Biomass Workshop Series 2020/21: REDII Implementation and Beyond

Workshop 4: Carbon, forests and climate impacts of woody biomass

30 November 2020

Content

Objectives and structure of workshop

Objectives of the workshop

This was the fourth workshop of a series held in quarter 4 of 2020 and quarter 1 of 2021, supported by the European Technology and Innovation Platform Bioenergy (ETIP Bioenergy), the International Energy Agency's Bioenergy Technology Collaboration Programme (IEA Bioenergy) and The Sustainable Biomass Program (SBP).

Other workshops in the series covered the implementation of the recast of the EU Renewable Energy Directive ('RED II'), biomass supply chains, biodiversity protection and social impacts.

Although widely recognised as a form of renewable energy, the climate benefits of biomass are questioned by some who view that benefits accrue over a time horizon that may vary from a few years to several decades. With no harmonised methodology available for companies to demonstrate climate benefits and verify balanced carbon stocks, the issue is complex. The aims for the workshop were:

- To identify and explain the different views on the measurement of the climate impacts of woody biomass, the underlying concerns and worldviews/priorities to achieve better mutual understanding
- To identify areas of possible agreement within a wide number of stakeholders
- To understand what timeframes are acceptable for bioenergy systems to deliver climate benefits compared to fossil energy systems and how these timeframes can be determined (with a simple set of rules for a wide variety of settings)
- To discuss possible ways forward to ensure the use of those woody biomass feedstocks that can deliver climate benefits, including a path to finding the balance between perfection and practicality and the role for certification schemes, such as SBP.

An understanding of the impact of the use of forest biomass for energy is essential to achieving sustainable benefits from bioenergy. However, scientists are not in agreement on how to measure and address its climate benefits. This leaves regulators and policy makers (and the general public) confused and concerned about the use of forest biomass for energy. Yet, in displacing fossil sources woody biomass plays a significant role in the current renewable energy supply mix; and there are opportunities for this to expand. The European Union will be implementing the RED II revision next year and sets out conditions under which biomass may be used. Partly in relation to this the SBP is currently revising its standards, including reviewing the Principle on regional carbon stocks within its Feedstock Compliance Standard.

Structure of the workshop

The workshop was held 'virtually' over the Internet. Presentations were posted in advance of the workshop. 421 people registered for the workshop; 217 attended on the day and 74 people watched the full presentations.

Short (~ 8 minute) summaries of the presentations were presented on the day, followed by a question and discussion session. Participants could ask questions directly to the presenters online during the workshop and afterwards on 'Howspace'. The final session of the workshop posed a number of questions on specific issues relevant to the way in which the impact of

forest biomass on carbon might be measured to give participants the opportunity to provide their views. The results to this session are shown in Annex 1.

Presenters

The presenters on forest carbon outlined:

Richard Peberdy, Drax

LINK TO PRESENTATION (COMING SOON)

Linde Zuidema, FERN

LINK TO PRESENTATION (COMING SOON)

Annette Cowie, IEA

Annette presented on climate effects of forest-based bioenergy with input from IEA Bioenergy Task 45 “Climate and Sustainability Effects of Bioenergy within the broader Bioeconomy”.

LINK TO PRESENTATION

Pat Howes, Consultant

Pat presented on the use of North American woody biomass in UK electricity generation: Assessment of high carbon biomass fuel sourcing scenarios.

LINK TO PRESENTATION

Robert Matthews, Forest Research

Robert presented on possible approaches to regulating the use of woody biomass to ensure climate benefits.

LINK TO PRESENTATION

Áurea Nardelli, RSB

Áurea presented the key aspects of RSB’S certification system approach, and the way it handles different categories of woody biomass.

LINK TO PRESENTATION

Conclusions of the workshop

The following section presents a summary of key points from the presentations and discussion in the webinar and on Howspace.

In the webinar there was general consensus on some issues that participants agreed were important. This included important gaps in data; and areas where carbon accounting methodologies do not result in clarity on the carbon impacts of the use of fibre for pellets. It was clear that there are different objectives for different stakeholders and difficulties in reconciling these. This led to a lack of consensus on some issues.

A summary of these points follows. Issues where there was general agreement are presented first, followed by a summary of those issues for which there was a lack of consensus.

Issues for which there was general agreement

Key issues and principles

Carbon stock in the Supply Base[1] should be maintained as a minimum or carbon stock in the supply base should be increased. To measure and monitor this a baseline against which we compare carbon stocks has to be defined.

Sustainable forest management (SFM) should ensure that forests are managed with due care to achieve environmental, social and economic objectives. Although the concept of SFM was established some decades ago, it has constantly evolved. Carbon management has become a key focus in recent years.

There is a need to proceed with caution in situations where governance and sustainability management is not well established.

The use of forest wood for pellet fibre embodies a trade-off between all aspects of sustainability. Aspects of the debate around the carbon implications of the use of this fibre include: how residues should be treated (including how much should be left in the forest); how carbon is measured and monitored; and the contribution of the market for pellet fibre to the forest economy and investment in forests. Forest owners respond to a variety of market, political and local signals, and pellet demand is just one of these. One pellet user summarised this issue on Howspace as follows: “The important factor is to understand how pellet demand assists (or otherwise) forest owners to take carbon beneficial decisions (such as keeping forests as forests, or sustaining productivity, maybe sometimes planting new forest) and the evidence is that this is happening.”

When asked how we ensure carbon stocks could be maintained in practice, the best option was thought to be harvesting on a sustained basis (harvest rate less than growth rate – *although the spatial scope needs to be defined*). There was a lower but moderately high consensus around avoiding harvest of specific areas where carbon stocks are particularly important (e.g. slow growing forests, high carbon stock forests and where the harvest rate is less than growth). This definition begs the questions how harvest and growth rates are defined and how monitoring and verification is carried out.

The market place

[1] The “Supply Base” is the area encompassing all places where feedstock for pellet production is harvested.

There was a general consensus that biomass used for energy should not displace other longer life end uses – with the proviso that those longer life end uses are for good quality products that provide for genuine long-term use.

There was also a general consensus agreeing with the statement "displacement of forest products to biomass from longer life end uses is unlikely given the low-grade nature and value of biomass feedstock". There was concern about the distance to the alternative markets, and the impact this has on use; a general unease about a blanket application of cascading (simply because something has a longer life, is it a good use?); and, on the other hand, there was a desire to ensure that wood is not used for pellet production simply because there is no other market, i.e. that other functions for this wood in the forest are taken into consideration. One comment was: "the dynamic between multiple low and high grade products is too complex to deal within this simple framework."

Use of biomass

The participants were asked following question directly "Even if forest carbon is maintained, burning biomass generates carbon at the chimney/stack. From a carbon perspective, under what circumstances can biomass be an acceptable part of the energy mix?" The response showed that, with a few important exceptions, there was a general consensus from participants that it is acceptable to burn biomass if forest carbon is maintained and where there is a carbon saving over the appropriate alternative generation technology. There were some provisos:

- the biomass plant should be a high efficiency plant;
- significant savings over the alternative generation technologies should be achieved (i.e. 1% is not acceptable);
- the use of biomass for energy is a transition to improvements in biomass use technologies;
- the forest carbon is maintained/ site productivity improved; and
- forest growth in the sourcing region and dynamics of energy generation in end market are all considered.

The need for clarity from methodologies

A number of methods to measure carbon outcomes were described by Annette Cowie and Robert Matthews. They reviewed strengths and weaknesses of these. All of the methods described inform the general debate, by informing our understanding of the risks and benefits of the use of wood for pellets on carbon in forests.

Modelling was seen as problematic by participants unless consensus on scope/boundaries could be reached. Questions remain on counterfactuals, assumptions and definitions. The reference scenario (i.e. if we had done something else) is always hazy and depends on a multiplicity of decisions, making it difficult to prove the counterfactual.

There was agreement that **models need to incorporate natural disturbances and the value of management scenarios that protect against disturbances such as fire, insect infestations and drought stress.**

Modelling is also required to interpolate and extrapolate from inventory measurements to determine the change in forest carbon stocks; and to interpret forestry economics.

Modelling, such as life cycle assessment, has not led to an easy consensus. Consequently, risk-based approaches have been proposed that aim to identify a set of lower risks options or feedstocks. There was considerable interest in risk-based decision tree presented by Robert Matthews. Robert emphasized that this decision tree was only an 'initial proposal'; that there is a need to test it in practice and for professional review. It should not be used as a substitute for SFM, but to augment SFM criteria.

Data

More data is needed to improve modelling and risk-based approaches.

Two presentations, by Pat Howes and Richard Peberdy presented results from work to understand the effects of fibre for pellet production in the forest. These showed the importance of marketplace decisions in dictating what biomass is taken from the forest (and how it is harvested). Richard's presentation discussed the observed impacts of harvesting for pellet fibre since the pellet market started. Key findings were that carbon stocks have been maintained or increased and there is increased investment in forest management within the Supply Base.

Options for improving our understanding.

The comments on modelling results emphasised the potential role of sustainability management in helping resolve the issues for modelling and gaps in data: (i) it can provide data aimed at improving our understanding of what is happening in the field and providing data for models; and (ii) it can use our current understanding to ensure that fibre is taken in such a way as to minimise risk of impact on forest carbon, given the dynamic environment in which forests exist.

Participants provided a list of issues that need to be better understood:

- **How we use limited biomass resources in the context of decreasing overall energy system emissions and the need to maintain and enhance forest sinks**.
- **Where using biomass residues to replace fossil fuel contributes to mitigating climate change**: in particular how much residue can be taken from the forest without impacting its function in the forest (e.g. carbon, fertility, erosion management, soil structure etc).
- **That fossil-based economies are not the way forward**. The biomass economy can contribute to more sustainable raw materials and energy, but the way in which it can do this was not agreed. Is concentrating on contributing to the 1.5 trajectory sufficient or should this be combined with ensuring the long-term health of forests, including their use as carbon sinks?
- For forest to play a key role in GHG mitigation, **criteria related to carbon should apply to all managed forest not only to a small part of forest products.**
- If forest carbon stocks are to be maintained or increased what baseline should be considered? What time scale and what spatial scale?
- There is a requirement to continuously **review evidence on whether biomass demand can result in additional supply and additional growth**; and if there are significant market diversions from other wood products.
- There are difficulties in linking data from forests to pellet production.

There was some support for defining a payback period by which carbon stock must recover to pre-harvest levels. One comment was: “Considering the need for negative emissions we should increase forest carbon stock in all forest, disregarding the end use.”

Issues where there is a lack of clarity or consensus

Sequestration and carbon stock

The participants were asked: “Where feedstock for biomass production is derived is it enough to maintain carbon stocks or should the carbon stocks be increased? The answers and discussion suggested that **the rate of sequestration and carbon stock are both of great importance carbon in forest systems.** However, the trade-off between managing forests to provide net carbon sequestration and managing them to provide substitution benefits is challenging. Participants commented that the forest sector faces difficult choices and will struggle with a "highly constrained optimisation problem"…. “Forestry cannot carry the entire burden for everyone else”. Forestry may need help from other sectors, to achieve climate benefits.

The workshop did not reach a consensus on which metric represents the best way to monitor ‘maintenance’ of forest carbon. Forest dynamics, the type of forest, species profile, the forest system, climate, and relative role of soil carbon are important to various degrees in different forest systems. Further work is needed to define how best to monitor carbon in different systems.

Areas where participants had varying views

Additional issues where there was no consensus were:

- **The role of subsidies and the role of biomass in meeting decarbonisation of European energy.** Concerns regarding the use of increasing levels of biomass use in Europe were summarised in the presentation by Linde Zuidema of Fern. Her presentation put an emphasis on the need to align EU climate actions with other environmental factors such as air pollution; ensuring that there is no shift from other material use for forest products to energy; and accounting for emissions from biomass in production and at the stack. She argued that:
    - RED II takes a risk-based approach, based on sustainable production but not sustainable use, i.e. that it does not allow the scale of deployment, air emissions and the import of biomass to be addressed
    - LULUCF has data gaps on wood production and biomass use and so will not prevent increases in the use of high carbon biomass
    - There is a lack of detail on how to supply the required sustainability of biomass by feedstock origin and trajectory of forest biomass and how these are aligned with measures to maintain and increase the carbon sink
    - It is important to distinguish between reported and accounted emissions.

  Suggested solutions included restricting the types of feedstock that could be used; restricting regulatory and financial incentives; reduction in the use of biomass in heating and power; and addressing emissions, pricing in the full biogenic GHG emissions from the use of biomass. Her concern that biomass is causing declines in carbon sinks in forests in Europe was countered by arguments that sequestration of carbon by forests is Europe is affected by many issues not just biomass. There was

also discussion on the impact of using 2000-2009 as a baseline for forest harvesting in the EU RED II.

- There is no consensus on the **time scale** over which it is acceptable for the use of woody biomass for energy to result in increased GHG emissions. Participants were asked a direct question on this issue. Responses varied between 10 to 50 years.
- The opinion was split on requirements that should be placed on **wood processing residues** compared to feedstock that is directly harvested. Options put forward included: harvesting on a sustainable yield basis; the requirements being the same as for feedstock that is directly harvested; and avoiding displacement effects that result from the wood processing residues being diverted for biomass instead of other uses. Comments were:
    - Processing residues need to come from a legal and sustainably managed forest management system. Requirements should be linked to the prime product rather than the residues.
    - Poor practice might be encouraged if there are no requirements.

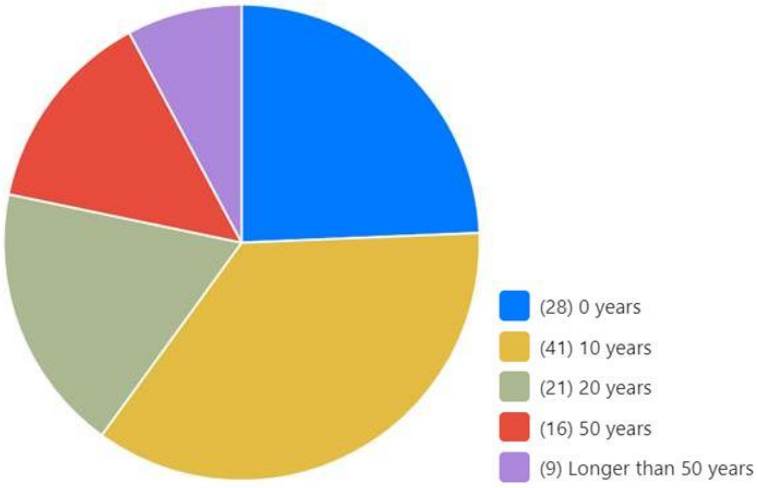
- **A wide range of opinion was expressed on inclusion of soil carbon in the carbon stock calculation.** In responding to questions on his presentation Richard Peberdy referenced evidence that removal of above ground organic matter in US south did not reduce growth on fertile soils. Other participants were concerned about the time and cost of soil stock monitoring, given the lack of evidence that harvest rates have long-term consequences to soil carbon stocks. However, it was agreed that soil carbon can be important on some sites and **below ground biomass should be left in place**. Reconciliation of views on soil carbon requires identification of those situations where there is a risk that soil carbon is a significant part of the carbon stock and could be impacted by harvest for biomass. These high-risk environments could then be monitored for impacts on soil carbon.
- Disagreement about what **would happen in the absence of harvest** (the 'counterfactual'). Some participants thought that the best possible natural outcome should be assumed (although this may not necessarily happen).
- A range of views were expressed on **biomass use**. NGOs were particularly concerned at the scale of biomass use. Other participants argued that harvest for biomass is a small percentage of total harvest and often allows use of fractions that would otherwise have been burnt or become a fire hazard.
- **Carbon debt** – there were a range of views on carbon debt: some participants considered it important, others that it's important in some regions; and others that it is an artefact of starting the clock at harvest and taking a stand rather than landscape scale perspective. It was pointed out that calculations of carbon debt are dependent on assumptions made for the modelling. The lack of consensus on this metric means it is not credible to make decisions on the basis of calculations of carbon debt alone.
- Aurea Nardelli discussed the approach taken by RSB. Their solution to the complexity of carbon accounting is to exclude types of biomass for energy on the basis of risk. This is related to their perceived risk that harvest of some wood for bioenergy purposes may cause a decrease in forest carbon stock that may not be recovered in the short term; and the need to correctly account for carbon stock changes in the forest. Therefore, instead of counterfactual modelling, the RSB aims to define those materials and practices with a low risk of decreasing carbon stock and to exclude others. One notable exclusion is roundwood. Thinnings are only eligible if there is no regional

pulpwood market to which they could otherwise be sold. Verification and implementation are currently being developed.

Summary of discussions which led to workshop conclusions, including interactive question sessions

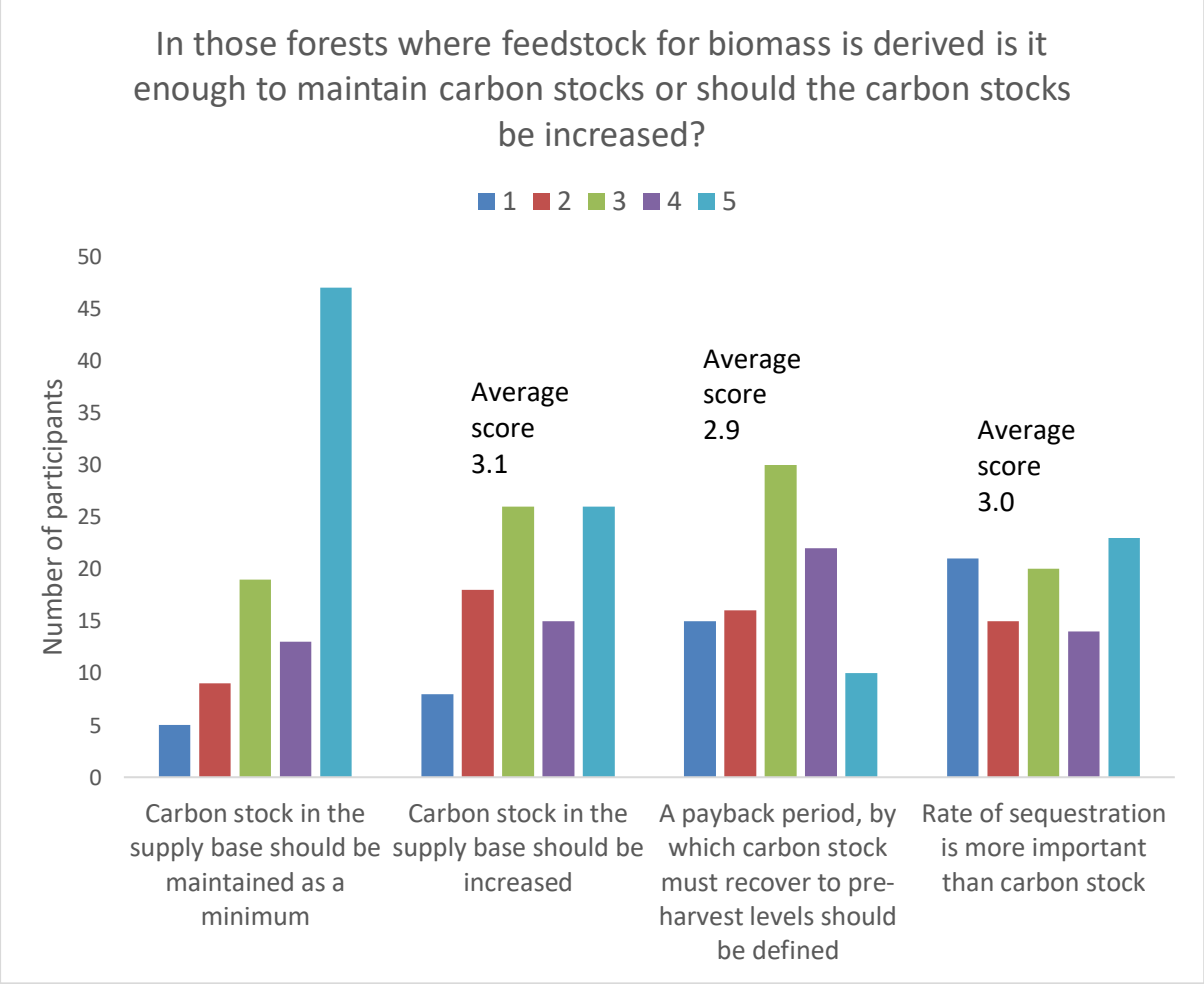
In the final session participants were asked their opinions on statements and questions related to the principles important to the climate change effects of woody biomass. The questions, responses and comments are summarised below. This should be viewed in the context of the workshop attendees and the relatively small pool of people who responded.

1. Should it be acceptable under certain circumstances that the use of woody biomass for energy result in increased GHG emissions for a limited time?



2. In those forests where feedstock for biomass production is derived, is it enough to maintain carbon stocks or should the carbon stocks be increased?

Participants were asked to score their opinion on a number of suggested views on this issue on a scale of 1 (strongly disagree) to 5 (strongly agree). The supply base is the area in which wood fibres are sourced for a pellet mill. The spread of answers and average scores are presented in the graph below.



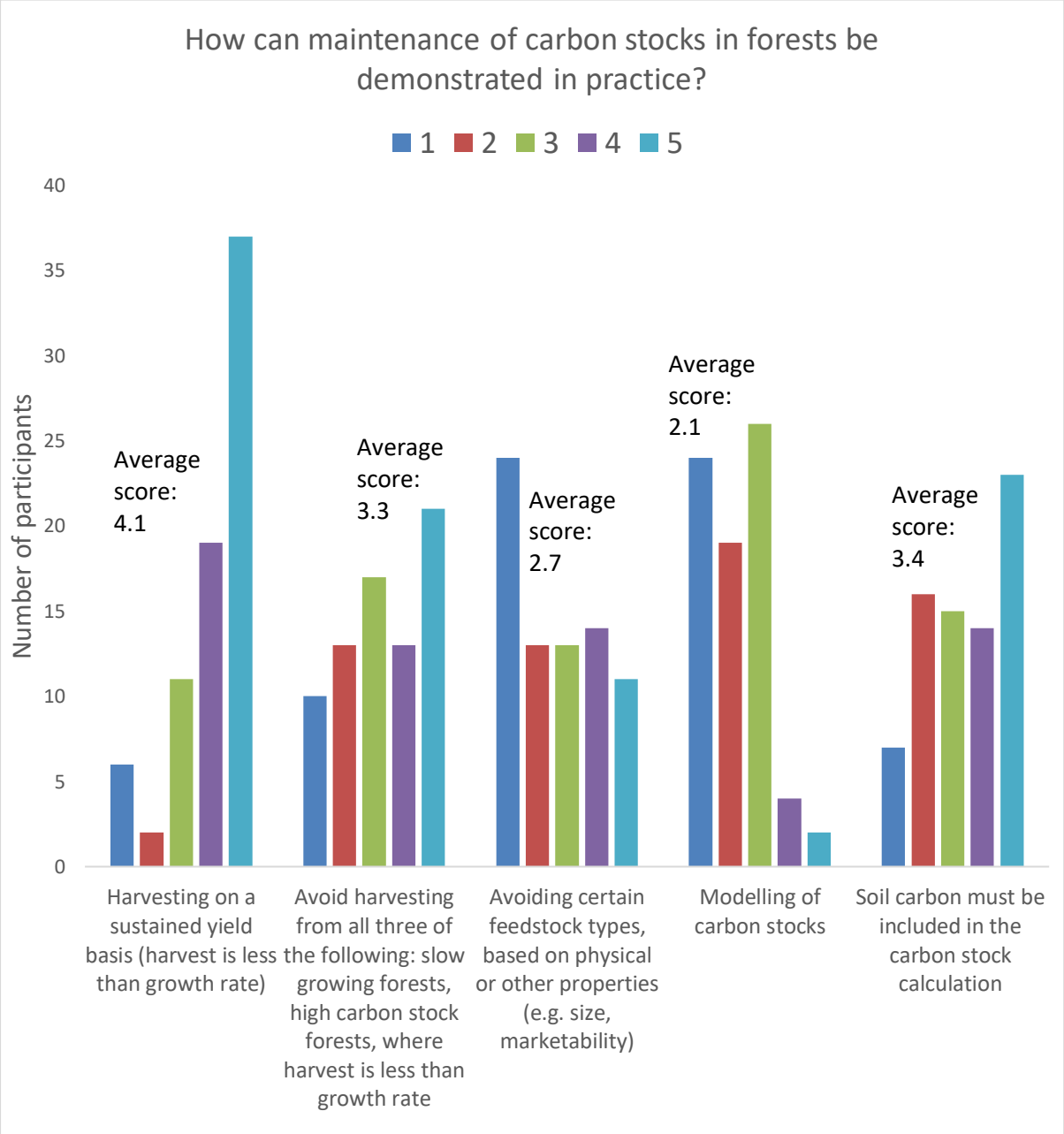
Summary of discussion

93 participants answered this question. There was a general consensus that carbon stock should be maintained as a minimum in the forest (79 participants (85%) scoring 3 or above), but less clarity on other options. Participants' comments show the spread of opinions:

- *"The statements need a base for comparison (the time and area base for carbon stock; or any counterfactual for alternative use)"*
- *"To address climate change there is a need to increase forest carbon stock in all forest, disregarding the end use."*
- *"Biomass demand should result in additional supply and growth (or protect against a decline in the instance of natural disturbances)."*
- *"Rate of sequestration and carbon stock are both of great importance."*
- *"Payback was controversial. Comments ranged from its potential merits to questions on its validity and the influence of assumptions. Alternative options suggested included using payback as one metric within a dashboard of metrics; and using alternatives such as carbon storage balances."*

How can maintenance of carbon stocks in forests be demonstrated in practice?

This was scored on the same basis as question 2, on a scale of 1 (strongly disagree) to 5 (strongly agree). The average score for each option is provided in the graph below, together with the spread of answers.



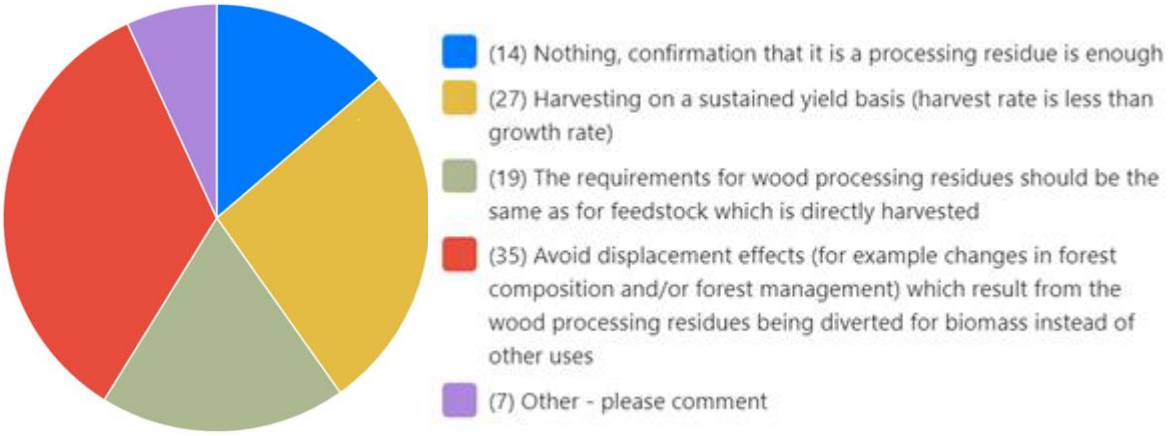
Summary of discussion

75 participants answered the question. Comments were:

- "Modelling can be useful, but
    - Calibration / verification and monitoring are important.

    - Consensus is needed for issues such as scope/ boundaries."
- "Modelling is required to interpolate and extrapolate from inventory measurements to determine changes in forest carbon stocks."
- "GIS/spatial mapping could be used to show stocks over time."
- "Harvesting on a sustained yield basis – requires definition of spatial scope to define harvest and growth rates."
- "Avoiding harvest of specific types may be subject to exemptions, particularly if the harvest is for saw logs."
- "There was disagreement on evidence relating to the long term impact of harvest on soil carbon stocks; and the cost/benefit of monitoring soil carbon was questioned. On the other hand, some participants regarded soil carbon stocks as important, depending on the forest type."

4. From a carbon perspective, what requirements should be placed on wood processing residues compared to feedstock which is directly harvested?

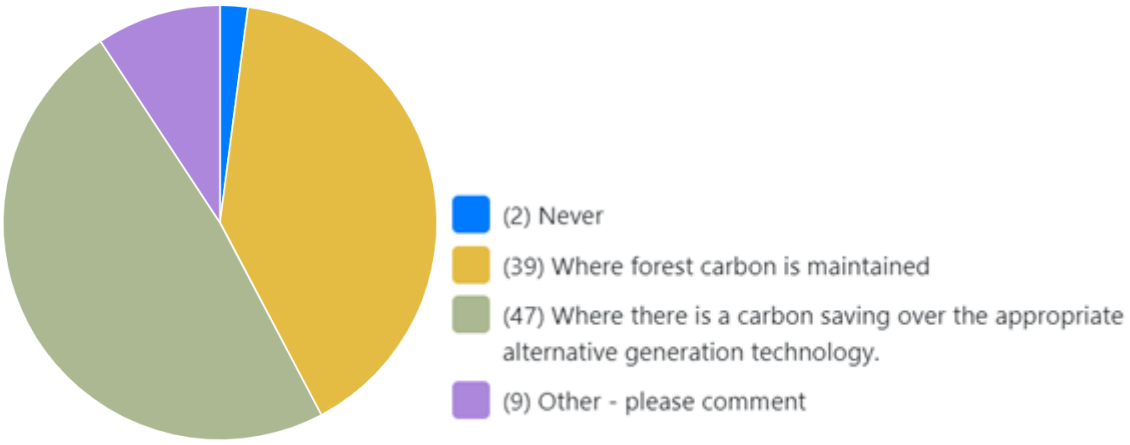


Summary of discussion

Opinions varied from questioning why any requirement is needed, as this is placed on the main product to concern about potential fraud:

- "Processing residues should be obtained from legal and sustainable managed forest management system."
- "There is a need for a commonly understood definition of what a "residue" is, and then combined with a robust Chain of Custody system to avoid controversial sources. If residues are acceptable simply because they are residues, then residues from any controversial source would also be acceptable without sustainability considerations, simply because they are residues."
- "Fraud: logs chipped to create false "mill residues"; or when the land owner has no other way of generating cash or if a mill needs to supplement its production (if the price is right)."

5. Even if forest carbon is maintained, burning biomass generates carbon at the chimney/stack. From a carbon perspective, under what circumstances can biomass be an acceptable part of the energy mix?



Summary of discussion

- "'A carbon saving' could be 1%: we should be more ambitious, define what a minimum accepted carbon saving is, stipulate high efficiency plant and gains relative to appropriate alternative technology."
- "In addition: forest carbon should be at least maintained and the cumulative outcome (forest carbon + displacing alternative energy emissions) should be negative.
- Ensure that no longer term carbon storage of the biomass is possible."
- "Biomass end use should be part of a credible, time-bound transition to sustainable energy generation. "
- "Context is important: the dynamics affecting forest growth in sourcing region and dynamics of energy generation in end market."

6. Biomass used for energy production should not displace other longer life end-uses

The average score for this was 3.8: of the 63 answers, 43 scored 4 or 5. This shows a 68% agreement with the principle that use of wood for pellets should not displace longer life end uses. However, a small but significant number of participants did not agree.

7. Displacement of forest products to biomass from longer life end- uses is unlikely given the low-grade nature and value of biomass feedstock

The average score for this was 3.4: of the 70 answers, 54 scored 3 or above. This showed a 77% agreement with the principle that displacement of forest products to biomass is unlikely. However, a small but significant number of participants did not agree with this.

Summary of discussion

This discussion concerned questions 6 and 7.

- "The answer depends on context: if an alternative processing plant is a long distance away and transport costs exceed the value of the wood, then the alternative use may be economically inefficient. Additionally, the alternative use may have a short life (e.g. a fast food paper bag). The energy system displaced is also relevant."
- There was some discussion of the use of simple rules (such as question 6) and whether or not market economics would result in anomalies:
    - "The dynamic between multiple low and high grade products is too complex to deal within this simple framework"

    - “What changes to markets would enable higher pay for biomass as raw material?”
    - “Forced cascading - i.e. no roundwood for energy is likely to impact forest management. Potentially with negative impact on carbon sequestration.”
    - “Cascading has a big drawback. If owner cannot sell his wood to highest bidder then how is he compensated? Instead of a market economy we then have an economy that is led by above. Who is capable of making all main decisions?”
- “It’s not about longer life end-uses but overall GHG mitigation potential.”