Peak Soil: Soil Destruction and the Food Crisis
– The loss of fertile land and how to avoid it

"Peak soil" was coined as a term for land grabbing by Fritz (2009). This phenomenon existed already before the sharp increase of global food prices in 2008, but it was boosted by this event. However, peak soil could be used even more justified with regard to the continuous global soil erosion and destruction. Obviously the term is a semantic derivative of "peak oil", but there is an important difference: Whereas it is impossible to "renew" fossil energy, except – if at all – in geological time scales, it is possible to recover many types of degraded soil within human time horizons provided the political will existed, and skills and appropriate resources were applied.

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Current situation and prospects

Detailed estimates about global soil degradation vary, and findings based on remote sensing remain "provisional until validated in the field" (Bai et al. 2008). A figure of 10–12 million km² of total degraded land, i.e. 20 to 25% of all used land being degraded to at least some degree, has been mentioned repeatedly (Magdoff and van Es 2009; IAASTD 2009). Estimates for future increments of degraded land are even less accurate. Despite further land degradation, the FAO projects a continuous growth of the global agricultural production, although annual growth rates are expected to decrease from 1.5% to 0.9% for 2000–2030 to 2030–2050, respectively (FAO 2006). Fortunately, world population growth is expected to be declining too. Estimates refer to 1.0% and 0.5% for the same time periods (FAO 2006).

Fig. 1: Photo: Land degradation in Tanzania. Photo: Uwe Hoering, Bonn.

While this outlook seems quite promising (although the FAO forecasts a significant incidence of undernourishment even in a world with stationary population and plentiful food supplies), it has a number of constraints. First of all, the figures above refer to growth of the *aggregate* agricultural production which also comprises non-food crops. Second, an extension of agricultural land by 1.2 million km² or about 6% of the current crop land (to a significant extent at the expense of forests) is factored-in into FAO's calculated growth in agricultural production. But this does not yet include the estimated additional 0.25 to 0.60 million km² to be cultivated by 2050 to meet agrofuel demands (Fischer 2009). Therefore, the WBGU [1] concludes that competing interests regarding land use will become a central theme of sustainability and a potential area of conflict (WBGU 2011).

The big unknown in this equation is soil degradation and its impacts, in particular, because predictions of productivity impacts of land degradation are even more imprecise than global estimates of degradation (Wiebe 2003, cited in IAASTD 2009). This is due to the time lag between the causation of soil degeneration and its recognition (Blum and Held 2011).

The determination of yield impacts is even more time-lagged and associated from the cause of degradation. It is uncertain which principal agricultural model will dominate the global South in the next decades. Will non-sustainable methods of production prevail or even expand? Or will agroecological systems gain significant influence? As the WGBU stated, socioeconomic factors are neglected in models of land use predictions (WGBU 2009). But the principal agricultural model and socioeconomic factors will have tremendous impacts on the extent of soil degradation. The future of agrofuel use seems to be in a catch-22 situation: Either claims made to downplay possible conflicts with food production become reality and "marginal" land will be used predominantly, which, however, is particularly prone to soil degradation. Or, fertile land is used instead confirming concerns about territorial competition with food production. Therefore the "Great Transformation, the transition from an unsustainable fossil driven era to a post fossil sustainable age" (Blum and Held 2011) could become a crash rather than a "soft landing".

[1] Advisory Council on Global Change of the German government.

Unfortunately, current policies – disappointing climate summit results, funding priority for the banking sector, unabated support of global trade, unsustainable agricultural investments ignoring scientific recommendations – seem to be more indicative of a crash (Montgomery 2011).

Restoring land

It is self-evident that the restoration of degraded agricultural land is the better option to (re)gain land as compared to utilizing new land for agriculture, in particular forests (IAASTD 2009). Wrong agricultural practices account for about one quarter of the total soil degradation (GACGC 1994, cited in IAASTD 2009). *Conversely, proper agricultural practices are able to restore soils.*

A lot could be achieved in a relatively short period of time, if appropriate methods were applied and the political will existed. While simple biological approaches to soil fertility management can already help to reverse environmental degradation, such practices should preferably not be a stand-alone measure, but rather be embedded into agroecological production systems of increasing complexity. Replenishing the soil with nutrients, however can be a starting point. A two- to fourfold increase of maize yields has been demonstrated after overcoming nitrogen deficiency by a rotational (fallow) system of interplanting leguminous plants (Sanchez 2002). According to the author the fallows were economically and ecologically sound, and, importantly, fit well with local farmers customs and work calendars. An impressive example of converting gullies of three meters depth into a mixed agroecosystem of fruit trees, cassava, sweet potatoes, corn, peas and sorghum was presented in a case study by Hoering (2008). But the prime example is the frequently ignored nation-wide transition of the Cuban agriculture which started out of necessity in the 1990ies using organic inputs instead of mineral fertilizers and chemical pesticides due to import constraints. Meanwhile the second phase of transition is ongoing – the step from simple input replacement to applying integrated agroecological systems of production, based on a grass-roots *campesino-a-campesino* (peasant-to-peasant) transfer of knowledge, supported by a network of promoters (Rosset et al. 2011). Such experiences indicate that eco-farming can double food production in 10 years. This was announced by the Special Rapporteur on the right to food to the UN in March (de Schutter 2011) and refers to a possible two-fold production increase in regions with precarious food supplies, Africa in particular. It is the essence of an international expert seminar in Brussels in June 2010. Importantly, an agroecological approach includes both science and a set of practices. According to the report the application of agroecology provides the most favorable soil conditions by an intelligent management of organic matter and increasing soil biotic activity (de Schutter 2010). It is a labor-intensive way of raising yields and fixing carbon in the soil. Thus, it is a job-creating, environmentally sound approach to the most pressing global needs, but it is incompatible with industrial production methods. ■

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