Important facts on ELD

Facts about Land Degradation

52% of the land used for agriculture worldwide is moderately or severely affected by soil degradation **(UNCCD).**

Up to 40 % of the world’s agricultural land is seriously degraded **(GEF).**

There is an annual loss of about 1 percent of global land area, which could produce 20 million tons of grain each year, or 1 percent of global annual grain production **(Nkonya et al. 2011: Global Food Policy Report).**

Due to drought and desertification each year 12 million hectares are lost (23 hectares/minute!), where 20 million tons of grain could have been grown **(UNCCD).**

In den letzten 40 Jahren wurde ein Drittel der weltweiten Ackerflächen aufgegeben, da Bodenerosion sie unproduktiv gemacht hat. Jedes Jahr kommen weltweit 20 Millionen Hektar degradierten Landes dazu. Steigende Bevölkerungszahlen, abnehmende landwirtschaftlich nutzbare Flächen und die Auswirkungen des Klimawandels verschärfen das Problem (**BMZ 2011**).

Global assessments indicate that the percentage of total land area that is highly degraded has increased from 15% in 1991 to 25% by 2011 **(UNCCD: A Stronger UNCCD for a LD Neutral World 2013).**

One quarter of the earth’s land is highly degraded. Another 8 percent are moderately degraded, 36 percent are stable or slightly degraded and 10 percent are ranked as “improving.” The remaining shares of the earth’s land surface are either bare (around 18 percent) or covered by inland water bodies (around 2%) (**FAO 2011).**

About 12 million hectares of fertile land are lost every year due to land degradation **(IFAD 2010).**

Up to 849 million hectares of natural land - nearly the size of Brazil - may be degraded by 2050 should current trends of unsustainable land use continue **(UNEP-Report).**

This has resulted in widespread environmental degradation and loss of biodiversity, affecting an estimated 23 per cent of global soil **(UNEP-Report).**

About 24% of worldwide land surfaces have been degraded within the last 25 years affecting about 1.5 billion people directly. Of the 24% worldwide degraded land surface 22% is located within dry areas. In comparison to that, 78% of the actual degraded land surface is located in humid regions **(Bai et al. 2008).**

Different global estimates calculated that 10 - 20% (with a high possibility of 65-85%) of the world´s dry areas (hyper-arid areas included) have already been degraded **(Adeel et al. 2005).**

The percentage of Earth’s land area stricken by serious drought has more than doubled from the 1970s to the early 2000s (**UNCCD**).

1.5 billion people are affected by land degradation **(UNCCD).**

Financial Implications/ Economic Aspects

Land degradation costs an estimated **US$40 billion annually worldwide**, without taking into account hidden costs of increased fertilizer use, loss of biodiversity and loss of unique landscapes.

Land degradation includes components such as loss of biodiversity, salinization, water erosion, sand dune encroachment, rangeland degradation and outmigration **(FAO: http://www.fao.org/nr/land/degradation/en/).**

The productivity of some lands has declined by 50% due to soil erosion and desertification. Yield reduction in **Africa** may range from 2 to 40%, with a mean loss of 8.2%.

In **South Asia**, annual loss in productivity is estimated at 36 million tons of cereal equivalent valued at US$5,400 million by water erosion, and US$1,800 million due to wind erosion.

It is estimated that the total annual cost of erosion from agriculture in the USA is about US$44 billion per year, i.e. about US$247 per ha of cropland and pasture.

On a **global scale** the annual loss of 75 billion tons of soil costs the world about US$400 billion per year, or approximately US$70 per person per year (**Eswaran et al. 2001).**

The annual economic losses due to deforestation and land degradation are estimated at 1.5-3.4 trillion Euro in 2008, equaling 3.3%-7.5% of the global GDP in 2008 **(TEEB Interim Report 2008).**

Agricultural investments to the order of US$30 billion per year are needed to feed a globally growing population **(FAO 2006).**

For example, closing yield gaps and reaching 95% of potential maximum crop yields (assuming the adoption of SLM practices) could create an additional 2.3 billion tonnes of crop production per year **(Foley et al. 2011)**, equivalent to $1.4 trillion USD.

Global estimates of degraded areas amount to at least 10-20% of usable land, with an estimated total economic loss of $40 billion USD per year **(FAO 2006).**

This includes a startling loss of grain worth $1.2 billion USD yearly **(FAO 2006, Godfray et al. 2010).**

Facts about Specific Regions

In **Africa**, more than one third of the land is under threat of desertification. On the southern edge of the Sahara an area the size of Somalia of once productive land has been degraded over the past 50 years **(FAO 2014).**

Several African countries depend on agriculture, fisheries and livestock management for 40 % of their national GDP (**GEF 2011**).

In **Europe** 16 % of the total land area (excluding Russia) is affected by soil erosion (Bowyer et al. 2009).

In **China** the livelihood of 400 million people is threatened by land degradation **(GEF 2013).**

About 40% of the total population threatened by desertification lives in Africa and Asia. In South America´s population accounts for 30 percent (**BMZ 2011**).

Land degradation is a global problem. 168 countries report that they are affected by land degradation. This includes 15 G20 states **(UNCCD 2014).**

Effects of land degradation: Food Security, Migration, Biodiversity, Climate Change etc.

Generally land degradation has an effect on water availability, poverty, food security, environmental migration, gender, deforestation, biodiversity and climate change (**UNCCD**). .

Land degradation will have a negative effect on food production. Over the next 25 years the global food production might decrease by 12 % leading to an increase in food prices of 30 % **(UNCCD).**

50 million people may be displaced in the next 10 years because of desertification (**UNCCD**).

Land degradation has a negative effect on global biodiversity (**UNCCD**).

Soil is the second largest carbon storage next to the oceans. Land degradation reduces soil's capacity as carbon stock. There is a negative feedback loop (**UNCCD**).

Some 50 million people may be displaced within the next 50 years as a result of desertification.

24 billion tons of fertile soil disappear every year. Fertile soil can be considered the most significant nonrenewable geo-resource **(UNCCD)**.

Land degradation can act as a threat amplifier particularly with other pressing issues such as rapid growth, poverty, bad governance and little opportunity to migrate (**van Schaik, Dinnissen, 2014)**.

By 2050, at least a 70-100% increase in food production from existing land resources may be needed in order to be able to feed current and future generations **(FAO 2006, Godfray et al. 2010).**

Even if agricultural land productivity remains just at its current levels, an estimated 6 million hectares of land (roughly equivalent to Norway) will need to be brought into usage every year until at least 2030 to satisfy this growing demand **(FAO 2006).**

Climate Change mitigation & adaptation: Economics

Global economic mitigation potentials in agriculture in 2030 are estimated to be0.5–10.6 $GtCO_2e$/yr (IPCC 2014)

Through combination of forestry and agriculture potentials from AR4, total mitigation potentials for the AFOLU sector are estimated to be ~3 to ~7.2 $GtCO_2e$ / yr in 2030 at 20 and 100 USD / tCO_2e, respectively (Figure 11.13), including only supply-side options in agriculture (IPCC 2014)

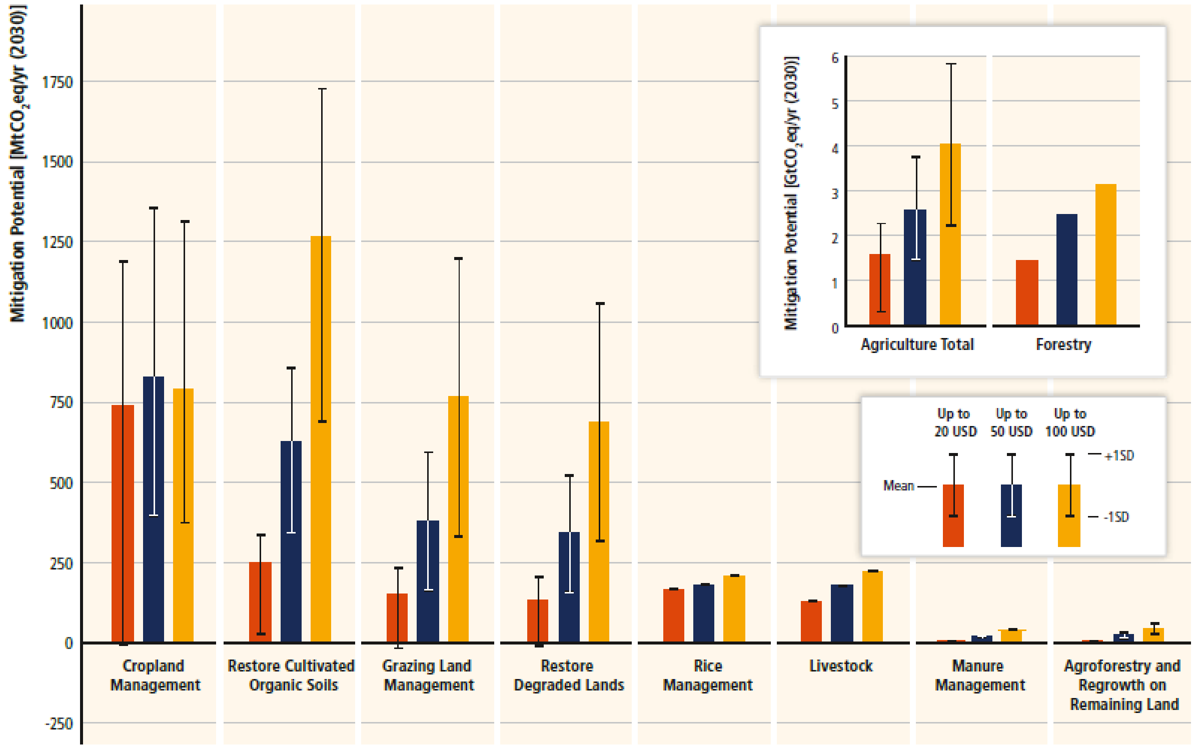

Abbildung 1: Mitigation potential for the AFOLU sector (IPCC 2014: 849)

	up to 20 USD / tCO2eq	up to 50 USD / tCO2eq	up to 100 USD / tCO2eq	Technical potential only
Agriculture only [1]	0 – 1.59 6	0.03 – 2.6	0.26 – 4.6	
Forestry only	0.01 – 1. 45	0.11 – 9.5	0.2 – 13.8	
AFOLU total [1,2]	0.12 – 3.03	0.5 – 5.06	0.49 – 10.6	
Demand-side options				0.76 – 8.55

Tabelle 1Ranges of global mitigation potential (GtCO2eq / yr) reported since AR4 | All values are for 2030 except demand-side options that are for ~2050 (IPCC 2014:852)

Agricultural and forestry measures are among the lowest capital intense levers to reduce the future global warming (McKinsey 2009: 17f)

The agricultural sector bears an abatement potential of 4.6 $GtCO_2e$/year until 2030. Key levers include sound grassland management (1.3 GtCO2e/year) and organic soil restoration (1.1 GtCO2e/year) (McKinsey 2009: 33)

“Land use, land-use change, and forestry are the fourth-largest source of global greenhouse gas emissions, accounting for 16 % of global GHG emissions, or 7.4 $GtCO_2e$ per year in 2005” (McKinsey 2009: 116)

The afforestation of marginal pasturelands and croplands and croplands could lead to the sequestration of 1.0 GtCO2e/year until 2030. “Because of the project based approach of afforestation, private-sector stakheolders play an important role. Afforestation is partially integrated into existing compliance markets. The estimated potential implies and incremental afforestation of 92 million hectares in 20years or 4.6 mil ha /year - an area larger than Denmark.”) (McKinsey 2009: 1119) **forestry, afforestation**

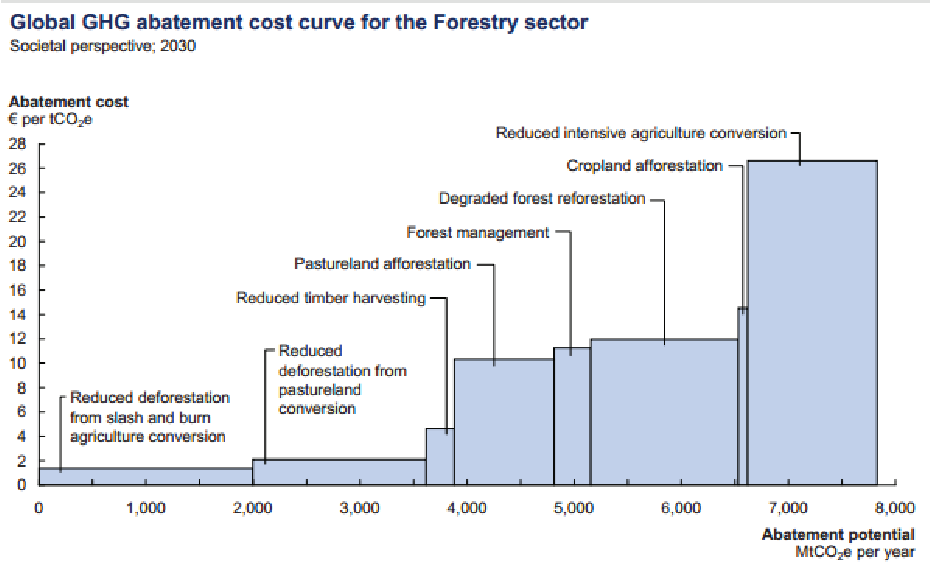

Abbildung 2: GHG abatement cost curve for forestry sector. McKinsey 2009: 120

“The abatement potential in the agriculture sector is very large at 4.6 $GtCO_2e$/year identified by 2030.[…] Most of the abatement levers come at a neutral cost or are net-profit-positive to society and require no substantial capital inverstment. […] The uncertainty around the abatement potential is significant […].” (McKinsey 2009: 123) **agriculture**

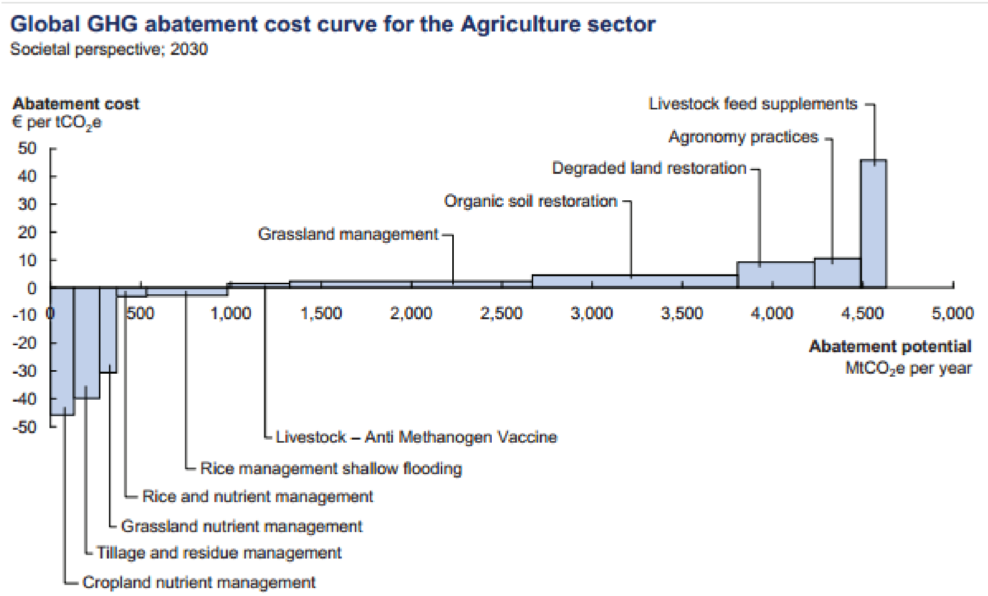

Abbildung 3GHG abatement cost curve for agricultural sector. Mc Kinsey 2009:125

A. **Pastureland (29 percent of abatement potential, 1.3 $GtCO_2e$ per year by 2030).** Improved grassland management is the single largest abatement lever, which consists of increased grazing intensity, increased productivity, irrigation of grasslands, fire management, and species introduction. Pastureland management can include the use of perennial and semi-perennial grasses as energy crops, which in turn can increase agricultural productivity. In addition, grassland nutrient-management practices can be improved through more accurate nutrient additions and better fertilization. Average abatement from this lever is around 0.4 tCO_2e per hectare out of a global total of about 3,250 million hectares of pastureland.

B. **Land restoration (34 percent of abatement potential, 1.6 $GtCO_2e$ per year by 2030).** Land degraded by excessive disturbance, erosion, organic matter loss, acidification, for instance, can be restored through revegetation, improved fertility, reduced tillage, and water conservation.[98] Reestablishing a high water table for organic soils in order to avoid decomposition is a large abatement lever.[99] Reaching the full annual 1.1 $GtCO_2e$ per year of abatement in organic soils requires 1.1 million hectares of land being restored annually between 2020 and 2030, an area almost the size of Northern Ireland. Restoration of degraded land has a potential of 0.5 $GtCO_2e$ per year and but would require a much higher amount of land restored of 6.1 million hectares annually.

C. **Cropland management (27 percent of abatement potential, 1.2 $GtCO_2e$ per year by 2030).** Management of cropland to reduce GHG emissions consists of improved agronomy practices (such as improved crop rotations, less-intensive cropping systems, and extended use of cover crops), reduced tillage of the soil, reduced residue removal (from burning, for instance), improved nutrient management (such as slow-release fertilizer forms, nitrification inhibitors, and improved application rates and timing), and better rice management and rice-nutrient management practices (such as mid-season and shallow-flooding drainage to avoid anaerobic conditions, and use of sulfate fertilizer instead of traditional nitrogen fertilizer). Rice practices, which are mostly limited to developing Asia, are the largest single lever in this category.[100] Average abatement from cropland management is around 0.7 tCO_2e per hectare from the global total of about 1,750 million hectares of cropland.

D. **Livestock management (10 percent of abatement potential, 0.5 $GtCO_2e$ per year by 2030).** Dietary additives and feed supplements can reduce methane emissions from livestock. Livestock account for about one-third of global methane emissions. Additives that are currently available are relatively expensive but vaccines against methanogenic bacteria are being developed. This 0.5 $GtCO_2e$ per year corresponds to a 19 percent reduction in livestock emissions.

"The average costs of abatement for all measures is very low, at around 1€ per tCO_2e in 2030 and […] most measures would be very inexpensive as they are assumed to imply small changes in agricultural practices and no significant capital investments. Soil restoration requires significant implementation and opportunity costs, but these are balanced by a large CO_2 abatement potential per hectar. For example, for organic soils, the implementation costs are about 227€/ha and the potential estimated at between 30-70 tCO_2e/ha. These cost calculations exclude transaction costs. (Mc Kinsey 2009:127)

References:

Bai ZG, Dent DL, Olsson L and Schaepman ME 2008. *Global assessment of land degradation and improvement. 1. Identification by remote sensing*. Report 2008/01, ISRIC – World Soil Information, Wageningen. URL:

ftp://ftp.unccd.int/disk1/Library/Full%20Text%202011-2012%20Full%20Text%20Publications/GLADAreport%202008_01_glada%20international_rev_nov%202008.pdf

BMZ. 2011. Bekämpfung der Desertifikation. URL: http://www.bmz.de/de/mediathek/publikationen/reihen/infobroschueren_flyer/flyer/Desertifikation.pdf

Bowyer, C. 2Sirini Withana, Ian Fenn, Samuela Bassi, Megan Lewis, Tamsin Cooper (IEEP) Patricia Benito, Shailendra Mudgal (BIO)009. Land Degradation and Desertification. Policy Department Economic and Scientific Policy European Parliament. URL: http://www.ecologic.eu/sites/files/project/2013/SC_20_Study_Land_Degradation_and_Desertification_March_2009.pdf

Eswaran, H., R. Lal and P.F. Reich. 2001. Land degradation: an overview. In: Bridges, E.M., I.D. Hannam, L.R. Oldeman, F.W.T. Pening de Vries, S.J. Scherr, and S. Sompatpanit (eds.). Responses to Land Degradation. Proc. 2nd. International Conference on Land Degradation and Desertification, Khon Kaen, Thailand. Oxford Press, New Delhi, India. URL: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/home/?cid=nrcs142p2_054028

IFAD. 2010. Desertification. URL: http://www.wmo.int/youth/sites/default/files/field/media/library/idad-desertification.pdf

FAO. 2011. The State of the World's land and water resources for food and agriculture- managing the risk. URL: http://www.fao.org/docrep/017/i1688e/i1688e.pdf

FAO. 2014. The conservation and rehabilitation of African lands. URL: http://www.fao.org/docrep/z5700e/z5700e00.htm#Contents

GEF. GEF Focal Area: Land Degradation. URL: http://www.thegef.org/gef/sites/thegef.org/files/publication/SAWAP_English_Final.pdf

GEF. 2011. Sahel and West Africa Program in Support of the Green Wall Initiative. URL: http://www.thegef.org/gef/sites/thegef.org/files/publication/SAWAP_English_Final.pdf

GEF. 2013. Did you know that desertification affects 400 million Chinese people? URL: http://www.thegef.org/gef/content/did-you-know-desertification-affects-400-million-chinese-people

IPCC (2014): Agriculture, Forestry and Other Land Use (AFOLU). In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United

Kingdom and New York, NY, USA.

McKinsey 2009. Pathways to a Low-Carbon Economy. Version 2 of the Global Greenhouse Gas abatement cost curve.

UNCCD. Desertification Land Degradation & Drought (DLDD)- Some Global Facts and Figures. URL: http://www.unccd.int/Lists/SiteDocumentLibrary/WDCD/DLDD%20Facts.pdf

UNCCD. Healthy soil is set to become the next “hot commodity”. URL: http://www.unccd.int/Lists/SiteDocumentLibrary/Publications/DrylandsSoilUNCCDBrochureFinal.pdf

UNCCD. 2014. 168 Countries Affected by Desertification. URL: http://www.unccd.int/en/media-center/MediaNews/Pages/highlightdetail.aspx?HighlightID=187

Van Schaik, L., Dinnissen, R. 2014 Terra Incognita: land degradation as underestimated threat amplifier. Clingendael Netherlands Institute of International Relations. URL: http://www.clingendael.nl/sites/default/files/Terra%20Incognita%20-%20Clingendael%20Report.pdf