

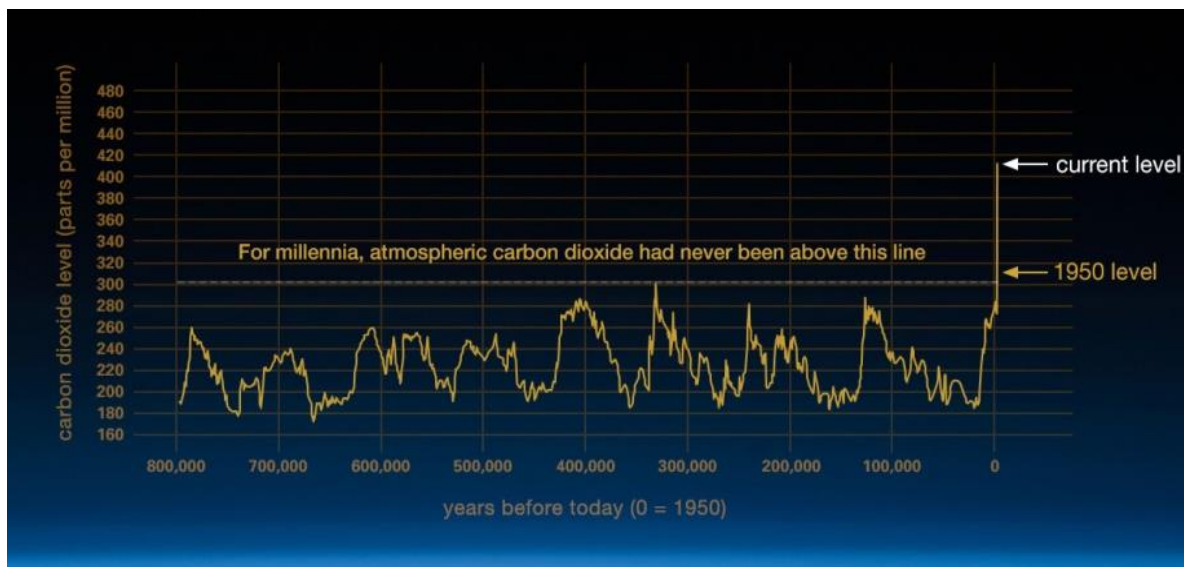
## The Power of Plants

### Using Sustainable Agriculture to Mitigate Climate Change

Climate change is currently a hot topic of discussion across the world, from political debates to social media chats. Over recent years the effects of climate change have been studied, modelled and future projections created, to understand the outcome of the path that the Earth is currently on, with an underlying message of huge ecological problems world-wide to come.

#### What do people really mean when they talk about climate change?

Although the climate of the Earth varies naturally over time, and has changed drastically since the formation of the planet, the changes to climate patterns over the last 150 years cannot be explained by natural causes alone. This phenomenon of accelerated change currently occurring across the globe is what we refer to nowadays as 'climate change'. It was instigated by the progressive rise of the average temperature of the planet, brought about by an increase in concentrations of greenhouse gases emitted into the atmosphere by human actions <sup>1</sup>. The major gases contributing to the greenhouse effect (the trapping of the sun's heat in the atmosphere) are carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>). Between the years 1750 and 2000, levels of CO<sub>2</sub> have increased by approximately 31% and CH<sub>4</sub> by 151%<sup>2</sup>, and as can be seen on the graph below, we have never known the levels of CO<sub>2</sub> to be so high <sup>3</sup>.



*This graph illustrates the trends in CO<sub>2</sub> levels in the atmosphere between 800 000 years BCE to present. The significant rise in levels over the last 150 years can be noted. (NASA Climate Change <sup>3</sup>).*

The shifting climatic patterns threaten many aspects of human life, including food security, increase in the risk of extreme storms and flooding, expansions in the ranges of tropical pests and diseases, and rising sea levels<sup>2</sup>.

Some such areas affected by the changes in the climate are the mountainous regions of Nepal. High altitude regions have been described as arguably being ecologically the most affected areas by climate change<sup>3,4</sup>. These areas are not only more vulnerable to the effects of climate change due to

their low adaptiveness, but the local communities are often completely reliant on the products of local resources for their livelihoods<sup>5</sup>. As such, when the climate changes and the yield is less dependable, these remote populations do not have the possibility to adapt, and have little buffer against the consequences. These changes have already begun to be studied, with changing rainfall patterns and decreased snow cover being observed to affect agriculture across high-elevation areas of Nepal and India<sup>6, 7</sup>. Additionally other issues have been linked to climate change in high altitude areas, such as a decrease in soil organic carbon content<sup>8</sup>, and a reduction in plant density<sup>9</sup>. Furthermore, many of these areas in the Himalayan Mountains receive their water from glacial run-off, a source which provides water for millions of people on a global scale. Unfortunately, the glacial ecosystem has been strongly affected by climate change, and the increased melting of the glaciers will cast doubt over the reliability of the source in the future.

### **Can we protect the future?**

Luckily, the answer is still yes, and it is believed that the effects of climate change can be mitigated if we work as a global population to reverse the causes. The choices that we make every day in regards to energy and water use, transport, diet, and many other small decisions that we make on a daily basis make an impact on the greenhouse gases we release into the atmosphere. But as well as those choices, we need to use renewable energy, prevent (and reverse) deforestation, stop mining, and most importantly change the focus of the world away from short-term economic gain, and direct it instead towards the long term plan for survival, and ultimately a much better, cleaner, and more sustainable world to live in.

Whilst this seems a fanciful and far off reality, it is the reality that we need in the world, and soon. Some areas, and some communities, will be hit the hardest by the changes occurring, and often they are those who rely on subsistence farming for a living, and have very little in the way of buffer to protect themselves from the changes occurring.

### **Practical Aid**

The remote village of Jaleshwori, located in northern Khotang in the Himalayan Mountains of Nepal, is the home of one such community. The village receives its water from glacial run-off, and the population of the village are almost entirely subsistence farmers and their families. Since 2014, Nepal Remote Villages Trust has been striving to provide practical aid for this and surrounding villages. Successful projects include installing solar panels to provide free, clean energy to the schools of the area, and providing drip irrigation kits to 80 families to aid water management and enable farmers to use the water resources more efficiently. Additionally NepalRVT has provided agricultural training to a group of interested farmers both male and female.

NRVT is currently buying farming land in Jaleshwori to establish a Community Farm. The land will be owned by NRVT Nepal and the farm will be run for the benefit of the whole community. Altered climatic conditions mean that traditional crops and farming practices are inadequate and often no longer provide sufficient nourishment to keep the mountain people strong and healthy. However, subsistence farmers are understandably reluctant to use their valuable terraces to trial new crops. If the harvest fails there is literally less to eat.

The community farm will be a centre for trying out new crops and for demonstrating new techniques and good farming practice. In addition to new vegetable crops, NRVT intends to establish a tree nursery to trail and propagate various varieties and species of fruit and nut trees.

Primarily, the native fruit trees planted will provide a reliable, easily managed crop for the local people to consume and sell, allowing them to gain a little extra economic stability. From a landscape perspective, the trees and their root system will help to stabilise the earth, hence decreasing the risk of landslides and assisting in the capture of water. In addition, the rhizosphere growth and activity will improve the biological activity in the soil<sup>11</sup>, increasing soil organic matter and nutrient content, especially after the addition of new, decomposed leaf litter dropped from the trees<sup>12</sup>.

One of the main benefits of this project however, would be the carbon sequestration provided by the vegetation and tree growth. Carbon sequestration is the phrase used to describe the capture of carbon dioxide gases from the atmosphere to be stored in solid or liquid form. In this situation, the CO<sub>2</sub> captured by the trees would be incorporated into their biomass, to become leaves and branches, or transferred to their symbiotic mycelium underground. Many studies have identified fruit trees as beneficial and practical carbon sinks, and as such their use should be promoted (*eg.* <sup>13, 14, 15</sup>). In this way, the project aims to directly face climate change and tackle the cause of the problem, whilst providing real practical aid. On top of this, this relatively low-cost project would allow the villagers to gain insight into the causes and consequences of climate change and become more involved in these global issues, along-side the improvement of their socio-economy through food production.

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NRVT Drip irrigation project in Jaleshwori, Khotang, February 2019

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