Major reason leading to the difference between results of FiBL Austria for dairy production (or chicken meat production; not published yet) and results from e.g. Williams et al. (2006)

Stefan Hörtenhuber, Theresia Markut, Thomas Lindenthal

FiBL Austria, Seidengasse 33, A-1070 Vienna; thomas.lindenthal@fibl.org

The major reason leading to the difference between our results for dairy production (or chicken meat production; not published yet) and results from e.g. Williams et al. (2006) is the change in carbon stocks in the soil.
The study of Williams et al. (2006) is highly detailed and well described but does not consider greenhouse gas emissions (GHGE) of **land use change (LUC)**, which are assumed to account for about one-fourth of anthropogenic CO2-emissions, especially in combination with forest clearing in the tropics (e.g. IPCC, 2007). In our model, we extended system boundaries for and included GHGE of land use change for feed used, which were not considered in previous studies (Garnett et al., 2009).
High amounts of carbon are released with land use change connected with feed production, mainly with soybeans and extracted soybean meal imported from South-America (mainly Brazil) but also with imports of cereals and rapeseed from Eastern- and Southern Europe (Fehrenbach et al., 2008). I

In addition to carbon emitted via land use change, we also included the effect of **carbon sequestration** in agricultural farmland into our calculations (with the exception of grassland, which was suspected to be at an equilibrium state and that its soils did not emit or sequestrate further CO2 due to its long history of relatively constant management; Soussana et al., 2004). Whereas organic soils are assumed to sequestrate CO2, conventionally managed soils are assumed to release carbon (Küstermann et al., 2007; Fliessbach et al., 2007).
We also found that GHGE per unit of product are reduced with a higher output (e.g. higher milk yield per cow and year or higher crop yield per hectare) but only within groups with similar management (conventional and organic). In dairy production or chicken meat production organic farms generally use a higher share of home-grown feed and thus need fewer imports generally. Especially in agricultural production of milk or chicken meat for HOFER KG´s organic product line *„Zurück zum Ursprung"* (Bio-ZZU) the use of imported soybean is strictly banned. For milk and meat almost all differences in overall GHGE can be related to this GHGE of land use change.

The lower $CO_{2\text{-eq}}$-emissions of Bio-ZZU for production of vegetables and cereals is also slightly a consequence of carbon sequestration but more due to the disuse of mineral nitrogen fertiliser and other readily soluble nitrogen fertilisers like residual materials from bio-fuel production.

Other main differences comparing the study of Williams et al. 2006 and our outcomes concerning vegetable production are:

- **Spatial scales:** Our study is based on regional data and mostly reflects typical and productive areas of the specific agricultural product (conventionally grown as well as

organic production). So we don't use aggregated or weighted values of different yields and applied fertilizers respectively of different production practices, soil types or climate on national level.

- **Infrastructure processes are excluded** in our study (as it is recommended by PAS2050)
- **Only direct N_2O emissions from soil** were taking into account, considering different proportions of N_2O emissions for synthetic and organic N applied.
- Product related differences:
    - Wheat: **Crop drying is not necessary** in some production areas of Austria (Marchfeld, Lower Austria), which would have a high impact on GWP. In contrast to Williams et al. 2006 and in accordance with the Danish Food LCA project we do not calculate a protein content related quality threshold.
    - Potatoes: Of course "**storage**" was taking into account but it is an own product-phase in our study, so the system boundaries of agricultural production differs from Williams et al. 2006. Furthermore storage of potatoes was adapted to conditions of the product line under survey (storage time, Austrian energy country mix).
    - Tomatoes: We calculate the GWP of **field-grown tomatoes** (open land tomatoes) in accordance to the organic product line. Consequently energy for heating and lighting the glasshouse, which is the main impact of the tomato's GWP in the study of Williams et al. 2006 and others, was omitted in our study.

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