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Modular Extrapolation of Crop LCA (MEXALCA): GWP of Wheat Production and its Global Variability

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MEXALCA – Modular EXtrapolation of Agricultural Life Cycle Assessment



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MEXALCA Modules



Crop production data sets can be described by a few key management axes [Nemecek et al., 2005]:

LCI_{module i} Original Country Basic cropping operations Tillage machinery use Variable machinery use N fertilizer use P fertilizer use K fertilizer use Pesticide use Irrigation Drying

Production Inventory:

farming inputs / ha

from *conventional*

crop production (at field)

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MEXALCA – Modular EXtrapolation of Agricultural Life Cycle Assessment

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General Idea



MEXALCA – Modular EXtrapolation of Agricultural Life Cycle Assessment



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6

MEXALCA Wheat: Validation Original Country



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MEXALCA Wheat: Comparison to Literature



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MEXALCA Wheat: GWP (per mass)





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Selected MEXALCA Crops



10



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Selected MEXALCA Crops: Global Yield





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11

Selected MEXALCA Crops: Water Content



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Comparison of the extrapolated GWP with literature values referring to European and US wheat production:

MEXALCA leads to plausible estimates for the GWP per area and mass and its global variability.

➤ A first comparison of the extrapolated GWP for oranges and several other crops with corresponding literature supports the applicability of the approach.

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MEXALCA provides the opportunity to estimate environmental impacts (GWP, Non-renewable energy use) taking into account their global variability. This might lead to more accurate results than a screening LCA often applying the results of one arbitrarily chosen study in order to estimate the impact of a certain process.

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> The single country variability of the GWP originating from wheat production often covers a considerable part of the extrapolated global variability. This shows the diversity in crop production practice and climate and the difficulty of any crop LCA to cover all those factors.

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Outlook or what could be improved ?



In order to better cover the variability originating from farming practice and climatic conditions, the following improvments are suggested:

> Subgrouping with respect to climatic zones and agricultural practice rather than only by country

> > Consideration of **organic farming**. This requires inclusion of organic fertilization.

Application of emission models with a more global applicability than Swiss conditions

=> Corresponding adaption of the statistical input variables (yields, agricultural indices): data availability?

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