# Key parameter model for the environmental assessment of Christmas Trees

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## Abstract

The goal of the study was to find the environmentally most friendly option for a Christmas tree. Therefore, a key parameter calculation tool to assess the environmental impact of Christmas trees was developed. It compares the impact of the different types of trees according to their specifications and assumptions about their life cycle.

The environmental impact of the different tree scenarios was assessed with the ecological scarcity method 2013 and the global warming potential.

The results give no general answer which version is the most environmentally friendly one. It heavily depends on the scenarios. Artificial firs tend to have the lowest impact if used over several years.

## Introduction

In the period before Christmas, many households purchase a Christmas tree. Therefore, the following question may come up to the environmentally concerned consumer: Which Christmas tree is the most environmentally friendly option?

The aim of this study was to find the best option of choosing and purchasing a Christmas tree and to identify the factors which have the highest influence on the environmental impacts during the lifetime of a Christmas tree.

## Methodology

The assessment of the environmental impact for the influencing parameters such as the tree, the transport per km or the tree stand were calculated with the SimaPro software. The key parameter model was then developed in Excel. The impact assessment was done with the ecological scarcity method 2013 (UBP) and the global warming potential (kgCO2-eq).

The following Christmas trees were modelled for one use cycle:
- fir, from forest, no pesticides or fertilizers
- fir, from farm, extensive, minimal use of pesticides and fertilizers
- fir, from farm, intensive, medium us of pesticides and fertilizers
- fir, rented from farm, extensive, wintered indoor in pot
- artificial tree, PVC and steel
- artificial tree, PE

These influencing parameters were regarded:
- height at purchase
- life expectancy
- country of origin
- distance transported in van and truck
- distance transported home by passenger car

Eventually, the impact was distributed according to the following contributing life cycle stages:
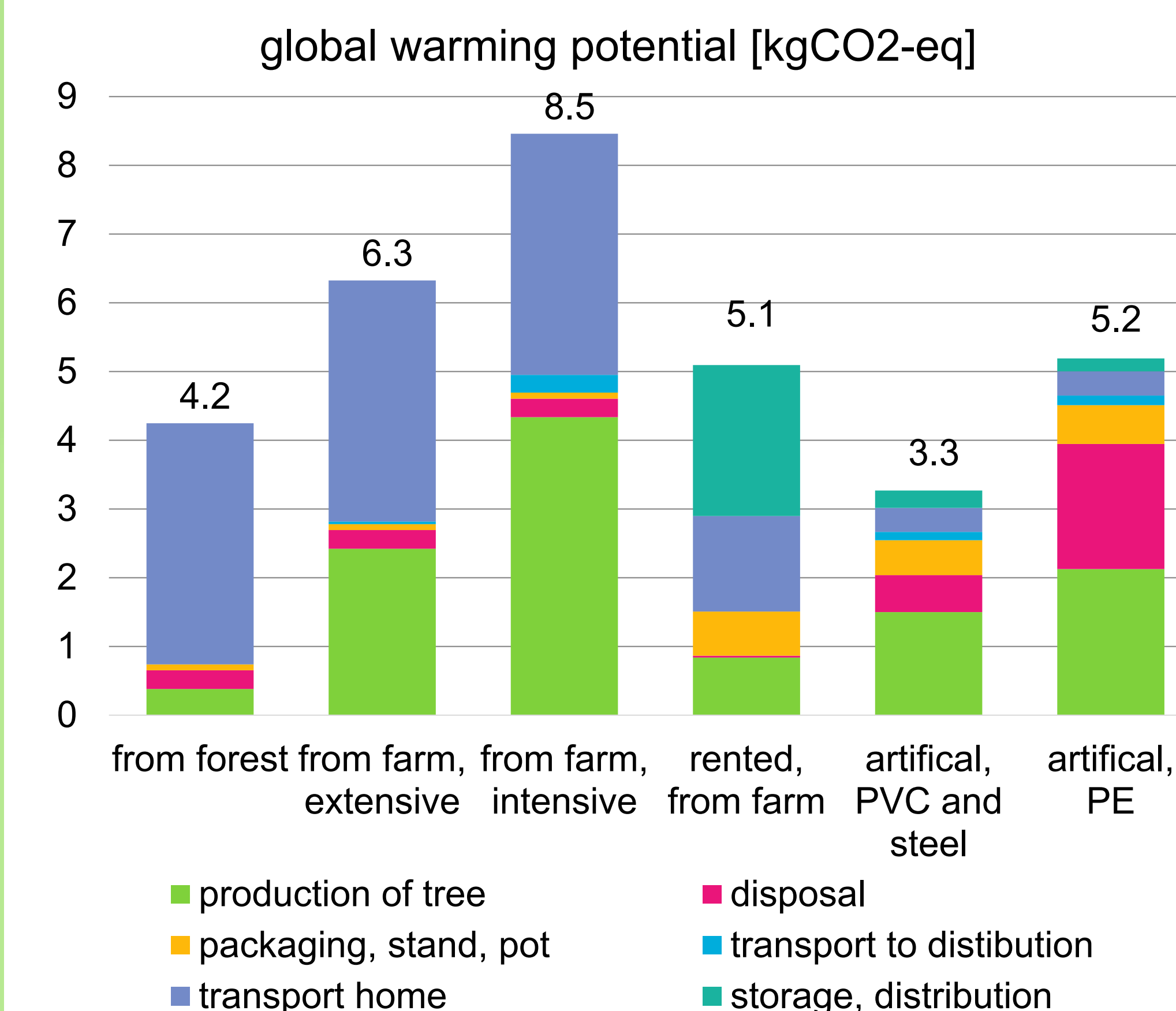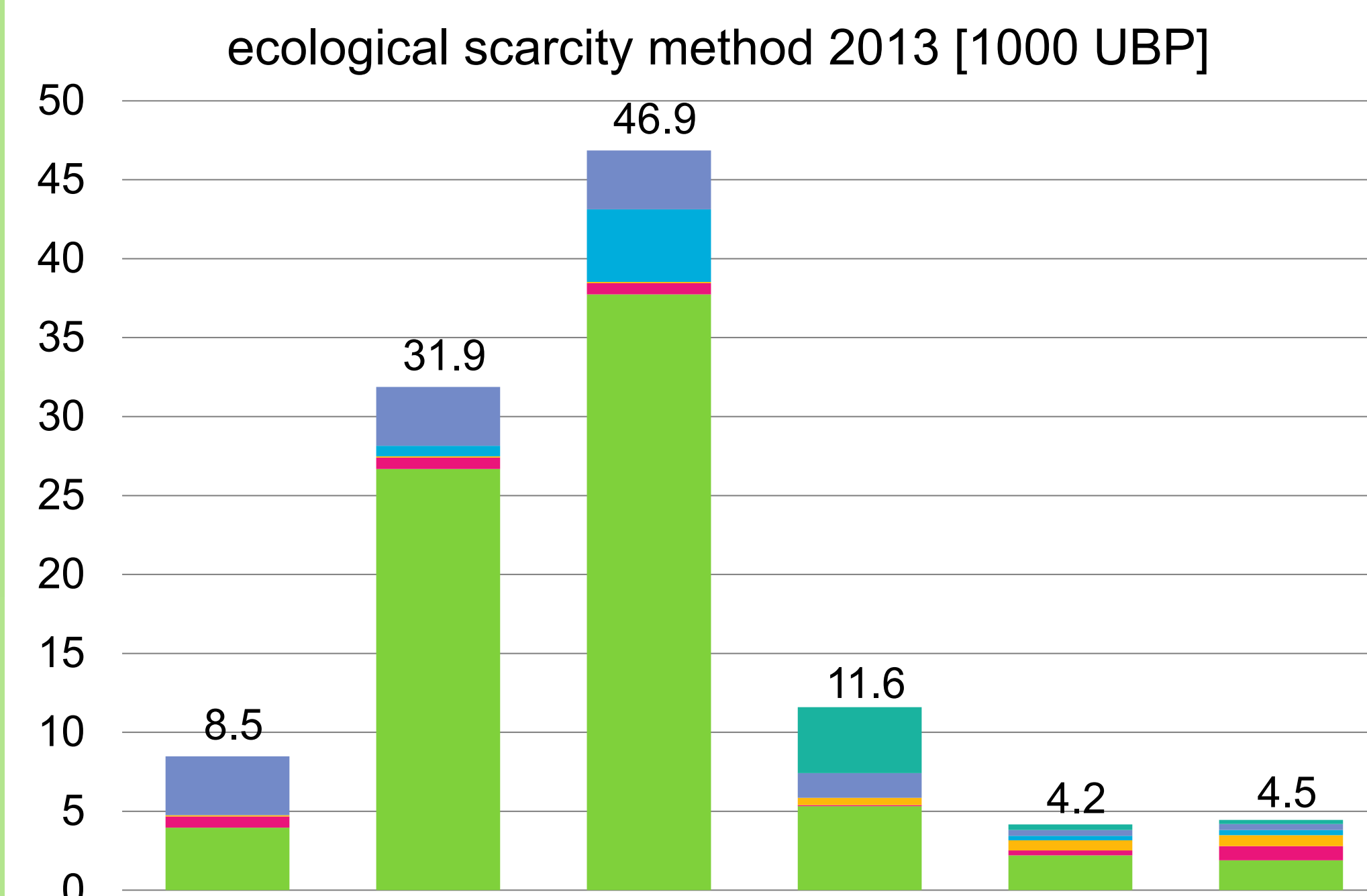- production of tree
- packaging, stand / pot
- transport to distributor
- storage / distribution
- transport home
- disposal

The LCI data for the growing of the firs respectively the production of the artificial trees was collected in direct cooperation with the fir farmers, from product information and literature. The background data and the data for general processes such as transportation and storage originates from the company internal database of ESU-services.

In the result-section, a specific scenario was chosen. Depending on the consumer's behavior, this scenario and its outcome may vary drastically.

## Results

The results for one season of usage are shown for the example setup. The parameters shown in this table can be changed in the Excel calculation tool.

| | unit | from forest | from farm extensive | from farm intensive | rented from farm | artificial PVC steel | artificial PE |
|---|---|---|---|---|---|---|---|
| height at purchase (0.5-4m) | m | 2 | 2 | 2 | 1.2 | 2 | 2 |
| life exp. | yrs. | 1 | 1 | 1 | 5 | 10 | 10 |
| origin | - | local | CH | DK | local | CN | CN |
| home-delivery | km | 0 | 0 | 0 | 10 | 0 | 0 |
| personal pickup | km | 5 | 5 | 5 | 0 | 5 | 5 |



ecological scarcity method 2013 [1000 UBP]



global warming potential [kgCO2-eq]

- production of tree
- packaging, stand, pot
- transport home
- disposal
- transport to distribution
- storage, distribution

## Conclusion

A general statement as to which variant is always the best is not possible. Different influencing factors (type of tree, transport, usage time, etc.) are important for comparison as well as the considered evaluation method.

In general fir trees from forestry grown without fertilizers and pesticides perform significantly better than trees from plantations in terms of overall environmental impact. Pesticides, fertilisers, land use, heavy metals from the fertiliser, etc. are evaluated negatively by the Swiss Ecological Scarcity Method.

Considering the GWP the use and disposal of the plastic tree and the private transport get a higher relevance in the juxtaposition. At just a few kilometres of private transportation, the related emissions exceed the ones of all other factors combined.

In the case of the rented fir, the storing of the trees in a hall in winter is the most relevant factor.

The service life, the materials used (PVC, PE, Steel) and the total weight is relevant for artificial firs. However, they often perform better than firs from the plantation after just a few years, especially when considering the Swiss ecological scarcity method.

Finally, and most important: In contrast to the huge discussion about the most environmentally friendly tree, most often other factors such as gifts, meals or traveling for Christmas eve have a much higher impact on the environment than the tree itself. For comparison: The average consumption per person in Switzerland causes emissions of 38kg CO$_2$-eq per day.

## Calculation tool

The tool is offline until December 2020. Until then, we look for sponsors providing data and money to calculate more different options in the tool or to translate it to English. Please **contact** us directly if interested.

More information can be found at:

http://esu-services.ch/software/christmastrees/