

Curriculum Vitae

Dr. Rachel Renae Schendel

Department of Animal and Food Sciences
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CAREER OBJECTIVE

To develop and sustain a research program which provides evidence-based knowledge on the structure of carbohydrates in human foods and animal feeds and clarifies why carbohydrate structural differences in these ingredients matter for food functionality, animal performance, and human health; and nurture a learning environment that fosters intellectual curiosity, motivates graduate and undergraduate students to learn about analytical food science research, and prepares students for successful careers in either academia or the food industry.

EDUCATION

- 09/2012 – 07/2016 **Karlsruhe Institute of Technology, Institute of Chemistry and Biosciences, Karlsruhe, Germany**
Doctorate (Dr. rer. nat.), *magna cum laude*
Dissertation: “*Qualitative and quantitative screening of side-chain profiles of cereal grain arabinoxylans*”
Adviser: Professor Mirko Bunzel
- 01/2011 – 08/2012 **University of Minnesota-Twin Cities, Department of Food Science and Nutrition, Minneapolis, MN, USA**
Master of Science in Food Science,
Thesis: “*Effect of cereal grains on the formation of heterocyclic aromatic amines in fried beef patties*”
Adviser: Professor Mirko Bunzel
- 08/2006 – 12/2010 **University of Minnesota-Twin Cities, Department of Food Science and Nutrition, Minneapolis, MN, USA**
Bachelor of Science, double majors in Nutrition (Nutritional Science track) and Food Science, University Honors Program (*summa cum laude*)
Honors Thesis: “*Effect of preparation method and water activity on the rate of creatinine formation in a model creatine supplement*”
Honors project supervisor: Professor Theodore Labuza

WORK EXPERIENCE

- 06/2017 – present **Assistant Professor**, University of Kentucky, Department of Animal and Food Sciences, Lexington, KY.
- 09/2012 – 08/2016 **Wissenschaftliche Mitarbeiterin – Scientific Employee**
Karlsruhe Institute of Technology, Department of Food Chemistry and Phytochemistry, Karlsruhe, Germany
Isolation of novel dietary fiber structures using various chromatographic techniques
Structural characterization of compounds (LC-MS, GC-MS, 1D- and 2D-NMR)
Analytical instrument installation and maintenance (GC-MS, HPLC-DAD, LC-MS, HPAEC-PAD)
Development and validation of quantification methods
- 01/2011 – 08/2012 **Graduate Research Assistant**, University of Minnesota-Twin Cities, Department of Food Science and Nutrition, Minneapolis, MN, USA
Optimization of analysis methods for heterocyclic aromatic amines in a cooked beef matrix
Investigation of the effect of adding wholegrain ingredients to beef patties on heterocyclic aromatic amine formation
Regular communication (five progress reports, one 20-minute presentation, and 20-page final report) with funding organization
- 11/2009 – 12/2010 **Undergraduate research assistant**, University of Minnesota-Twin Cities, Department of Food Science and Nutrition, Minneapolis, MN, USA
- 06/2010 – 08/2010 **Intern, Faribault Dairy Company**, Faribault, MN, USA
Perform regular analytical and microbial testing of milk and cheese
Help implement regular quality and safety control measures in a plant, including HACCP
Participate in Blue and Gorgonzola cheese production, including making, curing, aging, testing, plant sanitation, and packaging

SCHOLARLY ACTIVITIES: PUBLICATIONS & SELECTED PRESENTATIONS

Publications: Book Chapters

† - Corresponding author

‡ - Graduate student or visiting scholar under my supervision

* - Undergraduate student under my supervision

1. **R.R. Schendel**†. Phenol Content in Sprouted Grains. **2019**. In: Feng H., Nemzer B., Devries J. (eds) *Sprouted Grains: Nutritional Value, Production, and Applications*. Elsevier. (doi: 10.1016/B978-0-12-811525-1.00010-5)
2. M. Bunzel‡, **R.R. Schendel**. Determination of (Total) Phenolics and Antioxidant Capacity in Food and Ingredients. **2017**. In: Nielsen S. (eds) *Food Analysis*. Food Science Text Series. Springer, Cham. (doi.org/10.1007/978-3-319-45776-5_25)

Publications: Refereed Journal Articles

1. ‡G.E. Joyce, ‡H.G. Gaul, M.F. Flythe, I. Kagan, B. Harlow, **R.R. Schendel**†. Cool-season pasture grass arabinoxylan structures profiled via validated high-performance anion exchange chromatography with pulsed amperometric detection (HPAEC-PAD) method. **(In preparation)**.
2. J. Mobley, H. Gaul‡, B. Lynn, **R.R. Schendel**†. Lignin and structural carbohydrate characteristics of *Thinopyrum intermedium* biomass and potential for dual-crop utilization. **(In preparation)**.
3. **R.R. Schendel**, M. Bunzel‡. 2D-NMR-based screening of feruloylated side-chains of cereal grain arabinoxylans. **(In preparation, invited manuscript)**.
4. R. Dhakarey, M.L. Raorane, A. Treumann, P.K. Peethambaran, **R.R. Schendel**, P.K. Sahi, B. Hause, M. Bunzel, A. Henry, A. Kohli, M. Riemann†. Physiological and proteomic analysis of the rice mutant *cpm2* suggests a negative regulatory role of jasmonic acid in drought tolerance. *Front. Plant Sci.* **2017**, 8:1903. (doi.org/10.3389/fpls.2017.01903).
5. D. Wefers, J.J.V. Cavalcante, **R.R. Schendel**, J. Deveryshetty, K. Wang, Z. Wawrzak, R.I. Mackie, N.M. Koropatkin, I.K.O. Cann†. Biochemical and structural analyses of two cryptic esterases in *Bacteroides intestinalis* and their synergistic activities with cognate xylanases. *J. Mol. Biol.* **2017**, 429: 2509-2527. (doi.org/10.1016/j.jmb.2017.06.017)
6. **R.R. Schendel**, A. Puchbauer‡, M. Bunzel†. Glycoside hydrolase family 51 α -L-arabinofuranosidases from *Clostridium thermocellum* and *Cellvibrio japonicas* release O-5-feruloylated arabinose. *Cereal Chem.* **2016**, 93:650-653. (doi.org/10.1094/CCHEM-01-16-0011-N).
7. **R.R. Schendel**, A. Puchbauer‡, N. Britscho‡, M. Bunzel†. Feruloylated wheat bran arabinoxylans: Isolation and characterization of acetylated and O-2-monosubstituted structures. *Cereal Chem.* **2016**, 93:493-501. (doi.org/10.1094/CCHEM-12-15-0250-R)
8. M.B. Kantar, C.E. Tyl, K. Dorn, X. Zhang, J. Jungers, J.M. Kaser, **R.R. Schendel**, J. Eckberg, B.C. Runck, M. Bunzel, N.R. Jordan, R.M. Stupar, M.D. Marks, J.A. Anderson, G.A. Johnson, C.C. Sheaffer, T. Schoenfuss, B. Ismail, G.E. Heimpel, D. Wyse†.

Perennial grain and oilseed crops. *Annu. Rev. Plant Biol.* **2016**, 67.
(doi.org/10.1146/annurev-arplant-043015-112311)

9. **R.R. Schendel**, M.R. Meyer‡, M. Bunzel†. Quantitative profiling of feruloylated arabinoxylan side chains from graminaceous cell walls. *Front. Plant Sci.* **2015**, 6.
(doi.org/10.3389/fpls.2015.01249).
10. **R.R. Schendel**, C. Karrer‡, D. Bunzel, M. Huch, A.A. Hildebrand, S.E. Kulling, M. Bunzel†. Structural Transformation of 8-5-Coupled Dehydrodiferulates by Human Intestinal Microbiota. *J. Agric. Food Chem.* **2015**, 63:7975-7985.
(doi.org/10.1021/acs.jafc.5b03234)
11. **R.R. Schendel**, A. Becker‡, C.E. Tyl, M. Bunzel†. Isolation and characterization of feruloylated arabinoxylan oligosaccharides from the perennial cereal grain intermediate wheat grass (*Thinopyrum intermedium*). *Carbohydr. Res.* **2015**, 407:16-25.
(doi.org/10.1016/j.carres.2015.01.006).

Research Presentations- Oral Conference Presentations

‡ - Graduate student or visiting scholar under my supervision

* - Undergraduate student under my supervision

® - Presenting author

1. S. Newhuis®, M. Flythe, I. Kagen, B. Harlow, B., and **R. Schendel**. 2022. Changes in the cell wall composition of cool-season pasture grasses over the growing season. American Chemical Society (ACS) Spring 2022 National Meeting, San Diego, CA, USA.
2. **R.R. Schendel**. 2021. Upcycling spent grains into exceptional food ingredients. 2. James B. Beam Institute Industry Conference, virtual conference (COVID-19).
3. G. Joyce‡, I. Kagan, M. Flythe, and **R.R. Schendel**. 2021. Development and validation of a quantitative high-performance anion-exchange chromatography with pulsed amperometric detection (HPAEC-PAD) method permits structural profiling of arabinoxylans from cool-season pasture grasses. ACS Fall 2021 National Meeting, hybrid conference (COVID-19).
4. M.B. Pyles®, A. Fowler, A. Crum, S. Hayes, **R. Schendel**, M. Flythe, L. Lawrence. 2020. Factors influencing mare milk composition and yield and foal digestive health. ASAS Southern Section 2020 Meeting.
5. M. Pyles®, A. Fowler, A. Crum, S. Hayes, **R. Schendel**, L. Lawrence. 2019. Dietary nonstructural carbohydrate affects mare milk production and composition. Equine Science Society Annual Meeting.
6. M. Pyles®, A. Fowler, A. Crum, S. Hayes, **R. Schendel**, M. Flythe, L. Lawrence. 2019. Influence of milk composition and foal microbiota on diarrhea incidence. Equine Science Society Annual Meeting.
7. **R.R. Schendel**®. 2016. Development of quantitative screening methods for feruloylated arabinoxylan side chain profiles in whole grains. AACCC International Annual Meeting, Savannah, GA, USA.

8. **R.R. Schendel®**. 2015. Feruloylated arabinoxylans as cell wall components of cereal grains. 1. KIT Rice Symposium, Karlsruhe, Germany, October 2015.
9. **R.R. Schendel®**. 2015. Conversion of 8-5-coupled dehydrodiferulates by human intestinal microbiota. AACC International Centennial Meeting, Minneapolis, MN, USA.
10. **R.R. Schendel®**. 2015. Metabolism of 8-5-coupled dehydrodiferulates by human intestinal microbiota. 6th International Dietary Fibre Conference 2015, Paris, France.
11. **R.R. Schendel®**. 2014. Charakterisierung der mit Ferulasäure veresterten Arabinoxylane aus der mehrjährigen Getreidesorte *Thinopyrum intermedium* – Characterization of the feruloylated arabinoxylans from the perennial grain *Thinopyrum intermedium*. Arbeitstagung des Regionalverbandes Südwest der Lebensmittelchemischen Gesellschaft, Neustadt an der Weinstraße, Germany.

Conference Abstracts Presented as Poster Presentations (Univ. of Kentucky work only)

1. G. Joyce‡, **R.R. Schendel**. 2020. Investigating and comparing arabinoxylan structures in cool-season pasture grasses from central Kentucky. American Chemical Society Fall 2020 National Meeting & Exposition, conference took place virtually, originally planned for San Francisco, CA, USA.
2. S. Newhuis*, C. Schamp*, G. Joyce‡, H. Gaul‡, **R.R. Schendel**. 2020. The release of feruloylated arabinoxylan oligosaccharides from distiller's spent grain. James B. Beam Institute Industry Conference, February 2020. Lexington, KY, USA.
3. G. Joyce‡, H. Gaul‡, **R.R. Schendel**. 2019. Investigating and comparing arabinoxylan structures in ruminant-relevant cool-season pasture grasses. Cereals & Grains Association Annual Meeting, November 2019. Denver, CO, USA.

Invited Lectures and Seminars (Univ. of Kentucky only)

1. *Food Science!* (1.5-hour presentation and demonstration in collaboration with Kelsey Lamb). November 2019. GEN 300 Student Ambassador Course. UKY-CAFE.
2. *Dairy Foods* (1 class and lab). September 2019. ASC 420: Dairy Science. Dept. of Animal and Food Sciences, UKY. Also designed and led laboratory (2 sections): Milk Processing
3. *Food Science!* (1.5-hour presentation and demonstration). September 2019. Agricultural Education Society Meeting. Department of Community & Leadership Development.
4. *Research in valorizing spent grain material*. Kentucky Department of Agriculture/UKY Spent Grains Roundtable Meeting. January 2019. Lexington, KY, USA
5. *Dairy Foods* (1 class and lab). August 2018. ASC 420: Dairy Science. Dept. of Animal and Food Sciences, UKY. Also designed and led laboratory (2 sections): Milk Processing
6. *Food Processing of Animal Products* (1 class and lab). February 2018. ASC 382: Animal Production Principles. Department of Animal and Food Sciences, UKY. Also designed and led laboratory (2 sections): Milk Processing
7. *Spotlight on Research*. January 2018. CAFE Wildcat Winter Event (undergraduate recruitment event). CAFE, UKY.

RESEARCH SUPPORT: FUNDING

Since my appointment to assistant professor I have been granted a total of \$770,259 in research and instructional support (this does not include my start-up package). I have also applied for several federal grants that were not awarded to me.

<i>Current Awarded Funds</i>		<i>Initial year of award</i>
USDA-ARS – Co-PI: <i>The Agronomy of Hemp and Its Uses in Forage-Animal Agriculture</i> . My subpart of the project: <i>Evaluate plant cell wall structure of hempseed and its transformation during ex vivo rumen fermentation</i>	\$1,187,137 (\$336,794 for my laboratory)	2021
VerraGlo LLC (subaward for Kentucky Small Business Innovation Research matching program): <i>Analysis of the phosphate content and profile of products containing inorganic phosphates or phytates using HPLC-ELSD and ³¹P-NMR</i>	\$24,000	2021
USDA-ARS – Co-PI: <i>Improving Sustainability of Forage-based Production Systems</i> . My subpart of the project: <i>Optimize digestive fermentation by ruminants and non-ruminants through improved understand of the relationship between grass structural polymers and the efficiency of fermentation</i>	\$1,618,682 (\$125,000 for my laboratory)	2018
<i>Upcoming Awarded Funds (Competitive)</i>		
USDA-AFRI-NIFA-Foundational Program - Novel Foods and Innovative Manufacturing Technologies: <i>Transforming distillers spent grains into novel food ingredients with prebiotic and antioxidant characteristics</i>	\$274,000	2022
<i>Completed Awarded Funds (Competitive)</i>		
University of Kentucky, College of Agriculture, Food and Environment Research Activity Award (PI): <i>Funding to support purchase of microcentrifuge for my laboratory</i>	\$2344	2021
University of Kentucky, College of Agriculture, Food and Environment Research Activity Award (Co-PI): <i>Funding to support purchase of HPAEC analytical equipment for my laboratory</i>	\$2127	2021
Sustainability Challenge Grant Award (UKY) – Co-PI: <i>Kentucky Integrated Biorefinery</i>	\$34,887 (\$5119 for my laboratory)	2019
Charles E. Barnhart Fund for Excellence (CAFE, University of Kentucky): <i>Supporting Professional and Personal Development of UKY Food Science students via IFTSA College Bowl Participation</i>	\$875	2018/2019
<i>Hatch/Capacity Project (Non-sponsored)</i>		
<i>Development and Application of Nuclear Magnetic Resonance-Based Structural Profiling Methods for Arabinoxylans in Foods and Feeds</i>		2019
<i>Not Awarded</i>		<i>Application year</i>
USDA-NIFA – Co-PI: <i>Solid-state NMR to Enable Biomaterials, Soft Matter, Agricultural Products, and Biofuels Research</i> (resubmission)	\$500,000	2021

USDA-NIFA – Co-PI: <i>Value-Added Utilization of Bourbon Processing Waste and Proso Millet - an Opportunity to Increase Dietary Fiber in Extruded Products (resubmission)</i>	\$500,000	2020
USDA-NIFA – Co-PI: <i>Solid-state NMR to enable biomaterials, soft matter, agricultural products and biofuels research</i>	\$499,000	2020
USDA-NIFA – Co-PI: <i>Value-Added Utilization of Bourbon Processing Waste and Proso Millet - an Opportunity to Increase Dietary Fiber in Extruded Products (resubmission)</i>	\$500,000	2019
DOE-BETO – Co-PI: <i>Development of an Advanced Near Infrared Hyperspectral Analyzer for Relating Feedstock Characteristics to Conversion Potential</i>	\$3,358,349	2019
USDA-NIFA – PI: <i>Arabinoxylan Side-Chains: Quantitative Profiling of Precise Structural Differences between Cereal Grain Dietary Fibers.</i>	\$500,000	2018
USDA-NIFA – Co-PI: <i>Value-Added Utilization of Bourbon Processing Waste and Proso Millet - an Opportunity to Increase Dietary Fiber in Extruded Products</i>	\$500,000	2018
NSF – Co-PI: <i>Interweaving Kentucky's Knowledge Resources for INFEWS: A Model for STEM Graduate Education</i>	\$3,000,000	2018

TEACHING EXPERIENCE

University of Kentucky, Department of Animal and Food Sciences
Lexington, KY

1. Instructor – Food Fermentations, FSC 538 (4 credits; 3 hours lecture, 2 hours lab)

- Responsible for creating all lecture and laboratory material, instruction, creating and grading assignments, organizing and assisting activities
- Instructor of record for:
 - Spring 2022 semester: 13 students
 - Spring 2021 semester: 10 students
 - Spring 2020 semester: 11 students

2. Instructor – Introduction to Food Processing, FSC 306 (4 credits; 3 hours lecture, 2 hours lab)

- Responsible for instruction, creating lecture and laboratory material, creating and grading assignments, organizing and assisting activities
- Instructor of record:
 - Fall 2021 semester: 7 students
 - Fall 2020 semester: 5 students
 - Fall 2019 semester: 9 students
 - Fall 2018 semester: 5 students
 - Fall 2017 semester: 11 students

3. Instructor – Special Problems in Food Science, FSC 395 (varied number of credits)

- Responsible for mentoring research project, organizing activities, providing support and feedback for final presentation/report
- Instructor of record:
 - Fall 2019 semester: 2 students (Sophia Newhuis, 3 credits; Claire Schamp, 2 credits)
 - Spring 2021 semester: 1 student (Claire Schamp, 2 credits)

4. Instructor – Experiential Learning in Food Science, FSC 399 (varied number of credits)

- Responsible for guiding student through reflection of their experiential learning activity, creating and grading reflection and follow-up assignments
- Instructor of record:
 - Fall 2020 semester: 1 student (Morgan Waldner, 1 credit)
 - Summer 2021 semester: 1 student (Jon Neely, 3 credits)

4. Faculty Coach – IFTSA College Bowl team, November 2018–present

Past assignments

Karlsruhe Institute of Technology, Department of Food Chemistry and Phytochemistry,
Karlsruhe, Germany

- 1. Food Chemistry Diploma thesis advisor**, December 2012–November 2015
 - Serve as adviser to eight diploma students (daily laboratory guidance and thesis-writing direction and editing) in Professor Mirko Bunzel's working group
- 2. Food Chemistry Bachelor thesis advisor**, October 2014–present
 - Serve as primary adviser for five bachelor theses
- 3. Instructor – GC-MS laboratory class**, November 2013–January 2016
 - Instructor: Rachel R. Schendel
 - Organize and teach a 2-day practical laboratory class (GC-MS method development/quantification of pesticide residues in fresh produce) individually to 40 groups of students
 - Responsible for designing curriculum, instruction, creating and grading assignments, organizing and assisting activities

University of Minnesota-Twin Cities, Department of Food Science and Nutrition,
Minneapolis, MN, USA

- 1. Graduate teaching assistant – Food Analysis**, September 2011–December 2011
 - Instructor: Dr. Baraem (Pam) Ismail
 - Responsible for laboratory preparation and organization
- 2. Graduate teaching assistant – Food Processing**, January 2012–May 2012
 - Instructors: Dr. Gary Reineccius and Dr. David Smith
 - Responsible for baking laboratory preparation, organization, and instruction

STUDENT TRAINING: GRADUATE STUDENT ADVISOR

List includes only students from my appointment at the University of Kentucky

2021 – present	Miranda Kunes (MSc. student)
2021 – present	Sophia Newhuis (MSc. student)
2019	Hannah Gaul (Visiting Scholar from Karlsruhe Institute of Technology, Germany)
2018 – 2021	Glenna Joyce (MSc. student; MSc degree awarded in April 2021)

GRADUATE STUDENT AWARDS

2021/2022	Sophia Newhuis, Clair L. Hicks Food Science Scholarship, Bluegrass IFT section (\$2000)
2019/2020	Glenna Joyce, Clair L. Hicks Food Science Scholarship, Bluegrass IFT section (\$2000)

STUDENT TRAINING: UNDERGRADUATE STUDENT MENTORSHIP

2018 – present	Serve as undergraduate adviser for several Food Science junior and senior undergraduate students (Lydia Schneider, Morgan Waldner, Kimberly Lopez)
2018 – present	Wrote 50+ recommendation letters for UKY food science students for scholarship applications, graduate school applications, and employment opportunities

Selected success stories:

- Morgan Waldner, admittance to University of Kentucky graduate program, 22-23
- Claire Schamp, admittance to University of Tennessee graduate program, 21-22
- Ava Weyrich, Chicagoland Food Science Foundation Scholarship, 21-22
- Clarissa Somers, successful Fulbright award, 21-22
- Clarissa Somers, national IFT scholarship, 20-21
- Clarissa Somers, Clair L. Hicks Food Science Scholarship, Bluegrass IFT section, 20-21
- Lydia Schneider, national IFT scholarship, 18-19

Spring 2021	Claire Schamp (undergraduate research assistant); Project title: <i>Ester-linked phenolic acid content in cool-season forage plant cell walls.</i>
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Summer-Fall 2019	Sophia Newhuis (undergraduate research assistant); Project title: <i>Bourbon spent grains as a source of prebiotic food ingredients.</i>
Fall 2019	Claire Schamp (undergraduate research assistant); Project title: <i>Application of ¹H-NMR to quantify acetyl substituents in plant cell wall material.</i>

STUDENT TRAINING: THESIS COMMITTEE MEMBER

MSc.

Hyun Mok Kim – University of Kentucky (2017, Completed)

PhD.

Morgan Pyles – University of Kentucky (2020, Completed)

Yawen Huang – University of Kentucky (2020, Completed)

Jessie Hoffman – University of Kentucky (2018, Completed)

Runnan Li – University of Kentucky (In-progress)

PROFESSIONAL AFFILIATIONS

2018 – present	American Chemical Society
2017 – present	Bluegrass Section Institute of Food Technologists
2009 – 2012, 2016 - present	Institute of Food Technologists
2011 – present	American Association of Cereal Chemists International / Cereals and Grains Association
2013 – 2017	Gesellschaft Deutscher Chemiker (Society of German Chemists)

PROFESSIONAL SERVICE: JOURNAL REVIEWER

2016 – present	Reviewer , Journal of Agricultural and Food Chemistry
2017 – present	Reviewer , Cereal Chemistry
2019 – present	Reviewer , ACS Sustainable Chemistry & Engineering
2019 – present	Reviewer , Foods
2020 – present	Reviewer , Applied Sciences

OTHER PROFESSIONAL SERVICE

2015 – present	Member , Cereals and Grains Association (formerly AACCI) Bioactive Compounds Technical Committee member
2018 – present	Science Fair Project Judge , State FFA Agriscience Fair & UK Field Day Agriscience Fair
2017 – 2019	Dare To Dairy dairy food products session presenter , UK / CAFE Cooperative Extension Service / 4H

2022	Hiring committee member , Food Science faculty position in AFS department
2020	Hiring committee member , Research Animal Scientist position with USDA-ARS-FAPRU
2019	Independent Recommender , Dr. Adeoluwa Adetunji's US EB2-National Waivers Interest application
2018	Reviewer , Technical abstracts for American Association of Cereal Chemists International 2018 Annual Meeting program

COLLEGE AND DEPARTMENTAL SERVICE

2021 – present	AFS Department Graduate Admissions Committee member
2019 – 2021	Assist with IFT accreditation application for Food Science program
2018 – present	Meet individually with prospective Food Science students and their families and provide personalized department tours
2018 - present	Represent Food Science program / Participate in CAFE recruitment and Welcome events <ul style="list-style-type: none"> • 4-H/FFA Agric. Field Day UK Involvement Fair (2022) • Kentucky Science Olympiad (2022) • CAFE Welcome Event (2019) • CAFE Winter Event (2019) • CAFE Round-Up Academic Programs Fair (2018) • CAFE Winter Event (2018) • Instit. for Future Agricultural Leaders lunch (2018)

LANGUAGES

Fluent: English (native speaker), German