projected a general decline in wheat yields by the 2050s. Despite the growth-stimulating effect of elevated CO2 concentrations, consistent yield declines were simulated across most of the main wheat growing regions of Mexico due to the projected increase in temperature. Exceptions occurred in some cooler areas, where temperature increases improved sub-optimal conditions, and in a few areas where rainfall increased. Larger and more variable yield declines were projected for rainfed wheat due to current and projected spatial variability of temperature and rainfall patterns. When aggregating the simulated climate change impacts, national wheat production for Mexico is projected to decline between 6.1% for RCP 4.5 and 6.5% for RCP 8.5. Model uncertainty in simulated yield changes, and across two scaling methods, is smaller than temporal and spatial variability in both RCPs. Spatial variability tends to be the largest in both future scenarios. To maintain or increase future wheat production in Mexico, adaptation, particularly to increasing temperatures affecting irrigated wheat, or expanding the cropping area, will be necessary.

---

Back to Top
Session 2A: Resolving Crop Losses (including Pests, Diseases, Weeds, Ozone)

***Title*:** **Toward a regional early warning system network for coffee leaf rust and associated socio-economic crises**

*Presenter: Jacques Avelino*
*Author*: Avelino, Jacques [1,2,3], Allinne, Clémentine [1,2], Bommel, Pierre [1], Cofre, Hipólito [2], De Melo, Elías [2], Casanoves, Fernando [2], Gamboa, Harold [3], Gutiérrez,Isabel [2], Leclerc, Grégoire [1,2], Merle, Isabelle [1], Motisi, Natacha [1], Ribeyre, Fabienne [1], Sibelet, Nicole [1], Tixier, Philippe [1], Treminio, Edwin [2]
[1] CIRAD
[2] CATIE
[3] IICA

*Abstract:* Coffee rust epidemics that occurred in Latin America since 2008 have caused millions of dollars losses, job losses, and food security issues. In response to this crisis, Central American and Caribbean countries have been developing national surveillance systems to prevent future coffee rust epidemics.
The European Union is supporting these initiatives through the PROCAGICA project led by IICA, which aims at increasing the national and regional capacity to prevent coffee rust and the resultant socio-economic crises. Indeed, pest and disease risk warnings and management recommendations may not be followed by producers' actions, meaning that outbreaks will impact producers' livelihoods. Responses must therefore also encompass the economic sphere. In addition, the project aims at promoting the establishment of a regional coordination to enable the exchange of information on epidemic risks between countries, as pests and pathogens can spread over large distances.
The Central American early warning system network is based on harmonized national early warning systems coupling surveillance and monitoring, with expert knowledge and forecast models. The estimated risks of epidemic and socioeconomic crises will lead to actions specific to each country. The system will help launching general warnings and personalized recommendations to farmers.

In this presentation we evaluate a range of modelling approaches for forecasting coffee rust and socio-economic crises associated to rust outbreaks, including Structured Equations Modelling of coffee rust, multi-criteria models, machine learning, agent based models and Bayesian models.

---

***Title*: Air Quality and Agriculture – Critical pollutants, risk assessment and response.**

*Presenter: Lisa Emberson*

*Author*: Emberson, L.D[1]., Pandey, D[1]., Dentener, F[2]., van den Berg, M[2]., Maiorano, A[2]., Ewert, F[3,4].

[1]SEI York, Environment Dept., University of York, YO10 5NG

[2]European Commission, Joint Research Centre, via E. Fermi 2749, Ispra, Italy

[3]Institute of Crop Science and Resource Conservation INRES, University of Bonn, 53115, Germany

[4]Leibniz Centre for Agricultural Landscape Research (ZALF), Müncheberg, 15374, Germany

*Abstract:* There are a number of air pollutants that are well known to alter agricultural yields. This paper identifies which of these air pollutants might be considered 'critical' for agriculture through understanding both the magnitude and spatial extent over which effects occur.

We describe what is known of the mechanisms by which these pollutants influence crop productivity (e.g. ozone is a phyto-toxic pollutant that acts directly on uptake via the stomates whilst particulate matter largely acts indirectly to alter yield through modification of incoming solar radiation). We review and evaluate the ability of existing models (including risk assessment models, crop models and land surface exchange schemes) to simulate, at regional to global scales, the influence of air quality on arable crops.

We discuss various mitigation and adaptation options in the context of climate change since many air pollutants are also climate forcers which impact near term climate and weather patterns. Mitigation options include reducing emissions from agriculture (e.g. agricultural residue burning and controlling soil erosion) as well as emissions from fossil fuel burning associated with urban and industrial centres. Adaptation options include modifying agricultural practices which would reduce the influence of air quality on crops and enhance crop resilience to air pollution and other stresses.

Finally, we describe the ambition of the AgMIP-ozone group and how the approach used within this activity could be extended to incorporate additional 'critical' air pollutants and develop a programme of work within AgMIP to enable a more holistic assessment of these abiotic stressors on agriculture.

---

***Title*: Modelling the effects of multiple diseases on wheat growth and yield**

*Presenter: Kurt Christian Kersebaum*

*Author*: Kersebaum, Kurt Christian[1], Willocquet, Laetitia[2], Savary, Serge[2,] Rossi, Vittorio[3], Olesen, Jørgen E.[4], Bregaglio, Simone[5], Feike, Til[6], Ferrise, Robert[7], Bindi, Marco[7], Asseng, Senthold[8], Hoogenboom, Gerrit[8], Pavan, Willingthon[8], Stella, Tommaso[1], Ficke,