

Developing the Next Generation of Climate-ready Workforce in California

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Introduction/Need for Idea or Innovation

The University of California (UC) has become a world leader in agricultural and natural resources research, teaching, and Extension (UCANR, 2023). With one of the largest educational systems in the world, the UC system boasts a 10-campus world-class research university system (UC, 2025) and California also boasts the largest community college system in the world with 116 colleges (California Community Colleges, 2025). Additionally, in California, the UC system is at the forefront of climate research and California leads climate policy and technology in the country (California Natural Resources Agency, 2024). Although there are many courses offered at the university level focusing on climate and agricultural science, students are exposed to this knowledge separately. There is a critical gap in climate and agriculture nexus courses that can give students much-needed exposure to their interactions and implications that could yield actionable solutions (Dooley & Grady, 2020; Leal Filho et al., 2021), especially in the Central Valley, the heart of California agriculture and the world (CDFA, 2023; Needham & Collier, 2023; Scheuring, 2023).

Our case studies including UC Merced, the first American research university of the 21st century, along with Merced College have the majority of their undergraduate students that are first-generation students and raised in the Central Valley (UC Merced, 2025; Merced College, 2025). Many of these students have experienced the health, environmental, and social issues associated with agricultural production in variable climates (Ikendi et al., 2024; Jasechko & Perrone, 2020; Pinzón et al., 2025) and are highly motivated and interested in receiving training to become the next generation of leaders. To satisfy this tremendous student demand, a transdisciplinary team of academics and educators developed a multifaceted pathway to a climate-smart agriculture educational project (Ikendi et al., 2024, p. 3), part of which provides student education with Extension service-learning opportunities. The goal of this innovative educational idea is to develop the next generation of climate-ready workforce equipped with scientific knowledge and resources to provide science-based solutions to stakeholders. This innovative idea contributes toward promoting environmental health (AAAE, 2023, p. 9) and preparing stakeholders to tackle salient issues affecting agricultural production like climate extremes as set in AAAE priority five (Andenoro et al., 2016).

How It Works/Methodology/Program Phases/Steps

This climate-smart agriculture education project is implemented in California and the student component is part of the full project (Ikendi et al., 2024, p. 3) implemented in the spring semester. Step one in the student project involves the project team of four members to meet and design a recruitment survey. The survey is sent out to the students campus-wide through the program coordinator and administrators as well as on notice boards. Students from all majors are eligible to apply. As the recruitment goes on, a draft calendar is made specifically for the spring break. The major topics focus on the emerging trends in climate and agriculture in the state. Once the recruitment survey is completed, the team analyses the data to assess the main aspirations of the students who wish to participate. The project grant allows 15 students per year, but we take on more than 15 students. We synchronize these student needs with our draft schedule. For instance, we found contrasting perceptions about climate variability, and we invited a climate science communication expert. Overall, we invite key speakers from within the UC system academics, Extension advisors, and farmers through farm field visits. Alongside logistics, workshop rooms and meals are booked as well as procurement of necessary items. We deliver the education programs through lectures, panel discussions, field tours, team projects on re-representing climate change story (YPCCC, 2025), and conduct postworkshop evaluations for improvement.

Results To Date/Implications

A total of 44 students completed the workshops; 72.7% participated in the 2025 cohort and 27.3% in 2024. The majority, 95.5% came from UC Merced, and 4.5% from Merced Community College. Students came from various disciplines with the majority, 31.8% from Engineering programs, 25.0% from Biological and Health programs, 25.0% from Environmental programs, and 18.2% from Social Sciences and Business. Sophomores, 40.9% were the majority, followed by 25.0% Juniors, 18.2% Freshmen, and 15.9% Seniors. Most students, 54.5% were female. The greatest number, 68.2% were Hispanic, 18.2% Asian, 11.4% White, and 2.3% Black. On research knowledge, 54.5% had never engaged in any research programs.

In 2024 and 2025 combined, 18 thematic areas were covered by 32 guest speakers in 18 lectures, seven hands-on practices, six farm field visits, two team projects, and a panel discussion. We assessed students' knowledge change in each thematic area on a 5-point Likert scale with 0=no knowledge through 5=superior knowledge in a pre-then-post workshop survey. Overall, the knowledge before the workshop was 2.2 ± 1.214 within a **minimal knowledge** range and there was a knowledge gain of up to 4.0 ± 0.796 within an **adequate knowledge** range and with a Cronbach alpha of 0.953, showing a strong consistency in the assessment. Eight thematic areas were delivered and assessed in both 2024 and 2025 ($n=44$), six in 2025 ($n=32$), and four in 2024 ($n=12$). Of the eight areas assessed for 2024 and 2025, $n=44$, students had highest knowledge gained in CalAgroClimate tools for managing risks, computing agroclimate matrices, regenerative agriculture, and integrated pest management. In the six areas assessed for 2025, $n=32$, students had the highest knowledge gained in the role of the USDA Climate Hubs in climate-agriculture research, sorghum and abiotic stress, and irrigation water management. In the four areas assessed for 2024, $n=12$, students had highest knowledge gained in CSA resources for growers and small farms climate adaptation.

Nevertheless, students were asked how useful was to them or their career learning about these climate and agriculture thematic areas, which we assessed on a 5-point Likert scale with 0=not at all useful through 5=extremely useful. Overall, the level of usefulness was 4.3 ± 0.870 within a **very useful** range, with a Cronbach alpha of 0.950, showing a strong consistency in the assessment. The combined students, $n=44$, rated learning about climate and weather, regenerative agriculture, climate science communication, agricultural water resources management, climate and food and nutrition as the most useful to their future careers. Students, $n=32$ rated learning about UC Merced experimental smart farm, soil and composting, irrigation water management, and precision agriculture as useful to their career. While students, $n=12$ rated learning about livestock and rangeland adaptation, small farms adaptation, and agrivoltaics as most useful.

Students formed teams of 2-6 members and presented 12 projects on re-representing a climate story, covering topics on wildfires, floods, seaweed, diabetes, ocean acidification, climate resilience, sweet potato breeding, West Nile Virus, online shopping on fossil fuels, and product recycling. In 2024, for instance, an Environmental Science and a Psychology student presented on managing wildfire using goats munching on brushes while in 2025, a team of six presented on extreme climate events increasing diabetes worldwide.

Students provided feedback on their future aspirations. In 2024, one wrote that *I want to make inner-city youth more aware of agriculture and the career possibilities they have. Growing up in the Bay Area, you're told people who work in tech are the ones who make money, but you're not taught much about agriculture.* In 2025, one said that *this workshop reinvigorated me in terms of caring about climate extremes. This in turn made me as a Computer Engineer want to explore different avenues where my computational skills may help in climate mitigation.* This innovative idea shows the greater impact that experiential learning has on students' academics and careers (Ikendi et al., 2023; Ingles & Retallick, 2025).

Future Plans/Advice to Others

Issues of climate extremes affect agriculture and a range of sectors such as health-increasing cases of mental health (Moore, 2024), and the urban sector leading to urban heat islands (Hartin & Bennaton, 2023). These aspects underscore a need to involve students in climate discussions. By creating educational opportunities, we provide students with the foundational knowledge on climate change, climate impacts and adaptation of our working agricultural lands. In the future, we plan to enroll more university and college students. We are looking toward opportunities to work with Extension academics and Climate Hub partners through service-learning, which will provide an enriched learning experience for students. Students will proceed to a competitive summer internship phase, followed by a year-long Externship with partners.

Cost/Resources Needed

Financial resources needed differ in unit cost per item. However, in our project, we provided meals paid to the university dining center from the project grant. Transportation for field visits through hiring and chartering a bus. We provided gifts to guests such as branded university cups. Social capital is important to source guest speakers. The university provided the lecture rooms at no cost; however, we paid for cleaning daily. Also, funds for Certificates of Completion. Funds final dinner, the team acknowledges that food is one of the tools for social bonding and families coalesce around food as an identity (Bradley et al., 2023).

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