

## Deborah A. Bossio

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### Key Qualifications

Deborah Bossio has more than 20 years professional experience working in soil science and multidisciplinary sustainable agricultural development research, first as a researcher and in the last 10 years as a science leader and director. She has an MSc and PhD in Soil Science, and has recently developed a strong multidisciplinary program for the CGIAR focused on soils. She has broad-based experience in soil fertility, soil ecology and biology, soil carbon, sustainable agriculture, land degradation and water management, and has promoted the importance of political ecology and institutional sciences to achieve impact. Deborah has been a key advocate for soil science and land restoration in the CGIAR as Director of CIAT's Soils Research Area, and a Flagship Leader for the Water, Land and Ecosystem Program of the CGIAR. She has served on the scientific committee of the Global Landscape Forum, the 4p1000 Soils for food security and climate research consortia, and the Initiative 20by20 to restore degraded lands in Latin America. She has lived and worked in the Americas, Asia, and Africa. In October 2016, she took up a new position at The Nature Conservancy, where her role will be to bring soil science expertise to large-scale implementation programs of TNC for Natural Climate Solutions, Water Funds to rehabilitate upland watersheds in Latin America and East Africa, and projects to restore rangelands in Brazil and Kenya, and peatland soils in the United States. In addition she will be developing new initiatives for TNC on soil health and soil carbon, and providing soil science expertise for policy development, advocacy and large-scale investment.

### Education

- 1988 M.Sc. Soil Science, University of California, Davis, USA  
1996 PhD. Soil Science, University of California, Davis, USA

### Professional Experience

- 2016 to present Lead Soil Scientist, Global Lands Team, The Nature Conservancy (TNC)  
Director, Soils Research, International Center for Tropical Agriculture (CIAT), Nairobi, Kenya  
2012 to 2016 Theme Leader, Productive Water Use, International Water Management Institute (IWMI), Addis Ababa, Ethiopia  
2008 to 2012 Interim Director, Research Programs, International Water Management Institute, Colombo, Sri Lanka  
2007 to 2008 Theme Leader, Land, Water and Livelihoods, and Coordinating Lead Author, 'Conserving land - protecting water,' Comprehensive Assessment of Water Management in Agriculture, International Water Management Institute, Colombo, Sri Lanka  
2004 to 2008

- 2002 to 2012 Principal Soil Scientist, International Water Management Institute, Colombo, Sri Lanka
- 2000-2002 Soil Ecosystem Scientist, International Centre for Research in Agroforestry, Nairobi, Kenya
- 1998-2000 Soil Microbiologist, and Project Manager U.S. Geological Survey, California, USA

### Peer Reviewed Journal Articles and Assessments (selected)

- Bousquet, F., A. Botta, L. Alinovi, O. Barreteau, D. Bossio, K. Brown, P. Caron, M. D'Errico, F. DeClerck, H. Dessard, E. Enfors Kautsky, C. Fabricius, C. Folke, L. Fortmann, B. Hubert, D. Magda, R. Mathevet, R. B. Norgaard, A. Quinlan and C. Staver. 2016. Resilience and development: mobilizing for transformation. *Ecology and Society* 21 (3):40. [online] URL: <http://www.ecologyandsociety.org/vol21/iss3/art40/>
- Zomer R J, Neufeldt H, Xu J, Ahrends A, Bossio D, Trabucco A, van Noordwijk M and Wang M. *Global Tree Cover and Biomass Carbon on Agricultural Land: The contribution of agroforestry to global and national carbon budgets. Scientific Reports* 6, Article number: 29987 (2016). doi:10.1038/srep29987
- Sommer, R., Mukalama, J., Kihara, J., Koala, S. Winowiecki, L., Bossio, D. 2015. Nitrogen dynamics and nitrous oxide emissions in a long-term trial on integrated soil fertility management in Western Kenya. *Nutrient Cycling in Agroecosystems*. 10.1007/s10705-015-9693-6.
- Verchot, L.V., N.L. Ward, J. Belknap, D.A. Bossio, A.N. Muchiru, D. Wall, and R.S. Reid. 2015. From bacteria to elephants: Effects of land-use legacies in the Serengeti - Mara ecosystem on biodiversity and ecosystem processes. In Sinclair, A.R.E., J.M. Metzger, K.L. Fryxell, and S.A.R. Mduma, (Eds.) *Serengeti IV: Sustaining Biodiversity in a Coupled Human-Natural System*. University of Chicago Press: 1427 E. 60th Street Chicago, IL USA.
- Sommer, R., Bossio, D. 2014 Dynamics and climate mitigation potential of soil organic carbon sequestration. *Journal of Environmental Management*. Vol 144, 83-87. DOI: 10.1016/j.jenvman.2014.05.017
- Wolde Mekuria, Andrew Noble, Oloth Sengtaheuanghoung, Chu Thai Hoanh, Deborah Bossio, Nivong Sipaseuth, Matthew McCartney & Simon Langan (2014) Organic and Clay-Based Soil Amendments Increase Maize Yield, Total Nutrient Uptake, and Soil Properties in Lao PDR, *Agroecology and Sustainable Food Systems*, 38:8, 936-961, DOI: [10.1080/21683565.2014.917144](https://doi.org/10.1080/21683565.2014.917144)
- Ginkel, Maarten van, Jeff Sayer, Fergus Sinclair, Aden Aw-Hassan, Deborah Bossio, Peter Craufurd, Mohammed El Mourid, Nasri Haddad, David Hoisington, Nancy Johnson, Carlos León Velarde, Víctor Mares, Andrew Mude, Ali Nefzaoui, Andrew Noble, K. P. C. Rao, Rachid Serraj, Shirley Tarawali, Raymond Vodouhe, Rodomiro Ortiz. 2013. An integrated agro-ecosystem and livelihood systems approach for the poor and vulnerable in dry areas, *Food Security*, 10.1007/s12571-013-0305-5.
- Bossio, D. Erkossa, T. Dile, Y. McCartney, M. Killiches, F. and Hoff, H. 2012. Water implications of foreign direct investment in Ethiopia's agricultural sector. *Water Alternatives* 5(2): 223-242
- Descheemaeker, K., Amede, T., Haileslassie, A., Bossio, D. 2011. Analysis of gaps and possible interventions for improving water productivity in crop livestock systems of Ethiopia. *Expl. Agric.* 47: 21-38.
- Herrero, M., P. K. Thornton, A. M. Notenbaert, S. Wood, S. Msangi, H. A. Freeman, D. Bossio, J. Dixon, M. Peters, J. van de Steeg, J. Lynam, P. Parthasarathy Rao, S. Macmillan, B. Gerard, J. McDermott, C. Seré and M. Rosegrant 2010. Smart investments in sustainable food production: revisiting the focus. *Science Policy Forum*.
- Bossio, D., Geheb, K., and Critchley, W. 2010. Managing water by managing land: addressing land degradation to improve water productivity and rural livelihoods. *Agricultural Water Management*, 97:536-542.

- John Dixon, Xiaoyun Li, Siwa Msangi, Betina Dimaranan, Tilahun Amede, Deborah Bossio, Hernan Ceballos, Bernardo Ospina, Reinhardt Howeler, Belum VS Reddy, Robert Abaidoo, Jagadish Timsina, Charles Crissman, Victor Mares, Robert Quiroz, Carlos Leon-Velarde, Mario Herrero, Michael Blummel, Michael Peters, Douglas White, Judit Szonyi. 2010. Feed, Food and Fuel: Competition and potential impacts on small crop-livestock-energy farming systems. An Assessment Commissioned by the CGIAR Systemwide Livestock Program.
- Herrero, M. P.K. Thornton, A. Notenbaert, S. Msangi, S. Wood, R. Kruska, J. Dixon, D. Bossio, J. van de Steeg, H. A. Freeman, X. Li and P. Parthasarathy Rao. 2010. Drivers of Change in Crop Livestock Systems and their Potential Impacts on Agro-ecosystems Services and Human Well-being to 2030. A study commissioned by the CGIAR Systemwide Livestock Programme. ILRI, Nairobi, Kenya.
- Bossio, D., 2009. Livestock and Water: Understanding the context based on the Comprehensive Assessment of Water Management in Agriculture. LWP Special Issue. *Rangeland Journal*, 31(2): 179-186.
- Smith, L., and Gurib-Fakim, A., Nazimi Acikgoz , Patrick Avato , Deborah Bossio , Kristie Ebi , André Gonçalves, Jack A. Heinemann, Thora Martina Herrmann, Jonathan Padgham, Johanna Pennarz, Urs Scheidegger, Leo Sebastian, Miguel Taboada, Ernesto Viglizzo. 2009. IAASTD Chapter 6. Options to enhance the impact of AKST on the development and sustainability goals. 2009. World Bank.
- Nienke Beintema, Deborah Bossio, Fabrice Dreyfus, Maria Fernandez, Ameenah Gurib-Fakim, Hans Humni, Anne-Marie Izac, Janice Jiggins, Gordana Kranjac-Berisavljevic, Roger Leakey, Washington Ochoa, Balgis Osman-Elasha, Cristina Plencovich, Niels Roling, Mark Rosegrant, Erika Rosenthal, Linda Smith. 2009. IAASTD Global summary for decision makers. World Bank.
- Enfors, E.I., Gordon, L.J., Peterson, G.D., and Bossio, D. 2008. Making investments in dryland development work: Participatory scenario planning to increase the robustness of investments made in small-scale farming in the Makanya catchment, Tanzania. *Ecology and Society*.
- Zomer, R.J., Trabucco, A., Bossio, D.A., and Verchot, L.V. 2008. Climate change mitigation: a spatial analysis of global land suitability for clean development mechanism afforestation and reforestation. *Agriculture, Ecosystem and Environment*, 126:67-80.
- Trabucco, A., Zomer, R.J., Bossio, D.A., van Straaten, O., and Verchot, L.V. 2008. Climate change mitigation through afforestation/reforestation: a global analysis of hydrologic impacts with four case studies. *Agriculture, Ecosystem and Environment*, 126: 81-97.
- Namara, R. Bossio, D., Weligamage, P. and Herath, I. 2008. The practice and effects of the System of Rice Intensification (SRI) in Sri Lanka. *Quarterly Journal of International Agriculture*, 47: 5-23.
- de Fraiture, C., Smakhtin, V., Bossio, D., McCornick, P., Hoanh C., Noble, A., Molden, D., Gichuki, F., Giordano, M., Finlayson, M., Turrall, H. 2007. Facing climate change by securing water for food, livelihoods and ecosystems. *Journal of Semi-Arid Tropical Agricultural Research*, 4(1): E-journal.
- Bossio, D., Critchley, W., Geheb, K., van Lynden, G. and Mati, B., 2007, Conserving land - protecting water. In Molden, D. (Ed.) *Water for Food, Water for Life: A Comprehensive Assessment of Water Management in Agriculture*. Earthscan, London and International Water Management Institute, Colombo, pp. 551-583.
- Zomer, R., Bossio, D.A., Trabucco, A., Yuanjie, L., Gupta, D.C. and V.P. Singh. 2007. Water and trees: small holder agroforestry on irrigated lands in Northern India. IWMI Research Report No 122.
- Craswell, E., Bonnell, M., Bossio, D., Demuth, S., Giesen van der, N (eds). 2007 *Integrated Assessment of Water Resources and Global Change: A North-South Analysis*. Special issue *Water Resources Management* vol. 21. Reprinted by Springer, Dordrecht, The Netherlands, 373 pp.
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- Zomer, R., Trabucco, A., van Straaten, O., Bossio, D. 2006. Carbon, Land and Water: A global analysis of the hydrologic dimensions of climate change mitigation through afforestation/reforestation within the Kyoto Protocol Clean Development Mechanism. IWMI Research Report 101, 38 pp.

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- Noble, A.D., Bossio, D.A., Penning de Vries, F.W.T., Pretty, J. and T.M. Thiyagarajan. 2006. 'Bright Spots': Impacts and Drivers. Comprehensive Assessment Research Report 13, Sri Lanka.
- Penning de Vries, Frits; Bossio, Deborah. 2006. Smallholder land and water management. In Giordano, M.; Rijsberman, F.; Saleth, R.M. (Eds.). 'More crop per drop.' Revisiting a research paradigm: Results and synthesis of IWMI's research, 1996- 2005. London, UK: IWA. pp.56-83
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- Fleck, J.A., D.A. Bossio, and R. Fujii. 2004. Dissolved organic carbon and disinfection by-product precursor release from managed peat soils. *Journal of Environmental Quality*. **33**:465-475.
- Bossio, D.A., W.R. Horwath, R. Mutters, and C. van Kessel. 1999. Methane pool and flux dynamics in a rice field following straw incorporation. *Soil Biology and Biochemistry*. **31**: 1313-1322.
- Bossio, D. A., K.M. Scow, N. Gunapala, and K.J. Graham. 1998. Determinants of soil microbial communities: effects of agricultural management, season, and soil type on phospholipid fatty acid profiles. *Microbial Ecology*. **36**:1-12.
- Bossio, D. A., and K.M. Scow. 1998. Impacts of carbon and flooding on soil microbial communities: phospholipid fatty acid profiles and substrate utilization patterns. *Microbial Ecology*. **35**: 265-278.
- Bossio, D.A., and K.M. Scow. 1997. Management changes in rice production alter microbial community. *California Agriculture*. **51**:33-40.
- Bossio, D.A., and K.M. Scow. 1995. Impact of carbon and flooding on the metabolic diversity of microbial communities in soils. *Appl. Environ. Microbiol.* **61**:4043-4050.
- Bossio, D.A., and K.G. Cassman. 1991. Traditional rainfed barley production in the Andean Highlands of Ecuador: soil nutrient limitations and other constraints. *Mountain Research and Development*, vol. **11**(2), pp. 115-126.

### Books and Book Chapters

- Bossio, D. and Geheb, K. 2008. *Conserving Land, Protecting Water*. Comprehensive Assessment of Water Management in Agriculture, Oxford, UK, CABI Publishing, 235 pp.
- Bossio, D. and Geheb, K. 2008. Conserving Land, Protecting Water: an Introduction. 2008. In Bossio, D. A. and Geheb, K. (eds) *Conserving Land, Protecting Water: Bright Spots' Reversing the Trends in Land and Water Degradation*. Comprehensive Assessment of Water Management in Agriculture, Oxford, UK, CABI Publishing, pp xi –xviii.
- Trabucco, A., Bossio, D., and van Stratten, O. 2008. Carbon sequestration, land degradation and water. In Bossio, D. A. and Geheb, K. (eds) *Conserving Land, Protecting Water: Bright Spots' Reversing the Trends in Land and Water Degradation*. Comprehensive Assessment of Water Management in Agriculture, Oxford, UK, CABI Publishing, pp 83-106.

- Bossio D., Noble, A. Aloysius N., Pretty, J., Penning de Vries, F. 2008. Ecosystem benefits of 'Bright Spots'. In: Bossio, D. A. and Geheb, K. (eds) *Conserving Land, Protecting Water*. Comprehensive Assessment of Water Management in Agriculture, Oxford, UK, CABI Publishing, pp. 205-224.
- Bossio, D.A., Noble, A., Molden, D., and V. Nangia. 2008. Land degradation and water productivity in agricultural landscapes. In: Bossio, D. A. and Geheb, K. (eds) *Conserving Land, Protecting Water*. Comprehensive Assessment of Water Management in Agriculture, Oxford, UK, CABI Publishing, pp. 20-32.
- Noble, A., Bossio, D., Pretty, J., Penning de Vries, F. 2008. 'Bright spots': Pathways to ensuring food security and environmental integrity. In: Bossio, D. A. and Geheb, K. (eds) *Conserving Land, Protecting Water*. Comprehensive Assessment of Water Management in Agriculture, Oxford, UK, CABI Publishing, pp. 191 -204.
- Valentin, C., Bossio, D., Boonsaner, A., Guzman, M.T.L., Phachornphonh, K., Subagyono, K., Toan, T.D. Janeau, J.L., Orange, D. Ribolzi, O. 2006. Improving catchment management on sloping land in Southeast Asia. In: Rocchi, D. (ed.) France and the CGIAR: Delivering Scientific Results for Agricultural Development. CGIAR. Pp68-72.

### **Presentations, invited panels and Proceedings**

- Bossio, D. 2015. Soil matters and is a key element for climate change and a world without hunger, invited panelist. 'Soil matters' Side Event German Pavillion, Blue Zone, UNFCCC COP21. Paris, France. Dec 2015.
- Bossio, D. 2015. Seeing the big picture on land restoration: how research supports key decisions. Introduction to the session 'putting pledges into practice in Latin America – an early assessment of the Initiative 20x20 from science, policy, and finance perspectives. Global Landscape Forum, Paris, France. Dec 2015.
- Bossio, D. 2015. Soil carbon for food security and climate, CGIAR perspectives. 'See you in Brussels,' CIRAD, Brussels, Belgium, Nov 2015.
- Bossio, D., Snyder, K., Okolo, W. 2015. Soil policies for sustainable land management. GIZ side event, UNCCD COP 12, Ankara, Turkey, Oct 2015.
- Bossio, D. 2015. Soil organic matter the bridge between the UNCCD and the UNFCCC. Rio Convention Pavilion, UNCCD COP12, Ankara, Turkey, Oct 2015.
- Bossio, D. 2015. Soil organic matter for climate change: boon or bane for food security? 2015 Wageningen Soil Conference, Wageningen, Aug 24, 2015.
- Bossio, D. 2014. Transforming the global landscape. Virtual briefing, Global Donor Platform for Rural Development, Jun 2014.
- Bossio, D. 2014. Soils in the landscape. European Soil Partnership Plenary meeting. Ispra, Italy. May 2014.
- Bossio, D and Janetschek, H. 2015. Soil fertility management – toward a joint paradigm, facilitators. Global Soil Week, Berlin, Germany, Apr 2015.
- Bossio, D., Kizito, F., Cordingley, J., Desta, L. 2014. Re-thinking transitions in rainfed farming landscapes. Global Land Project Open Science meeting, Berlin, Germany, Mar 2014.
- Bossio, Deborah. 2013. Putting Soils Back on the Global Agenda, Key Note address, 10<sup>th</sup> Biannual Pedometrics Conference, Nairobi, Kenya, 26-31 August 2013.
- Bossio, Deborah. 2012. Soils and resilience, much more than a slow variable. Plenary keynote. Tropentag, Göttingen, Germany. 19 September, 2012.
- Bossio, Deborah. 2012. Why we need soils information. Global Soils Week, Berlin, Germany, 20<sup>th</sup> Nov 2012.
- Bossio, Deborah. 2012. Soils research in the CGIAR. Global Soils Week, Berlin, Germany, 21<sup>th</sup> Nov 2012

- Bossio, D., 2009, Water management in agriculture, challenges and way forward. SAI Platform's 3<sup>rd</sup> Seminar on Water and Agriculture. Rotterdam, The Netherlands, 7 Oct, 2009.
- Bossio, D. and Molden D., 2009. Improving Agricultural Productivity, Water Use Efficiency and Strengthening Rural Livelihoods". UN DESA Bangkok, Thailand, 28 Jan 2009.
- Bossio, D. 2008. Livestock and Water: Understanding the context based on the Comprehensive Assessment of Water Management in Agriculture. Systemwide Livestock Program Workshop on "Drivers" and Biofuels/Trade-offs", April 29-30, Addis Ababa, Ethiopia.
- Bossio, D., 2008. Key note address: Agriculture water management: adapting to an uncertain future. IMAWESA 3<sup>rd</sup> Regional Conference on Agricultural Water Management in Eastern and Southern Africa, 15<sup>th</sup> to 19<sup>th</sup> September 2008, Addis Ababa, Ethiopia.
- Bossio, D., 2008. Impact of irrigation on poverty and the environment in Ethiopia and elsewhere. 2<sup>nd</sup> Forum on Irrigation & Water for Sustainable Development Program, December 15- 16, 2008. Addis Ababa Ethiopia.
- Bossio, D. 2007. Land, water and livestock. Key note address. Harnessing Water Productivity in Crop-livestock Systems of sub-Saharan Africa through Improved Livestock and Water Interventions. Addis Ababa, September 24-26, 2007.
- Bossio, D. 2006. Convener: Greening Upper Catchments, International Forum on Water and Food, November 13-17, 2006.
- Bossio, D. 2006. Conserving land, protecting water: benefits for smallholders and the environment. Turning Assessment Findings into Action. World Water Week, Stockholm, Sweden, August 2006.
- Bossio, D. 2006. Small scale water innovations for ecosystem restoration in semi-arid agroecosystems. Keynote, Young Water Professionals Seminar. World Water Week, Stockholm, Sweden, August 2006
- Rijsberman, F., Bossio, D., and Noble, A.D. 2005. The Impact of Land Degradation and Improved Land Management on Water Productivity. International Conference of Soil, Water and Environmental Quality – Issues and Strategies, New Delhi, India, January 28-February 1, 2005.
- Bossio, D., Zomer, R., Singh, P. 2004. Smallholder agroforestry provides local and global benefits in Northern India. First World Congress of Agroforestry, June 27 – July 2, Orlando, Florida.
- Bossio, D. 2004. Reversing Land and Water Degradation: Trends and Bright Spot Opportunities. SIWI/CA Seminar, Stockholm Water Week, August 21, 2004.
- Bossio, D. 2004. Landscape management for sustainable water use in sloping uplands agriculture. Keynote Address: International Conference on Innovative Practices for Sustainable Sloping Lands and Watershed Management, Chiang Mai, Thailand, Sept. 5-9.
- Bossio, D., Noble, A., Penning de Vries, F., Pretty, J., Molden, D. 2004. Linking land, soil, and water resource management. Watershed Management Challenges: Improved Productivity, Resources and Livelihoods. ICAR/IWMI/ICRISAT International Workshop. New Delhi, India, Nov 3-4, 2004.

#### **Other publications and communications**

- Bossio, Deborah. 2015. Soil Organic Carbon and the 4‰ Initiative: Soils for food security and climate, November 27, 2015, CIAT Blog, <https://ciat.cgiar.org/soils-2-2/soil-organic-carbon-and-the-4‰-initiative-soils-for-food-security-and-climate>.
- Bossio, Deborah, 2015, Thrive Blog: Podcast: Bringing soils back to life: A conversation with Deborah Bossio by Jeremy Cherfas on August 13, 2015 <https://wle.cgiar.org/thrive/2015/08/13/podcast-bringing-soils-back-life-conversation-deborah-bossio>
- Bossio, Deborah. 2015 Changing the hippy discourse. Thrive WLE Blog. July 3, 2015, <https://wle.cgiar.org/thrive/2015/07/02/changing-hippy-discourse>
- Bossio, Deborah. 2015. Can Africa afford to save its soils? April 21, 2015, Thrive WLE Blog, <https://wle.cgiar.org/thrive/2015/04/21/can-africa-afford-save-its-soils>
- Bossio, Deborah. 2014. Building confidence in large-scale landscape restoration. December 11, 2014, Thrive WLE Blog, <https://wle.cgiar.org/thrive/2014/12/10/building-confidence-large-scale-landscape-restoration>

CGIAR Research Program on Water, Land and Ecosystems (WLE). 2014. Ecosystem services and resilience framework. Colombo, Sri Lanka: International Water Management Institute (IWMI). CGIAR Research Program on Water, Land and Ecosystems (WLE). 46p. doi: 10.5337/2014.229

Bossio, Deborah. How do we ensure our landscapes support agriculture to increase wealth and equity in smallholder farming communities? October 18, 2013, WLE Thrive Blog, <https://wle.cgiar.org/thrive/2013/10/18/how-do-we-ensure-our-landscapes-support-agriculture-increase-wealth-and-equity>

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