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Junior Scientists Tandems
Final Report

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Backgroung:

My name is Kening Liu, and I am a Master's student in the double-degree program Agricultural Sciences in the Tropics and Subtropics jointly offered by the University of Hohenheim and the Czech University of Life Sciences Prague. As an international student in Germany, I have always been eager to experience different lifestyles and academic environments, which was the main reason I chose this program. During the second year of my studies, I began exploring the possibility of completing an internship abroad to gain solid scientific experience at a leading agricultural institute. When I learned about the ATSAF Junior Scientist Scholarship from a colleague, I immediately began preparing my application. I was particularly interested in a project focused on agronomy, carried out in a country with a completely different cultural and environmental context. This led me to apply for the project at the International Potato Center (CIP) in Peru.

Project description:

The topic of my project is the effect of mulching, incorporation of crop residues and application of chicken manure on the soil health of the potato rotation system in Lima. My coursework in cropping systems, sustainable agronomic practices, and tuber crops prepared me well for this experience, and I was eager to apply this knowledge in practice. Lima, located in the coastal region of Peru, has an arid desert climate with minimal rainfall. Farmers in this area often irrigate with saline water from the sea, which increases soil salinity and degrades soil health. In addition, excessive conventional tillage disrupts soil aggregates, reducing infiltration and accelerating the loss of organic matter by exposing it to air. Limited awareness of regenerative agricultural practices further exacerbates these issues. Continuous monocropping without crop rotation or intercropping also contributes to soil degradation.
To address these challenges, our team adopted a rotational potato production system and tested three regenerative practices previously shown to improve soil health in similar conditions: mulching with rice straw, incorporation of bean crop residues, and application of chicken manure. The objectives of this project are:

1. To identify which soil processes have been improved through the regenerative agricultural practices applied in our study.
2. To develop a soil quality index that highlights key soil indicators related to potato production in the study area.

Evidence from previous research in coastal Bangladesh, where residue incorporation and mulching improved soil quality in potato-rice rotations, suggests that similar benefits can be expected in our system. We focused on five soil functions most relevant to local conditions: productivity, salinity resistance, erosion control, infiltration, and nutrient cycling. Each function is represented by quantifiable indicators that will be integrated into a soil health index for comparing treatments and plots. Currently, we have completed data collection for several indicators, while laboratory analyses for others are still ongoing.

Practical training:

I joined the Regenerative Agriculture team under the supervision of Dr. David Ramirez in June 2025, during the potato growth season. In the early months of my internship, I received field and laboratory training from our research assistant, Javier Rinza. He taught me how to measure photosynthetic rate using the LI-COR 6800 system, assess chlorophyll content with a chlorophyll meter, and monitor field heat distribution with an infrared thermal camera. Javier has been an exceptionally kind and supportive colleague, always quick to respond and patient in addressing my questions. Despite the language barrier, we managed to

communicate effectively using a translator or our shared, imperfect foreign languages. I am sure these experiences will remain among my favourite memories of my time in Peru.

Figure 1. Me and Johan using the LI-COR 6800 system to measure crop photosynthesis

The other colleague I worked closely with was Johan Ninanya, a data scientist with exceptional skills in academic writing. We got along very well, as we shared many interests, similar personalities, and even a personal connection, he had previously visited my home country, which strengthened our bond. Johan provided several hands-on seminars on the use of *R* software, guiding me through the fundamental yet essential steps of data analysis for our field experiments. He also explained the reason behind each analytical method we applied. His mentorship was invaluable and has had a lasting impact on the way I approach data analysis and scientific research.

I also had the privilege of meeting Professor Ticona and Professor Carlos, along with their students, from Universidad Nacional Agraria La Molina. They offered me laboratory training on the POXC test, which measures the labile fraction of soil organic carbon, conducted in their university laboratory. Both professors treated me with warmth and generosity, always willing to provide guidance and support. I will always remember how Professor Carlos welcomed me like one of his own students, inviting me to academic conferences and university events. I am also grateful to Oscar and Mariana, who worked in the same lab and offered help during the POXC analysis. Without their assistance, completing the test would have been impossible on my own.

Figure 2. POXC training in the lab of Universidad Nacional Agraria La Molina

Participating in potato hilling, harvesting and sample collection:

After completing my initial training, I finally had the opportunity to take part in field operations. During the early growth stage of the potato crop, we carried out hilling, which involves piling soil around the base of the plants as they grow. This practice prevents tubers from being exposed to sunlight, stimulates the formation of additional tubers, improves drainage, and reduces the risk of disease. It was my first time engaging in such physically demanding fieldwork, and at the beginning, I found it quite enjoyable. However, the excitement quickly gave way to exhaustion as I bent, pulled, and pushed the heavy soil with the hoe, feeling the strain in my lower back. Despite the physical fatigue, the experience was invaluable. I believe it is essential for agronomy students to experience fieldwork firsthand, as both crop production and agricultural research cannot be separated from practice.

Figure 3. Potato hilling

When the potatoes reached full maturity, I joined the harvest team in the field. The event was a major occasion for the institute as well. Our team organized snacks—steamed potatoes and sausages—and drinks such as *chicha morada*, a traditional Peruvian beverage, to enjoy during breaks. The harvest lasted nearly a week, during which we dug up the potatoes, sorted the commercial-grade tubers from the non-commercial ones, and recorded their total weight.

Although we faced a shortage of technical staff, Javier encouraged colleagues from various departments at CIP to join us in the field, offering them a pack of potatoes as a reward for their help. Once the harvest was completed, we spent another two weeks collecting soil samples from all plots. These samples were later analyzed for their physical and chemical properties to evaluate the effects of the different treatments on soil health.

Figure 4, 5. potato harvest and soil sample collection

Afterwork Events and Cultural Experiences

During my six-month stay at CIP, I not only gained valuable theoretical knowledge and hands-on research experience but also built unforgettable memories beyond the laboratory and fieldwork. The institute fostered a strong sense of community, where work and friendship blended naturally. One of the highlights was celebrating my birthday with my teammates at CIP. They surprised me with a cake and a “Happy Birthday” sign written in Chinese, a small gesture that touched me deeply and made me feel truly welcomed. My supervisor also invited me to dinner and sightseeing trips with colleagues, which helped me learn more about Peruvian culture and strengthened our bonds as a team. I even attended a concert with my colleagues, creating memories that I will always treasure. Another remarkable experience was “Olympapas”, a two-week sports festival at CIP whose name translates to “Potato Olympics.” It is one of the biggest events of the year, and preparations began well in advance, teams buying costumes, organizing cheers, and practicing for the competitions. The atmosphere was lively and full of enthusiasm, with everyone, even non-players, cheering passionately for their teams. I participated in both the football and basketball tournaments; our basketball team triumphed, winning all five games and earning the championship title, while our football team reached the final but lost. Apart from these experiences, David also kindly allowed me to take several short breaks to travel and explore other parts of Peru. During these trips, I visited the White City of Arequipa, admired the breathtaking Rainbow Mountain and Humantay Lagoon in Cusco, and even spent time experiencing life in the Amazon jungle. These journeys not only broadened my perspective on Peru’s diverse landscapes but also introduced their unique cultures to me in an unforgettable way. All in all, CIP was far more than a workplace, it was a community that offered warmth, unity, and joy. My time there made me feel part of a big family. And Peru is not only a name of a country to me, it left me bonds and traces that I will never lose.

Figure 6, 7. Happy birthday at CIP, “生日快乐”, and basketball champions

Figure 8, 9. Breathtaking view of Humantay lagoon and “Montaña de 7 colores”