. The project will not purchase the seeds and seedlings, but will cover the cost of transportation to the target area. Requiring farmers and schools to buy the seeds and seedlings themselves is a way to ensure that they feel ownership over their produce, an important element in ensuring the long-term sustainability of the project. The project will support up to 100 farmers in the initial two year phase.

A2.8. Ground and shade crops

Coffee is only one product of layer farming and agro-forestry. Ground and shade crops are vital and allow farmers to also produce fruits, legumes and vegetables for sale or to improve diets. The project will support farmers to grow ground crops like ginger, turmeric and a variety of root vegetables. The Programme Coordinator will organise quarterly plant clinic workshops in each village to enable farmers to develop the skills needed to grow and nurture ground crops. Effective water management techniques will be taught along with organic fertiliser and organic insect pest control methods. Farmers will also be supported to grow shade crops such as Paulilna and Banana trees that provide crucial protection to the coffee trees that grow below them.

A2.9. Equipment

Farmers involved in the project will be given 50% match funding to purchase key agro-forestry and coffee processing equipment. We will support the purchase the following items in the initial two-year phase. These will be shared across the first three villages:

- 2 x coffee pulping machine (hand turned)
- 6 x plastic pond
- 6 x plastic polytunnel sheets
- 3 x coffee grinding machine (hand turned)
- 3 x pruning saw
- 3 x spraying tank and sprayer (for organic pesticides)
- 6 x plastic buckets for washing coffee
- 1 x coffee weighing machine

A2.10. Marketing and Exposure visit

By year two, farmers should be ready to sell coffee and other produce to local and national markets. To enable this and to ensure products reach the market in the most efficient and profitable way, HICODEF will coordinate a marketing workshop. The workshop will be attended by farmers, local government officials, traders, the local cooperative group and TGT staff. The primary aim of the workshop will be to agree on a way to get produce from the villages of the target area to the market.

A2.11. Exposure visit

Also, in year two, TGT will work with NGO partner Eco Himal Nepal and HICODEF to organise an exposure visit to Deusa Agro Forestry Resource Centre (AFRC) in Solukhumbu (eastern Nepal), which has been coordinating commercial coffee production since 2016. Nine farmers and two HICODEF staff will travel to Deusa AFRC for a learning exchange visit. They will meet coffee farmers from Solukhumbu to learn more about their techniques and share their own experiences.

A2.12. Monitoring and Evaluation

Regular monitoring, supervision and data recording will be conducted by HICODEF throughout the project. Each farmer involved in the project will be given a diary to keep a record of their production. The Programme Coordinator and OJT volunteers will support farmers in their record keeping and ensure that they are up to date.

HICODEF will keep records of the number of people attending each formal training workshop and the wider number of people benefiting from the project. HICODEF will also monitor changes in knowledge, attitudes and skills related to layer farming, climate change and agro-forestry.

TGT's Nepal based co-directors will visit the target area at least twice a year. TGT's UK based co-director will visit at least once a year to monitor and report on progress.

At the end of the first year of the initial two-year phase an external coffee growing specialist will visit the target area to verify that the project work is of a high quality and on track to meet the objectives of the project.

Furthermore, to guarantee the legacy of our previous work in Nawalparasi, HICODEF staff will visit the villages of Dhahaba, Durlunga and Sartakun to monitor the sustainability of the ECCLA (Enhancing Community Capacities for Learning and Adaptation to Climate Change) project.

All monitoring work will feed into the learning and reflection process that is crucial to the implementation of the project. Results will be analysed by HICODEF and TGT and reported on at stakeholder meetings. Any issues or problems will be identified through this process to help find and deliver solutions. Successes will also be highlighted to ensure positive results are understood and replicated.

ANNEX 3: Qualification to act

The Glacier Trust was founded in 2008 to enable climate change adaptation in Nepal's remote mountain communities.

A3.1. Current work

Our current climate change adaptation activities in Nepal:

- I. We partner with Eco Himal Nepal to support the work of Deusa AFRC in Solukhumbu, which is expanding in size and influence. To complement Deusa AFRC and its activities, we also support EcoHimal's Sustainable Tree Cropping (STC) programme in Solukhumbu. This programme covers Deusa and Waku in Thulung Dhudhkoshi but has recently extended to other wards and into the neighbouring district of Khotang. The STC programme emphasises the promotion of high value cash crops, grown using organic and intercropping methods. Notably, we have enabled over 300 farmers to grow high altitude speciality coffee, which not only helps farmers adapt to climate change, but also provides a valuable new income stream.
- II. The Glacier Trust has been working in direct partnership with HICODEF in Newalparasi since mid-2016 and has successfully initiated the ECCLA programme in Deurali VDC.
- III. TGT partnered with Eco Himal Nepal in the Sankhuwasabha district of eastern Nepal to pilot the installation of improved cooking stoves in 2017. With our help Eco Himal have recently secured funding to scale this project from the original 30 households to 160 households. TGT will play a role in monitoring this work and is currently seeking funding for a further expansion. The stoves help to mitigate against deforestation while bringing significant health benefits to families who, for the first time, are able to live in smoke free homes.
- IV. In late 2018, TGT secured funds from the Marr Munning Trust to start a five-year programme in the central Nepal district of Kavrepalanchok. Here we will work with EcoHimal to replicate the success of our Agro Forestry Resource Centre model. Eco Himal have just broken ground in Mandan Deupur, where a brand new AFRC complex, with plant nurseries, training centre and demonstration plots will be built. This project will enable farmers in Mandan Deupur to adapt to climate change and transition from harmful inorganic farming to organic methods that improve health and promote wildlife.

A3.2. How we work

The Glacier Trust is a UK registered charity (no. 1124955) run by two directors, one a paid part time employee based in the UK, the other a Nepal based volunteer. Our UK based Co-Director, Dr. Morgan Phillips has been in post since December 2016. He is experienced in programme and project management for environmental and international development NGOs.

Our Nepal based Co-Director, Richard Allen, is an agricultural scientist with over thirty years' experience working in Nepal. We have five UK based trustees with expertise in international development, sustainable development, the arts, education and IT. All trustees take an active role in the charity, four out of five have first-hand experience of our project work in Nepal. In addition to staff and trustees, we have two ambassadors, actor Siân Brooke and adventurer Levison Wood. To learn more about our team, please visit the people page of our website.

Income is largely derived from funding appeals to our existing supporter base, sponsored challenges and partnerships with schools and sports clubs. This provides us with a proportion of the funds needed to carry out our project work, the remainder is raised through applications to grant giving bodies.

The Glacier Trust works in partnership with Nepal based partner NGOs. We take an active role in project design and monitor progress through robust quarterly reporting and regular site visits. Project delivery is carried out by our partner NGOs, with activity, targets and reporting agreed in advance. Recent projects have been designed and delivered in collaboration with EcoHimal Nepal, HICODEF and Tribhuvan University.