We would like to thank Mr. Walter Rossi Cervi for the time spent on reviewing our paper and the valuable remarks which pointed out some important issues which will help to further improve the paper. Mr. Walter Rossi Cervi's comments are in grey, and our responses are in black with proposed edits for the revised manuscript in italics.

General comments:

I understood the principle of rotation lenghts derived from the relation between interest rate and IGR. This generates information on rotation lenghts and it is important for calculating timber production costs. I was wondering whether some reference data could be added to validate the rotation lenght map. I`m not a forest specialist, but in principle Latin America and Australia should have the similar spatial pattern, given that that both regions are important eucalyptus producers. Instead, the map shows different spatial patterns. I believe that an analysis on the main species (and they respective rotation period) per region could be used to calibrate the rotation lenght map.

Thank you for this important comment. Using FAO 2006 (Global planted forests thematic study. Results and Analysis), the mean rotation length in Australia is 34 years (min = 28 years, max = 40 years) - mean rotation length in Latin America (using South America from FAO reported numbers) is 24 years (min = 18 years, max = 29 years). Leech 2013 suggest an optimal rotation of 45 years in Australia. Additionally, the intensity of the management, e.g. using genetic engineered plant material, irrigation and fertilization might differ between Latin America and Australia a lot, even for the same species. As these are aggregated numbers, it cannot be determined with certainty if the spatial patterns on a finer spatial scale (as in fig. 4) are going to be similar between Latin America and Australia. In principle, the numbers from FAO 2006 can be used to validate the rotation lengths from MAgPIE and we can add this as an additional figure in the manuscript.

MAgPIE in its current format cannot handle tree species information. Calculation of rotation lengths at the cellular level is one of the novelties of this manuscript. Calibrating of cellular rotation lengths to a regional or country level data-set would result in loss of the spatial (cellular) level differentiation in rotation lengths. Instead, for the initial time step, we calibrate the growing stocks to FRA 2020 reported numbers for both natural forests and plantations. Also using a single value for rotation length per MAgPIE region would not be ideal as there are spatial differences in the way plantations grow within each region. Our way of deriving rotation lengths based on carbon stock information from LPJmL for natural vegetation (different species dominate in different cells) helps us in using spatial differences in carbon densities to act as a proxy for differences in species. We are also not aware of any spatially explicit data which is on a finer spatial scale (e.g., 0.5° resolution) with information on both tree species and associated rotation length which can be used to calibrate MAgPIE's cellular level rotation lengths correctly.

It is clear that the study was focused on creating a proof of concept that enables a forestry module in MAGPIE. However, I missed a bit the discussion on how realistic are the figures presented. For example, in section 3.1, it is mentioned a large increase in cropland at expense of primary forest areas (where exactly?). Are protected areas included in the analysis? What about agro-forestry (also included?)? Perhaps some discussions around the current and future spatial uncertainties would be relevant as well.

We will add further discussion on how realistic the figures are based on uncertainties in the socio-economic model drivers across SSPs as this manuscript only considers the SSP2 scenario.

We will also add a regional level figure akin to fig. 10 in the appendix to clarify where does cropland expand at the cost of primary forests (also including other land-use types).

In terms of protected areas, the manuscript accounts for National Policies Implemented (NPIs) in terms of forest protection and afforestation according to existing national policies until 2030, in support of the Paris Agreement. Additional land protection is based on The World Database on Protected Areas (WDPA) which earmarks category I and II areas from International Union for Conservation of Nature (IUCN) as protected in MAgPIE. We will make this further clear in the method and discussion section.

Agroforestry is not included in MAgPIE.

We will add further discussion on the uncertainty of spatially explicit data on plantation forest, with respect to the differentiation between productive and non-productive plantations – which in turn also has a bearing on the results in this manuscript and that the management of plantations also depends on other factors such as availability of workforce, investment, R&D available to improve the management etc.

Productivity is an important component for calculating global costs of demand driven land uses. I`m not fully aware of LPJML, but doing a quick research, I found that LPJML might include the productivity of natural vegetation and planted forests. These were surely incoporated in MAGPIE (right?). But yet it is not clear to me how the productivity of secondary forest came about?

For every cell, the long-term carbon density of natural vegetation from LPJmL is converted to age-class dependent carbon densities by a Chapman-Richards volume growth function. Based on information from LPJmL, we use different parameters in the Chapman-Richards function for plantations and natural vegetation, resulting in faster regrowth of plantations as compared to natural vegetation. The resulting age-class dependent carbon densities for plantations and natural vegetation are converted to harvestable yield with the help of biomass conversion and expansion factors. For secondary forests, we use these age-class specific harvestable yields. We initialize the age-class structure of secondary forest based on observational data (Poulter et al). For primary forests, we use the highest age-class yield, which reflects natural vegetation. This is also explained in eq. 3 and p10L189, where age-class specific natural vegetation yields are akin to secondary forests. We will further clarify it with an additional sentence.

We will further clarify it with an additional sentence in p10L190: (...) tDM/ha*, yr is age-class and forest type specific harvestable yield*, C is the (...).

To avoid confusion, we will add a sentence in the introduction of the manuscript which makes it clear that we include secondary forest in our definition of the term "natural forest", based on the rationale that secondary forest is regrown natural forest. We will change p10L193 as: (...) et al. (2020a). *Harvestable biomass yield (yr) is different between natural forests (primary and secondary forests) and plantations by virtue of differences in the parametrization of underlying growth function(s).*

Specific comments:

Line 175. If a fraction of forestry residues is recovered during the harvesting period, it is likely that there will be a potential decay in productivity in the forthcoming period in comparison with a plantation system that does not recover any fraction of residues. It was not cleat for me if that was included in the model, but it is something to be considered

We assume that the residues are collected from the overall production system i.e., we do not differentiate if the residue comes after harvest from plantations or natural forests. Additionally, the decay in productivity after residue removal is also not modelled. The residues are used to fulfil a part of wood fuel demand as described in p9L175:178. This residue generation constraint in the model is an upper bound and the model is flexible to decide based on the cost of production if the residue should be removed or not from the part of production which comes from plantations. We will add a short discussion on it in the revised manuscript, making it clear that in MAgPIE, only a fraction of the residues are removed depending on production costs but if that happens, no decline in nutritional status is assumed, which is a caveat. We would also argue that at least for some plantations fertilization would be applied to maintain productivity.

Typo:

Line 119. "optimal"

The line containing this typo will be removed as we will re-write the rotation length calculation segment as requested by Dr. Pekka Lauri in his review of this manuscript.