Target Population of Environments (TPE) and beyond: helping make better crop improvement practice

QUESTIONS TO THE PANELISTS THAT HAVE NOT BEEN REPLIED (received before the webinar and during the webinar.)

#	Questions	Answers
#1	How TPE analysis can be helpful in breeding experiments? What else better conclusions can we drive from TPE analysis?	Geospatial resolution, quantification, product design in current and future climates (Jana).
#2	I wish to explore the TPE for cotton improvement	That is possible, models are well established for cotton (Jana).
#3	I work at a research institute on the diversity of local plants, especially spices, what TPE approach can also be used for morphological characterization of plants?	If the model can capture the functions linked to morphology then a TPE approach is suitable (see webinar for more information). (Jana)
#4	Hi Panelists. I really appreciate your piece of work in marrying the key expertise needed for crop improvements. Are you part of the AgMIP? Are you aware of the AgMIP work?	Aware absolutely, Jana Kholova is not involved but Diego Pequeno is. AgMIP has several teams of crop modelers working on different subjects and Diego is part of AgMIP Wheat (https://agmip.org/wheat/) and the Global Gridded Crop Model Intercomparisons (GGCMI) (https://agmip.org/aggrid-ggcmi/).

#5	Can CGIAR national partners be part of the TPEs initiative?	Absolutely, we work on this approach with several NARS partners in India (Jana).
#6	I'm evaluating climatic suitability of suburban farming around Nairobi and I'm using sensors to evaluate the effect of environmental microcosm (e.g., Greenhouse conditions, urban farm microenvironments). I wonder how to establish a nexus between large-scale crop growth models and microenvironments. How do we do this in TPE?	This is a big challenge, the large-scale simulations could be used to target large regions and study them in terms of a broader view. To access microenvironments and field level impact definitely socioeconomic aspects should be considered.
#7	I wonder if it is possible to consider weeds in the analysis?	Yes, some models can do this.
#8	Stephan: Are the models you presented accessible/downloadable?	Yes, the crop models are available at https://dssat.net/. The tool we are developing is still under development.
#9	What is the lowest cost highest resolution data acquisition system for field data gathering? Does CGIAR have a prototype system design? What models work and how well with this data?	There is a CGIAR platform that is working on making data sets available and other ongoing projects are also working on making it useful for crop modeling and other analysis tools : https://gardian.bigdata.cgiar.org/about.php#!/
#10	Why do we see reductions in Wheat grain yields by -15% and -16% Africa and Asia by 2050?	Each region has specific characteristics that could lead to yield reduction in the future, but these results are mostly explained by the fact that seasonal temperature is already within the upper limits of optimum temperature in those regions at lower latitudes, further increasing the risk of crop damage.
#11	Is Temperature, as a climate component, expected to decrease wheat and other crop yield? as its actual increment is not beyond the optimum level for photosynthesis.	High temperature can negatively affect crop yield in many ways, even if this represents few degrees celsius, for example accelerating plant development decreasing the number of days during which plants can intercept light for photosynthesis reducing biomass and grain yield. I would recommend you to check papers like Asseng et al. (2015). Rising temperatures reduce global wheat production. Nature Climate Change 5, 143-147.
#12	I really appreciate all panelists and committee regarding this topic. Could anyone give me a clue on available data about Indonesia (especially East Java) that could be accessed for this program /crop modelling? Thank you	Thank you. We have large scale outputs, but for a given country I would recommend you to use data from your region and then use the tools presented to analyse it.
#13	How can this process be adapted to consider conditions that influence the proportion of yield that gets to market, and select to reduce losses?	This will be part of the future disciplinary linkages expanding this “TPE” approach (Watch webinar, slides 28&29 in Jana Kholova’s presentation)

#14	Jana, how long has the study been conducted, and how can you obtain the significant amount of the data?	Data are extremely scarce, good data even more - some data we had to generate (this is available on dataverse) some data we had to get from government (also on dataverse) - the maps I was showing include ~15-20 years of data (Jana).
#15	Jana, is the map simply available for the region of india?	Yes, it is unfortunately only available for India
#16	Jana, Is there any information regarding the accuracy of data used in the process of crop modelling? It seems that the case you provided is in a very large area. Would that be appropriate for application in a very detailed area, such as in a part of any area but in a very detailed scale.	The publications I was showing include specific description and evaluation of the data used (Jana). Please check the webinar recording for the publications mentioned.
#17	How to link TPE definition and breeding cost efficiency?	It depends on how you would be using it in breeding. There are different ways to do it depending on the purpose.
#18	Do the Homogeneous Response Units for a particular crop correspond to relatively genetically homogenous groups among landraces for that crop?	In Homogeneous Response Units (HRU) we take in account a range of genetic variation typical for that crop
#19	How have the models been validated for the traits of interest?	The models have been rigorously validated (details are in the papers mentioned in the presentation form Jana Knolova)
#20	From how many years data should be collected to have a good model for TPE?	The more the merrier but sometimes we have to go with whatever is available
#21	Is it possible with variability of environmental factors have single process to answer breeding quest	Probably not - there is not single solution to address the enormous agri-system variability out there
#22	Am I right in thinking that the innovation here is that you're classifying the outputs of crop growth models rather than the raw environmental data?	The innovation is that we are using both (environmental, crop, management data and the model outputs)
#23	Question to Stefan, Is there any information about the results of simple model compared to DSSAT model ?	There are different purposes of these crop models. SIMPLE model is a very simple crop model that simplifies many processes, for example it does not consider nitrogen. It was developed for people who want to get into crop modeling as a first step and to be able to simulate crops which are not covered with other crop models and have little data/information available (e.g. fruits and vegetables).
#24	Steffan, DSSAT model did not support complex soil processes. it just deals like a bucket of nutrients or water? Are you satisfied it is sufficient for Good Prediction?	I do not totally agree with that. DSSAT models can deal with several important soil processes such as soil-water balance, nitrogen fertilizer application time and transformations in soil and plant processes, organic matter transformations, etc. and several scientific papers have used DSSAT for studying soil processes integrated with crop management, climate and genotype

		interactions.
#25	I am from India and intending to do research on climate smart agriculture in rice through DSSAT . My subject is agricultural meteorology. How can I incorporate TPE in my work?	DSSAT as any other crop model depends on input data to be used for different purposes. One example of application of DSSAT in South Asia together with climate data for smart agriculture would be the one in this link: http://beattheblastews.net.
#26	Connecting TPE to farming systems and market strategies is of great importance for product profiles and management practices: i.e. a rotation with grain legumes vs fallow will change the moisture vs nitrogen available.. The same a farmer that sells the harvest to the industry will have different traits need than one that consumes it at home.. How/should we integrate all these aspects?	It is a good point, for that we would need an even more multidisciplinary approach, integrating especially socioeconomic tools and also extension efforts to reach specific needs of each scenario.
#27	So, what are the basic differences between TPE and DSSAT? Cause DSSAT also integrates climate, management, crop, soil...	Crop models like DSSAT can be used as a TPE analysis tool, but it is not the only way to integrate many components of crop production systems.
#28	How to get access to the driven algorithms you use to develop the output	If you want to know more about coding algorithms working behind DSSAT models you can participate of the DSSAT Development Sprints: https://dssat.net/development/dssat-development-sprints/
#29	How did you decide which climatic variables to use in the crop model? Was it via GxExClimate?	For crop modeling, the minimum data set is maximum and minimum daily average temperature, daily rainfall and solar radiation. It will depend on the use of the data, I would say. It depends on what plant process and level of details you have available for your analysis.
#30	How do you integrate spatial and temporal complexity in TPE? How different is it from DSSAT and APSIM modeling?	To integrate spatial and temporal complexity it would require detailed spatial field data to be generated then several tools could be used to integrate them
#31	Have you considered investigating the usefulness of the TPE model in enhancing genomic selection?	Yes, this is getting more and more attention recently, but the idea is still in the beginning.
#32	Gridded simulations are very good tools for TPE. But the quality gridded input data is the challenge. Do you think that simulation outputs from gridded simulations are useful to inform product development?	I agree the input data is a challenge, however it helps us to see from a large scale point of view where are the most vulnerable and potential areas a specific cultivar would perform well or not and also measure response of different traits and challenges the breeders are targeting for a given cultivar in large regions.
#33	I am from Burkina Faso. I attend to work on Soil and Water conservation techniques and climate change adaptation. I wanted to integrate	Stay connected with the community and build connection/capacity to work with crop growth models. https://bigdata.cgiar.org/communities-of-practice/

	TPE in my study, so how could I do to integrate it?	crop-modeling/
#34	Are you aware of some models (inside dssat platform or not) that consider yield formation from yield components? Such model could be very helpful in order to identify some specific events that affect some specific plant processes and thus the specific traits to avoid them	Yes, e.g. APSIM can do this and that is why we use it in our team (see e.g. Kholova et al 2014; gems.icrisat.org)
#35	Diego: Which weather data did you use for the baseline for global wheat simulation?	Daily maximum (Tmax) and minimum (Tmin) temperature, rainfall, and solar radiation were collected from National Centers for Environmental Prediction and University Corporation for Atmospheric Research (NCEP/NCAR) reanalysis database (Kalnay et al., 1996). Rainfall data was collected from the Global Precipitation Climatological Center of the National Oceanic and Atmospheric Administration (GPCC NOAA, US). Five downscaled and bias-corrected GCM scenarios from the Inter-Sectoral Impact Model Intercomparison Project (ISI-MIP, revised version from November 2015) were collected from the Potsdam Climate Institute (Mueller and Robertson, 2014).