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ATSAF - CGIAR++ Junior Scientists Program Final Report

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Title: Detection of genotype by environment interaction patterns, trade-offs between traits, and different gender preferences in a participatory breeding program for biofortified potatoes in the high Andes

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Final report for my research stay at Centro International de la Papa (CIP) in Peru

Master thesis at CIP Huancayo /Lima (22.10.2018 to 5.5.2019)

To prepare my research stay, I applied for two scholarships from GIZ and Herzog Carl, which I both received. I got the contact to my Peruvian supervisor from my university professor and the CIP helped me to organize my visa, which I was able to pick up from the Peruvian consulate in Frankfurt a view days before my departure.

My research project deals with the participatory evaluation of new potato varieties with an increased iron and zinc content. The higher nutrient content should help to combat malnutrition in the Andes. In the highlands of Peru, especially many children suffer from iron and zinc anemia, as the diet is very one-sided and unbalanced. In order to adapt the new varieties to the farmers and make sure that they plant and consume them, the farmers are included relatively early in the breeding process and select among the 34 offered varieties the ones that are most favourable for them. In contrast to a conventional breeding program, a participatory variety selection program doesn´t look for a variety that achieves good results at all sites, but rather for particularly well-adapted and popular varieties at each location. As farmers make their own choices, we hope that the resulting varieties will be well received by the population.

For the first two weeks in Lima, I rented a room in a private house in the district of Jesus Maria, where several other international students lived. During this time, I received a safety briefing, was sent to the doctor to test whether my body is fit for the high altitudes, and got an introduction to the project. In the headquarters of CIP in Lima, we prepared together what was planned for the time of my stay. The colleagues were all very open-minded and helpful and made it easy for me to enter a world that was completely new for me. At the beginning of November, I drove for the first time to Huancayo together with a colleague, which is about 8 hours away from Lima. Huancayo was well located for the experiment from a strategic point of view, and the CIP has a second, smaller seat there with offices, greenhouses and experimental fields. The working hours there are from 7:30 to 16:30. The city is located at about 3300 m, has about 600,000 inhabitants and was my home for the whole time. My colleague Carolina, with whom I traveled and worked together during my entire stay, was waiting for me at the bus station. Before my arrival, Carolina found a room for me, that I was able to rent for the whole time. I lived together with a very nice Peruvian family with two children, who welcomed me with open arms and involved me into their everyday life.

We organized and planned some things from Huancayo, and then started right away: the entire month of November we traveled to the different test sites and planted the experiments. Since the same potato clones were grown in the same design at each site, we developed a good team spirit quite fast and everybody had his own tasks. In the following time, we drove to the individual experiments in and around Huancayo (Chulec, Huancavelica) again and again to check how the plants were developing.

When the plants were flowering at more or less all sites, we started our first evaluation round. For this purpose, we prepared a box for each location that contained all the required materials. In addition, we sent invitations to many different farmers, looked for interested participants on the

market and visited all sorts of institutions to invite them for the big field day. The field days were always performed in the same manner: The field was prepared with colored number plates and small "ballot boxes". First, the participants were asked to give us criteria that are important to them for a new potato variety. We did this to ensure, that the breeding process is going into the right direction and that farmers see that we care for their opinion and highly value it. The farmers were then given 6 seeds each (the men corn and the women peas for gender-specific data) to vote for their favorite varieties. They voted for the most popular variety with three seeds, the next best two seeds and the third choice one seed. At the end of the day, all participants were invited for lunch and the results were presented. The next day we collected data such as the height of the plants, the number of stems and made some additional evaluations.

Picture 1: Potato field in Leoqpata

Picture 2: Women selecting their favourites

The next step was the evaluation at harvest time. For this, we arrived one day before the big field day with the farmers. On that day, with the help of some local farmers, we harvested the experimental plots plant by plant. We collected various data such as the weight and quantity of harvested tubers, that have been subdivided into commercial and non-commercial piles, as well as evaluations of the size, the shape and the homogeneity of the tubers and the length of the stolons. The next day, the invited participants came and evaluated the harvested potatoes using the same methodology as in the flowering evaluation. In addition, participants also rated the taste, appearance and texture of the potatoes in a taste sample.

Picture 3: Harvested plot

Picture 4: Taste evaluations

At the end, several samples were taken: some tubers were sampled for the storage to produce more tubers next year and to carry out a storage experiment, another sample was sent to Lima for processing and laboratory analysis. Unfortunately, I was only able to attend the harvest at two locations, as half the year was almost over and I was only able to extend my visa for two weeks.

However, my colleagues will send me the harvest results to Germany, so that I can use them for my master's thesis.

In my last week I was in Lima to help with the processing of the tubers. We determined the dry matter content and the sugar content of the potatoes, and we also processed a small part of the sample into chips in order to evaluate their frying behavior.

Picture 5: Potatoes in the fryer

Picture 6: Colorful chips

In the meantime, I came back to Germany and now I have to analyse my data and finish writing my thesis. The time passed by incredibly fast for me, I gained a lot of experience in Peru and I got to know the world from a completely new perspective. By living with my Peruvian family, I was able to get an insight into their everyday life, the work in the most remote fields with the farmers gave me an insight into the rough life of the Andean people that a tourist would never get to see. It was also very exciting to do research in an international research center and to benefit from their years of experience.

Therefore, I would like to thank you very much for this scholarship, without it I wouldn´t have been able to take this unique opportunity. I hope, in the future other students will be interested in a research stay at the "Centro International de la Papa".