

## **Dr. Gina Marie Garland**

Address: Universitätstrasse 16, 8092 Zurich Switzerland

Email: gina.garland@usys.ethz.ch

Phone: +41 44 633 60 93

Research profile: [http://www.researchgate.net/profile/Gina\\_Garland/](http://www.researchgate.net/profile/Gina_Garland/)

OrcID: 0000-0002-1657-3669

### **Education**

June 2013 – Jan. 2017

#### **Ph.D. in Sustainable Agroecosystems**

*Department of Environmental System Sciences, ETH Zürich, Switzerland*

Thesis title: “Phosphorus cycling in soil aggregate fractions in maize-pigeon pea intercropping systems of Malawi.”

Advisor: Dr. Johan Six

Defense exam: 26 January 2017

July 2009 – July 2011

#### **M.Sc. in Horticulture and Agronomy**

*Department of Plant Sciences, University of California, Davis, USA*

Thesis title: “Direct N<sub>2</sub>O emissions in California vineyards as affected by conventional management practices.”

Sept. 2004 – March 2007

#### **B.Sc. in Biological Sciences**

*Major in Ecology, Evolution, and Marine Biology*

*University of California, Santa Barbara, USA*

### **Appointments**

August 2021 - current

#### **Group Leader in the Soil Resources group**

*ETH, Zurich, Switzerland*

As an independent Group Leader, I supervise my own group of students and post-doctoral researchers and conduct research on the impacts of antibiotics from human excreta derived fertilizers on the soil-microbial-plant nexus.

March 2020 – current

#### **Research scientist in the Soil Quality and Use group**

*Agroscope, Zurich, Switzerland*

Supervisor: Dr. Peter Weisskopf

In my current position I am the Scientific Coordinator representing Switzerland in the five-year Horizon 2020 funded European Joint Program on Soils. In addition, I conduct independent research on soil quality and functioning within the Soil Quality and Use group at Agroscope.

July 2019 – March 2020

#### **Post-doctoral researcher in the Soil Resources group**

*ETH, Zurich, Switzerland*

Supervisor: Dr. Sebastian Dötterl

In this postdoctoral position I primarily helped write and edit research grants for myself and group members, and also co-supervised PhD students working on soil nutrient dynamics in the Congo River Basin.

- March 2017 – June 2019      **Post-doctoral researcher in the Soil-Plant Interactions group**  
*Agroscope, Zurich, Switzerland*  
 Supervisor: Dr. Marcel van der Heijden  
 In this postdoctoral position I was part of a multidisciplinary team conducting research on the impact of crop biodiversity on the soil microbial community structure and its associated ecosystem services.
- July 2012 – May 2013      **Assistant Professor/Agriculture Cooperative Extension Agent**  
*New Mexico State University, New Mexico, USA*  
 In this Cooperative Extension position I conducted applied research and an educational outreach program focused on soil and sustainable agricultural systems in Sandoval county and several Native American reservations of western New Mexico.
- August 2011 – July 2012      **Agronomist**  
*Agri-Cultura Network Albuquerque, New Mexico, USA*  
 In this position as an agronomist for the organic farming cooperative “Agri-Cultura Network”, I was responsible for conducting research on organic pest management strategies to mitigate crop losses due to squash bugs in Albuquerque, New Mexico.
- July 2009 – July 2011      **Graduate Research Assistant**  
*University of California, Davis, USA*  
 As a research assistant in the Agroecology group of Dr. Johan Six at UC Davis, I measured N<sub>2</sub>O emissions from vineyards and orchards of northern California.
- Jan. 2008- Sept. 2008      **Natural Resource Management Volunteer**  
*Peace Corps Charagua, Bolivia*  
 As a natural resource management volunteer in the Peace Corps, I helped the community of Charagua, Bolivia with developing and implementing a tree nursery to aid in the reforestation and controlling soil erosion on the hillsides.

### **Teaching experience**

- August 2012 – May 2013      **New Mexico State University**  
*New Mexico State University, New Mexico, USA*  
 During my appointment as the Agricultural Cooperative Assistant with NMSU, I developed and taught the Master Gardener semester training program. The course objectives were to teach all aspects of sustainable agricultural and horticultural production including soil fertility, water use efficiency, plant propagation techniques, integrated pest management, and crop breeding and genetics.

### **Student supervision**

- Ph.D.    Sarah van den Broek (ETH Zurich, Switzerland), thesis in progress  
           Anna Edlinger (University of Zurich, Switzerland), thesis completed June 2021
- M.Sc.    Clara Palao Zapatee (University of Madrid, Spain), thesis completed April 2019  
           Justine Boitel (University of Nimes, France), thesis completed April 2018

B.Sc. Silvan Strebel (ETH Zurich, Switzerland), thesis completed August 2015  
Katja Degonda (ETH Zurich, Switzerland), thesis completed August 2015

## **Grants**

### **SNSF PRIMA Research Grant**

I received the SNSF PRIMA Research Grant in September 2020 for 1.43 million CHF to lead and conduct a five-year research project entitled “Understanding the impacts of antibiotics from human excreta derived fertilizers on the soil-microbial-plant nexus.”

### **World Food Systems Center Ambassador Grant**

I received a World Food Systems Center Ambassador grant for 1600 CHF to present my state of the art research at the *Phosphorus in Soils and Plants* conference in Montpellier, France in August 2014.

## **Awards**

### **Swiss Forum for International Agriculture Research Award**

I received the award for best PhD project of 2016 for my thesis project entitled: “The use of maize-pigeon pea intercropping to enhance organic phosphorus cycling and maize yields in Malawi”.

## **Reviewer for the following scientific journals**

New Phytologist  
Global Change Biology  
European Journal of Soil Science  
European Journal of Soil Biology  
Science of the Total Environment  
Soil Use and Management  
Soil Research  
Agronomy for Sustainable Development  
Renewable Agriculture and Food Systems  
Functional Ecology  
Applied Soil Ecology  
Catena

## **Scientific memberships**

Swiss Soil Science Society

## **Conference organization**

*Above- and Belowground Biodiversity for Sustainable Ecosystems*

Agroscope, Zurich, Switzerland

14-15 November, 2019

I organized all aspects of the symposium entitled “Above- and Belowground Biodiversity for Sustainable Ecosystems”. This included developing the scientific program and invited speakers list, organizing transport, lodging, and food for all participants, advertising the symposium on the Agroscope website and via flyers at conferences, organizing financial issues, and all logistical aspects of the symposium.

## **Publications in peer-reviewed scientific journals**

Koestel, J., Fukumasu, J., **Garland, G.**, Larsbo, M., Svensson, D.N., 2021. Approaches to delineate aggregates in intact soil using X-ray imaging. *Geoderma*, accepted.

Reichenbach, M., Fiener, P., **Garland, G.**, Griepentrog, M., Six, J., Doetterl, S., 2021. The role of geochemistry in organic carbon stabilization against microbial decomposition in tropical rainforest soils. *SOIL*, 7, 453-475. DOI:10.5194/soil-7-453-2021.

**Garland, G.**, Edlinger, A., Banerjee, S., Degrunne, F., Garcia-Palacios, P., Pescador, D., Herzog, C., Romdhane, S., Saghai, A., Spor, A., Wagg, C., Hallin, S., Maestre, F., Philippot, L., Rillig, M., van der Heijden, 2020. Crop cover is more important than rotational diversity for soil multifunctionality and cereal yields in European cropping systems. *Nature Food*, 2, 28-37. DOI:10.1038/s43016-020-00210-8

**Garland, G.**, Samiran, B., Edlinger, A., Oliveira, E., Herzog, C., Wittwer, R., Philippot, L., Maestre, F., van der Heijden, M., 2020. A closer look at the functions behind ecosystem multifunctionality: A review. *Journal of Ecology*, 1-14. DOI:10.1111/1365-2745.13511.

Edlinger, A., Saghai, A., Herzog, C., Degrunne, F., **Garland, G.**, 2020. Towards a multi-dimensional view of biodiversity and ecosystem functioning in a changing world. *New Phytologist*, 228(3), 820-822. DOI:10.1111/nph.16881.

Lee, J., **Garland, G.**, Viscarra Rossel, R., 2018. Continental soil drivers of ammonium and nitrate in Australia. *SOIL*, 4, 213-224. DOI:10.5194/soil-4-213-2018.

Huang, P., Zhang, J., Zhu, A., Li, X., Ma, D., Xin, X., Zhang, C., Wu, S., **Garland, G.**, Pereira, E., 2018. Nitrate accumulation and leaching potential reduced by coupled water and nitrogen management in the Huang-Huai-Hai Plain. *Science of the Total Environment*, 610-611, 1020-1028. DOI:10.1016/j.scitotenv.2017.08.127.

**Garland, G.**, Bunemann, E., Oberson, A., Frossard, E., Snapp, S., Chikowo, R., Six, J. 2017. Phosphorus cycling within soil aggregate fractions of a highly weathered tropical soil: A conceptual model. *Soil Biology and Biochemistry*, 116, 91-98. DOI:10.1016/j.soilbio.2017.10.007.

George, T.S., Giles, C.D., Menezes-Blackburn, D., Condon, L.M., . . . **Garland, G.**, et al., 2018. Organic phosphorus in the terrestrial environment: a perspective on the state of the art and future priorities. *Plant and Soil*, 427(1-2), 209-211. DOI:10.1007/s11104-017-3391-x.

Verhoeven, E., Pereira, E., Decock, C., **Garland, G.**, Kennedy, T., Suddick, E., Horwath, W., Six, J., 2017. N<sub>2</sub>O emissions from California farmlands: A review. *California Agriculture*, 71 (3), 148-159. DOI:10.3733/ca.2017a0026.

**Garland, G.**, Bünemann, E., Six, J., 2017. New soil aggregate fractionation methodology to understand phosphorus transformations in iron oxide-rich tropical agricultural soils. *European Journal of Soil Science*, 68, 115-125. DOI:10.1111/ejss.12396.

Decock, C., **Garland, G.**, Suddick, E., Six, J., 2017. Season and location-specific nitrous oxide emissions in an almond orchard in California. *Nutrient Cycling in Agroecosystems*, 107, 139-155. DOI:10.1007/s10705-017-9824-3.

Huang, P., Zhang, J., Ma, D., Wen, Z., Wu, S., **Garland, G.**, Pujol Pereira, E.I., Zhu, A., Xin, X., Zhang, C., 2017. Response to discussion of “Atmospheric deposition as an important nitrogen load to a typical agro-ecosystem in the Huang-Huai-Hai Plain” by Huang et al. (2016), *Atmospheric Environment*, 153, 236-239. DOI:10.1016/j.atmosenv.2017.01.017.

**Garland, G.**, Bünemann, E., Oberson, A., Frossard, E., Six, J., 2016. Plant-mediated rhizospheric interactions in maize-pigeon pea intercropping enhance soil aggregation and organic phosphorus storage. *Plant and Soil*, 415 (1-2), 37-55. DOI:10.1007/s11104-016-3145-1.

Huang, P., Zhang, J., Ma, D., Wen, Z., Wu, S., **Garland, G.**, Pereira, E., Zhu, A., Xin, X., Zhang, C., 2016. Atmospheric deposition as an important nitrogen load to a typical agro-ecosystem in the Huang-Huai-Hai Plain. 2. Seasonal and inter-annual variations and their implications (2008-2012). *Atmospheric Environment*, 129, 1-8. DOI:10.1016/j.atmosenv.2011.03.049.

**Garland, G.**, Suddick, E., Burger, M., Horwath, W., Six, J., 2014. Direct N<sub>2</sub>O emissions from a Mediterranean vineyard: Event-related baseline measurements. *Agriculture, Ecosystems and Environment*, 195, 44-52. DOI:10.1016/j.agee.2014.05.018.

**Garland, G.**, Suddick, E., Burger, M., Horwath, W., Six, J., 2011. Direct N<sub>2</sub>O emissions following transition from conventional till to no-till in a cover cropped Mediterranean vineyard (*Vitis vinifera*). *Agriculture, Ecosystems and Environment*, 144, 423-428. DOI:10.1016/j.agee.2011.11.001.

### **Contributions to books**

Suddick, E., Steenwerth, K., **Garland, G.**, Smart, D., & Six, J., 2011. Discerning agricultural management effects on nitrous oxide emissions from conventional and alternative cropping systems: A California case study. In: *Understanding Greenhouse Gas Emissions for Agriculture Management*, Eds. L. Guo, A. Gunasekara & L. McConnell, pp. 203-226, American Chemical Society Symposium Series, Washington D.C., USA.

### **Oral contributions to conferences**

November 2020. Agroscope Wissenschaftliches Kolloquium, Zurich, CH.  
Towards Climate-Smart Sustainable Management of Agricultural Soils.  
*Oral presentation*

September 2019. ETH Institute of Terrestrial Ecosystems R-Day, Zurich, CH.  
Towards a better understanding of terrestrial ecosystems: An interdisciplinary approach  
*Keynote presentation*

August 2019. Soil Science Society of Switzerland Annual Meeting, Bern, CH.  
Impact of crop diversification on the soil microbial community structure and soil multifunctionality  
*Oral presentation*

November 2018. Agroscope Wissenschaftliches Kolloquium, Zurich, CH.  
The impact of crop rotation biodiversity on soil microbial community structure and associated ecosystem functions  
*Oral presentation*

September 2018. Phosphorus in Soils and Plants 6, Leuven, BE.  
Impact of crop diversification on soil organic matter pools and phosphorus dynamics  
November 2016. World Food System Center Research Symposium, Zurich, Switzerland.  
*Poster presentation*

September 2016. Organic Phosphorus Workshop, Lake District, UK.  
Phosphorus cycling in soil aggregates: Maize-pigeon pea intercropping as a case study  
*Oral presentation*

June 2015. World Food System Center, Monte Verita, CH.  
A tale of maize and pigeon pea intercropping: Unlocking the hidden soil phosphorus reserves  
*Poster presentation*

August 2014. Phosphorus in Soils and Plants 5, Montpellier, FR.  
Soil aggregation and phosphorus cycling in maize-pigeon pea intercropping systems of Malawi  
*Poster presentation*

October 2010. Soil Science Society of America, Long Beach, CA, USA.  
Direct N<sub>2</sub>O emissions from a Mediterranean vineyard: Event-related baseline measurements  
*Poster presentation*

November 2009. Soil Science Society of America, Pittsburgh, PA, USA.  
Direct N<sub>2</sub>O emissions following transition from conventional till to no-till in a cover cropped Mediterranean vineyard (*Vitis vinifera*)  
*Oral presentation*

### **Outreach activities**

July 2019. International Phosphorus Workshop, Zurich, CH.  
Table host and co-moderator of workshop sessions.  
**Contribution:** I co-moderated groups of scientists to discuss the current state of environmental phosphorus research and the main knowledge gaps. Not only did I lead the smaller discussion groups, I also presented our compiled discussion points to entire group of workshop participants.

January 2019. Published article in Winery & Vineyard magazine.  
Verhoven, E., Decock, C., Garland, G., & Lazcano, C., 2019. Vineyard Nitrous Oxide (N<sub>2</sub>O) Emissions: Climate, irrigation, floor management interactions. *Practical Winery & Vineyard*, January 2019, 196-205.

March 2017. Website development for Biodiversa and SNF funded research project “Digging Deeper”.  
<https://diggingdeeper2017.wordpress.com/>  
**Contribution:** I created a website for our collaborative EU-wide project to highlight our research goals and approach in order to reach a broader audience interested in the positive environmental effects of biodiversity in agricultural systems.

December 2016. Swiss Federation for International Agricultural Research (SFIAR) Awards Ceremony.  
**Contribution:** I gave an oral presentation of my work on “The use of maize-pigeon pea intercropping to enhance organic phosphorus cycling and maize yields in Malawi”, participated in a panel discussion related to the importance of international collaboration with agricultural research and development, and accepted the 2016 SFIAR Award for best PhD project.

June 2010. UC Davis Farmer Field Day. Davis, California, USA.  
**Contribution:** I presented my work on assessing N<sub>2</sub>O emissions from vineyards and almond orchards to local farmers at a university-based experimental farm to highlight potential management practices that can reduce greenhouse gas emissions and improve nutrient use efficiency.

### **General contributions to science**

February 2017. Radio broadcast about my PhD research on maize-pigeon pea intercropping effects on soil fertility on the Ö1 radio show *Mittagsjournal*. Austria.

February 2017. Article about my PhD research on maize-pigeon pea intercropping effects on soil fertility on World Food Systems Center Homepage.  
<https://worldfoodsystem.ethz.ch/news/wfsc-media/2017/02/intercropping-improves-soil-fertility-.html>

January 2017. Article about my PhD research on maize-pigeon pea intercropping effects on soil fertility on ETH Homepage.  
<https://ethz.ch/en/news-and-events/eth-news/news/2017/01/pigeon-peas-improve-soil-fertility.html>

May 2013. Publication for the California Energy Commission to show impact of agricultural management practices on greenhouse gas emissions across the state of California, USA.

Verhoeven, E., Decock, C., **Garland, G.**, Kennedy, T., Periera, E., Fischer, M., Salas, W. & Six, J. 2013. N<sub>2</sub>O Emissions from the Application of Fertilizers in Agricultural Soils. California Energy Commission. Publication number: PIR-08-004.