LINKONLINE

Short webinars for environmental policy-makers and practitioners

How can small clusters of trees add value to rural landscapes?

The following questions were asked during our live webinar with David Whitehead and Sam McNally but due to time restrictions, we were unable to answer these in the session.

With areas retired from pasture within the agri forestry system, have economic values of reduced stocking rates/production be accounted for within calculations?

We have an economics component of our project which will plan to explore these aspects such as reduced stocking. These calculations were not included in our presentation but our goal is to value the additional co-benefits so we can look at the trade-offs associated with planting these groupings of trees..

Message to researchers - please connect with Tane's Tree Trust as there are elements of the Trust's R&D programme that are likely to have useful synergies with this research - particularly integration of native trees into farmland, via mosaic landscape, ecosystem services approach.

Thanks for letting us know about this work. We also have Tane's Tree Trust represented on our End User Advisory Group so will be engaging with the group.

Would the trees be fenced off? The edge effect is very interesting, but stock grazing underneath tree canopies cause soil compaction which can have adverse effects on tree health including damaging feeding roots and ability to draw oxygen.

We plan to have a mix of both fenced and non-fenced groupings of trees through our study so we should be able to explore the impacts of stock on this edge. Our soil sampling involves a measure of bulk density so can address the question of whether there is greater soil compaction under the trees or not. Exploring whether a site is fenced/unfenced when looking at the bulk density data should give us an idea about the effect of stock and soil compaction.

There is some NZ and international research on adverse ecological edge effects on combinations such as native forest remnants within pasture. Will you attempt to balance these adverse effects with the positive effects postulated?

Yes, we are aware of adverse edge effects. A good example could be high wind environments where trees on the edge may be smaller than the interior. We will explore the trade-offs between these effects and include them in our analyses.

Questions & Answers

Are you most interested in exotic species or native?

We are interested in both. The way we are approaching this is to look at functionality of the vegetation (e.g. carbon inputs and quality) as opposed to specific species. Both exotic and natives will play a part.

There is another project by Colin Meurk on right tree right place, might pay to link up with him.

Thanks for letting us know. We have already discussed this with Colin and we will follow up.

Are you able to provide a summary of or links/references to key international research?

We can provide references about the effects of tree edges on carbon stocks on request. Please send a separate email with more specific questions.

Will you be looking at the farmer management under the tree clusters and how that might enhance the C sequestration and etc e.g. fenced vs not fenced/grazed under trees?

We will have a mix of fenced/unfenced sites to address this question. We will also be working with farmers to understand the site history and management so that we can best understand any effect we might observe.

Thanks, very interesting. Is there greater biomass in a cluster than in a plantation forest because roots and branches are extending beyond the nominal area and sucking in resources (water, light, nutrients) from what is basically a pasture environment?

There are many possible reasons that might drive greater biomass on the edge such as increased light, nutrients, water and reduced competition. However, the trees on the edge could also be smaller due to effect such as wind. In addition, we will be exploring the concept of edge effects on microbial function that could lead to increased carbon uptake by trees.

Ecological weeds are known to flourish on forest/pasture edges. Is this impact an area of investigation/consideration of the current study?

During our sampling we will be document species present in the vegetation. This applies to measurements along the transects. So while not a specific question we are seeking to address, we should get an insight to this.

Deer Industry NZ and NZ Deer Farmers Association would be interested in collaborating.

Thanks, we will be pleased to follow up on this and discuss further.

David - the Farm Forestry Association would likely be very interested in this project.

Thanks, we will follow up with the FFA.

Be great to see how your project advice flows through to funding for tree establishment and fence costs for landowners.

Thank you, we will be addressing barriers and incentives for farmers to adopt on-farm tree planting practices.

Can the part on how methane reduction up to -053 MtC - eq be clarified, I missed it, will it be due to reduced animal stocking rates due to the trees taking up more space within grasslands?

We assumed that if you planted permanent forestry there would be no grazing so a reduction of methane for that equivalent area. For the clusters/grouping of trees we assumed a reduction up to that amount could be achieved but this is very much dependent on the context. For example, whether that area of trees fully excludes stock or not, or whether the vegetation could be used for forage. It also depends on the reduction in stock numbers resulting from planting an area of grassland with trees. We will be doing more sophisticated calculations to evaluate all benefits.

Have you been in touch with Pāmu/Landcorp, Silver Fern Farms and Synlait all of which are proactive in new areas such as this?

Yes, we have been in contact with PAMU and they are on our End User Advisory Group. We will follow up with the others and keep them connected.

Will the modelling or measurements look at the effects of shadowing by trees on adjacent pasture quality? Will the water needs of the trees impact adjacent pasture quality?

We will be making measurements of grassland productivity at our sites and we should be able to understand the impacts of trees on this. We also have colleagues who have modelled shade effects so will be able to draw on these if required.

Are clusters of trees more vulnerable to wind throw and extreme events than larger areas of permanent forest, and if so, will this be included in the models?

Yes, trees will be susceptible to wind throw and extreme events. We are working with our colleagues from Scion to look at metrics of wind susceptibility as this will be important when considering where in the landscape we might put trees. Our landscape modelling will also be able to explore aspects of this.
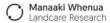
The value of the research outcomes is likely to be skewed or at least reduced by excluding biodiversity benefits and focusing on carbon stocks and other co-benefits with a focus on economics.

The rationale for excluding biodiversity seemed to be other research occurring in that area. What research were you thinking of there?

We have not started this work yet, but we will be incorporating economic and environmental drivers of biodiversity into our calculations of benefits. The scope of our programme does not allow for new research in this area, but we will draw on findings from our colleagues at Manaaki Whenua - Landcare research and the University of Canterbury, in particular.

There would be a need to quantify competition effects between tree clusters and pasture as it impacts pasture productivity. This would probably be a barrier that needs to be overcome before landowners adopt this form of land use.

We will be measuring grass and understorey indices along our transects and in relation to trees. So we will get an understanding of any positive or negative effects of trees on pasture quality and production to address this question.

How can we improve the carbon rates estimates for scattered trees, shelterbelts, and other on-farm categories sequestration, that currently seems to be so heterogeneous?

We intend to use our data to develop improved estimates of standing biomass in tree clusters. We will not be able to measure changes in time but we will be measuring clusters of different ages, so we may be able to estimate rates.

When it comes to native forest, I think it might pay for you to treat remnant blocks differently to recently replanted areas. It might make sense to exclude remnant bush stands, as these will have soil characteristics that are typical of pre-European times and are not really a management option for farmers (you can't create a new stand of remnant bush!).

Yes, we have already decided to exclude remnant native bush patches from our study as these are quite different to planting trees in grassland.

Excellent project. Re co-benefits, specifically erosion, might you link with the STEC project?

Yes, our colleagues at MWLR have a lot of expertise in erosion that we can draw on.

What are the project timelines/deadline?

The programme is for 5 years and started in October 2022. As we are early on in our project feedback has been appreciated.

The NZ Farm Forestry Association already has a lot of experience in learning what species grow well in what soil types, rainfall and temperatures. You don't have to reinvent the wheel altogether.

Thanks for your feedback and we certainly are not wanting to reinvent the wheel. A large aspect of this programme is centred around the edge effect and maximising this. We are hoping that understanding this in relation to vegetation/soil/climate will help to add value to the vast amount of information available. Our landscape modelling will be exploring the arrangement of trees to maximise this edge effect and the co-benefits associated with planting different vegetation types. So we see this work as complimentary.

Scion has found that soil carbon increases radically at about 2m below the surface due to mycorrhiza. At what depth are you taking your samples?

We are focussing primarily on the 0-60 cm depth for soil sampling, but we are working closely with Scion who are one of our collaborators on this project. So, we should be able to draw on their information in this area in relation to mycorrhiza at depth.

Questions & Answers

Something like a large-scale permaculture design project?

We are open to working with a wide range of tree clusters including agroforestry. But it's unlikely that permaculture will be within our scope because we will be working with systems where interventions are minimal.

Are we assuming fences around these clusters?

We intend to work with a mix of fenced/unfenced sites.

Do you think clusters would be effective for the long-term conversion of all of a grass area to indigenous forest?

Thanks for your interesting question. We are not saying that we should convert all our grassland to indigenous forest but the clusters, may have benefits in supporting native afforestation.

How do you see it possible to work outside of the forest definition >1ha, 30% crown cover of trees greater than 5m in height at maturity for the ETS?

In the first instance we need better information on the dynamics of these smaller plantings to provide evidence to support working outside of the current settings. Through a combination of data and rigorous modelling, we think it is possible to move beyond these settings and improve measurement techniques to estimate carbon stocks in smaller groups of trees. Our role is to provide data and evidence and we will engage to inform policy.

Research overseas increasingly suggests benefits of planting at least 4 different families of plants together. Any thoughts on if this applies with trees?

Many studies have shown that planting diverse species in grasslands and forests can lead to benefits in productivity. We will not be able to test this directly, but we are working in clusters of trees comprising different species.

As you mentioned, the ETS doesn't account for the small clusters of trees on farms and the area of trees must be reach a certain area/width. Would you recommend people to create clusters to reach this required ETS area and if not, why not?

Yes, that is one possibility that could be adopted for both the benefits of edge effects and meeting the criteria for the ETS. We will also provide evidence to inform policy. Through our landscape modelling we hope to explore the different arrangements that could be trialled to maximise all co-benefits. We are proposing that there benefits will be greater for tree groupings rather than widespread continuous forestry.

Is there any interest in the medicinal benefits of tree varieties. e.g. edible foliage for control of animal parasites

While this is an interesting point it is not a current focus of the study.

Questions & Answers

Trees provide shade and shelter to stock who tend to congregate under them. At the same time, fertilising the soil where they stand. This is the excuse given by some farmers for not using trees - they say that the paddock is not evenly fertilised by the stock if they congregate habitually in just a few spaces.

This is a good point. The nutrient transfer by stock is one of the reasons that could be driving the edge effect. The trees also provide shelter and shade for the animals. There will likely be trade-offs but the key will be balancing these.

Will the spatial distribution of the tree patches be accounted for? Potentially creating movement corridors for native birds?

In our landscape modelling, the arrangement of clusters will be considered which may influence many benefits including bird movement. We will not work directly ourselves on bird corridors but we will consult with our colleagues at MWLR.

What is the definition of a "tree cluster"?

This is a really good point and something we haven't yet fully defined. At this stage we are interested in the edge effect so require a large enough cluster to move from the interior to the grassland. We are hoping that through the project we will be able to better quantify this edge effect and then provide better guidance of patch/cluster size.

How will this research contribute to policy around biodiversity credits?

Our findings may provide insights that could be used to assess differences in biodiversity, but direct research into this is outside the scope of our project.

I enjoyed the talk. The topic is central in addressing NZ's mitigation goals. My only concern is the 4-year time span to provide carbon storage in soil and trees.

Thanks for your comment. We are aware of the short time frame for carbon storage. Hence, we will be sampling form already established tree groupings, rather than planting trees and tracking change. By using transects from the grassland into groupings of trees that have been established will enable us to quantify any change in soil carbon storage as a result of the trees.

Questions & Answers