The Sustainable Helicropping Group works with farmers, industry partners (seed, ag-chem, and fertiliser and helicopter contractors) and regional councils nationwide.

We formed as a group in recognition of the need to protect our soils in terms of quality and keeping them on farm. Soil loss degrades this valuable resource on farm and in the form of sediment degrades our waterways and ultimately our estuaries.

Helicropping brings on farm game changing advantages being cost effective, not destroying the soil structure and offering a greater window of opportunity to use land more effectively where access is difficult or soil conditions (too wet) do not allow wheeled vehicle access.

Cropping is widely practiced nationally as a method to address feed shortages on farm. It also serves as a pathway to improving pasture quality, allowing the establishment of better performing pasture species.

Helicropping enables farmers to establish crops of a comparable quality in terms of reliability and quantity with cultivation without affecting the soil structure that is so important to soil life (micro and macro) and water/air infiltration. The technology also allows pasture renovation.

Helicropping also introduces the opportunity to reintroduce native plant species (for example manuka) into areas difficult to access.

Soils are vulnerable at crop harvest (grazing). We have shown that a helicropped summer crop, with the soil structure intact, is not vulnerable to soil loss. This is not the case with winter grazed crops. Two of our objectives are on grazing and bund/buffer management to protect the soil. Outcomes are applicable to water quality management policy.

We are also investigating the establishment of companion plants to capture the nitrogen that is concentrated in stock urine at grazing. The concept of planting a companion plant that may both intercept nitrogen and provide forage is novel and applicable to water quality management.
We believe that we have identified management opportunities for farmers that will incentivise them to better protect their soils. These opportunities are grounded in better profitability and flexibility of land use.

Submission
The Sustainable Helicropping Group works with farmers nationwide and is partnered by the seed and agrichemical industries, Beef and Lamb NZ, regional councils and MPI (see Appendix 2 for partners and affiliations). The Group has demonstrated helicropping to be a cost-effective way to establish crops and renovate pastures in all classes of land but in particular land difficult to access (see Appendix 1 for publications).

Helicropping is a prescriptive process to ensure successful crop establishment. The absence of tractors and ploughs from the process ensures the soil structure is left intact as the crop is established. Advantages of helicropping include time saving by contractor and farmer, safer activity by contractors, and by not being constrained by soil moisture that would exclude a tractor ensures a larger window of opportunity to establish a crop/renovate a pasture.

The Group and its partners recognise the valuable tool that helicropping is to our pastoral industry. Fodder crops are popular winter crops in many regions of New Zealand and are often part of a programme to renovate runout or inferior pastures. Cropping allows weed and unwanted grass species to be eliminated prior to establishing a new pasture.

To complete this process while leaving the soil structure intact has very important implications both for the soil ecology and the sustainability of pastoral farming.

By allowing cropping/pasture renovation of areas previously inaccessible helicropping has important implications for the sustainability of pastoral farming. Not in terms of increased intensification but by better land use.

Retaining the soil structure also retains the soil micro and macro organisms (pest disease organisms that help keep pest populations in check and earthworms so essential to maintaining soil quality and carbon). Increased soil biodiversity is an indication of a healthy soil.

A healthy soil retains versatility; water infiltrates more readily and is less prone to erosion.

However, cropping on soils that may be vulnerable at grazing may lead to large quantities of urine nitrogen deposited on bare soils and stock treading that can destroy the soil structure.

Hence, the focus of the Group is to protect our soils as custodians of this non-renewable resource rather than ‘miners’.

We recognise the down stream effect of poor soil management.

The Group supports the need for action to improve the health of our waterways (Essential Freshwater). Its formation was borne out of recognition for the need to protect soil quality and keep soil on the land.

We would like to see more incentivisation to achieve the goals we all aspire in restoring our water quality rather than resorting to regulation and penalty. We believe the work we are undertaking in our MPI SFF project can identify aspects such as increased profitability and sustainability that might form the basis of useful incentives for farmers to work towards what are common goals.

We are seeking recognition that the work we are undertaking will form part of the move to improve farming practices, in particular retaining the soil structure over a range of soils and identifying and establishing effective cover/catch crops.
We have established the practice (e.g. Lane et al., 2016) and economics (Young et al., 2019) of helicropping and believe it to be a pathway that could incentivise better farm practice through reducing work load (time saving to establish a crop/renovate a pasture), improved health and safety (tractors with cultivation/sowing implements are not used) and an opportunity to increase profitability (better fed stock means better returns and an opportunity to reduce stocking rate).

While we agree that planting more trees will reduce soil loss, we note that commercial plantations of exotic species (in particular *Pinus radiata*) do not contribute to biodiversity, degrade the soils on which they are planted and pose considerable risk of soil loss at harvest. *Pinus radiata* is no more than a long-term crop. We plan to assess the capability of helicropping to establish native species such as manuka (*Leptospermum scoparium*) and would like to assess the establishment of some podocarps. We have developed the helicropping technology to apply pesticides, fertiliser and a range of seed sizes with successful results for a range of crops and believe the technology may have a role to play in re-afforestation with a focus on having the right trees, in the right place, for the right purpose.

Crop utilisation (grazing) issues are part of the Group's investigatory focus. We have measured soil movement following grazing of a summer crop established by helicropping and found little evidence of soil loss. We are currently investigating significant changes to the way winter crops are grazed to enable the retention of soil structure and reduce the risk of soil loss.

Protecting the soil from the impact of rain, reduce carbon loss and cycle nitrogen in the soil is the role of cover/catch crops. As farmers we require these crops to establish reliably and rapidly in order to supply forage to our animals particularly during times of feed deficit. We have looked at establishing a cover/catch crop as companion planting with the main crop with limited success dependant on the species, growth form of the primary crop and grazing intensity. Currently we are focused on establishing a cover/catch crop post grazing over a range of soil types and regions. The Group is able to contribute to grazing standards that would work both for the environment and be beneficial and practical for farmers.

The Group is on record in the support of effective rules. We are working with regional councils and helicopter contractors to create good practice procedures to ensure the success of helicropping. We plan to develop a decision support tool as we better understand the implications of risk to winter grazed crops. We believe we are well placed to contribute to the development and implementation of national rules and improve farm practices.

**Appendix 1 Publications**

*Hill country cropping with no land-based equipment.* 2016 P.M.S. Lane, S.A. Lee and B.E. Willoughby New Zealand Grasslands Association Hill Country – Grassland Research and Practice Series 16: 251-256

*Helicropping – early adopters’ experiences.* 2017 P.M.S. Lane and B.E. Willoughby Journal of New Zealand Grasslands 79: 131-134

*Helicropping – The role of nitrogen and phosphorus in forage cropping with aerial no-tillage.* 2018 P.M.S. Lane Agronomy NZ Journal pp 67-76.

Appendix 2 Partners and Affiliations

- Beef and Lamb NZ
- Ministry for Primary Industries (MPI)
- Ballance Agri-Nutrients
- Agricom
- PGG Wrightson Seeds
- Nufarm
- Bay of Plenty Regional Council
- DairyNZ
- Waikato Regional Council
- Horizons Regional Council
- Environment Southland
- Environment Canterbury
- Farming with our Environment Group – Southern North Island Farmer Group

Attached are copies of the two field day handbooks given to attendees at the field days. Double click on the cover to access the document as an embedded file.

Personal details removed
On-Farm Field-day: Helicropping - Protecting our soils
Hand out

Friday 8th March 2019
Waihora Station, Mangakino
Farm Field Day: Helicropping – Protecting our soils Summer Cropping Handout

Friday 3rd May 2019
Maungahau Farm, Otorohanga