The Past, Present and Future of Food, Climate Change and Sustainability

Under the general heading 'food', BrIAS will in 2021-2022 approach this topic from a wide array of viewpoints, with the input of scholars from biology, chemistry, ecology, agricultural sciences, hydrology, anthropology, ethnography, political sciences, biotechnology, sociology, economic botany, economics, ecology, urban studies, history, archaeology, medicine and law. In addition, BrIAS will involve policy makers and NGOs at a national and supranational level. Attention will be given to legal aspects of future agricultural and food technologies, and to medical and nutritional aspects of food.
In order to preserve coherence and inspired by current societal and academic debates, we have identified one core theme that will receive special attention in the activities of BrIAS in 2021-2022:

The world's future food supply is in jeopardy. The prospect of fast-growing populations combined with environmental degradation and shrinking agricultural yields because of the climate crisis has urged researchers from all disciplines to develop new ways of thinking about food security and sustainability. The Brussels Institute of Advanced Studies (BrIAS) wants to bring together top experts working on this topic and share their insights with the academic community and policy makers.

Feeding the population has been a main concern of societies throughout human history, as the vagaries of the weather and other natural and human catastrophes frequently caused famine and hardship. 'Give us our daily bread' reflects an ever-present fear of hunger and starvation. However, it was only in modern times that this concern reached a global scale, when it was coupled to the spectre of global overpopulation and the degradation of the environment. Most famously, Thomas Malthus (1766-1834) in his essay on the principle of population warned about increasing poverty if population was to grow unrestrainedly, giving birth to a concept that it is at the heart of modern social theories. Less well-known is the response of William Godwin, who in 1820 calculated that the world could sustain a population of 8 billion people. At the time, world population was nowhere near that figure, but it has grown exponentially since. Inspired by the catastrophic experiences of his lifetime and the awareness of the collapse of earlier civilizations, William Vogt in 1948 voiced ecological concerns about rampant population growth, which threatened the future of 'civilized existence'. Similar apocalyptic views were voiced by Paul Ehrlich in The Population Bomb (1968) and by other scholars. However, another constant in human history, as was pointed out by Esther Boserup, is that demographic growth drives innovation in agriculture and food production. The Green Revolution came in time to feed the ever-growing populations, and may even have stimulated growth, while the realization emerged that large-scale famines in the modern world resulted from societal failure.

However, the detrimental impact of intensive modern agriculture has subsequently been recognized. Current modes of intensive agriculture cause long-term damages to the environment due to the depletion of water and chemical pollution, which will eventually prevent the further use of soil for next generations. In addition, the awareness of climate change has increased worries about the sustainability of world population and current food systems. With the emergence of a better understanding of past climate change and the recognition that current global warming is manmade came increasing concerns for the future of humankind. Fears for the future have sparked in interest in the past, as theories that ascribe the collapse of past civilizations, ranging from the Mayas to the Roman Empire, to climate change and failing food supply systems are widely accepted. The link with societal concerns for the 21st century is obvious.

By 2050, society will be challenged to almost double food production from existing land areas to feed more than nine billion people. According to FAO, achieving global food security and eliminating malnutrition are among the most challenging issues humanity must face. Policy makers, scientists and the general public recognize that policies, agricultural practices and food production have to change in order to guarantee the long-term wellbeing and sustainability of future generations. Agricultural development must combine fundamental research with advanced technologies to produce more healthy food with fewer inputs.

Researchers across academic disciplines will develop an integrated program on the past, present and future of food, climate change and sustainability. This theme, which is at the heart of the BrIAS project, is covered by five perspectives:

- the impact of climate change on Eurasian societies from antiquity to the present
- the resilience of agricultural practices and societies in North-East Africa
- the adaptability of crops to future climate conditions in Europe
- food systems and Green Deal policies in and beyond Europe
- innovations in food technologies to create sustainable food products

Climate change and society over the past two millennia

Paul Erdkamp
Professor of Ancient History, VUB

This part of the project aims to critically discuss the assumed direct link between climate change and a society's ability to feed its population. It is often claimed that temperature and population were positively linked, with population levels rising when average temperature rose and going down when temperature fell (Galloway 1986; Malanima 2013, 72-73; Kennett and Marwan 2015, 2; Lee et al. 2016; Bevan et al. 2018). Some even go so far as to causally link sunspot activity and population (Wiener 2018, 17). Such views have led to the wide acceptance of ideas that connect climatic 'cold spells' to societal collapse. In contrast, many historians and archaeologists dispute the universal link between climate and society and point to the various degrees of resilience in past societies. It has been pointed out that, on the scale of the entire Holocene, there seems to be no correlation between climate and society. Until the onset of Global Warming, the long-term climatic trend was one of decreasing temperature and humidity. Despite fluctuations in temperature and humidity, which were limited compared to the effects of Global Warming, temperature and precipitation saw a declining trend over the millennia. At the same time, however, population levels, societal complexity and life expectancy increased significantly. It would seem that humans were rather resilient in the base of adverse climate change. From a different perspective, however, the image reverses. Some of the deadliest famines in historical times occurred in as a result of extreme weather phenomena. Despite differing degrees of vulnerability, societies clearly were susceptible to weather extremes.

But then again, it might have been precisely such catastrophic experiences and the challenges posed by worsening conditions that stimulated societies to adapt and develop institutions and mechanisms that increased their resilience. It may be significant that, in Europe at least, it were the more northern countries that emerged strongest from the Little Ice Age. In general, expansion during beneficial circumstances does not logically imply contraction during unfavourable conditions, since societies were not passive subjects of their environment. Hence, it is entirely possible that favourable climate conditions stimulated demographic growth more often than that an adverse climate change caused demographic decline.

Food for plants - waste for food?

David Cannella
Assistant professor
Christian Hermans
F.R.S.-FNRS research associate
Crop Production and Biostimulation Laboratory, Interfacultary School of Bioengineers, ULB

Global climate change, towards higher temperature, greater aridity and more frequent erratic climate events, become a major threat to agricultural sustainability and food security. Hence, enhancing crop resilience to climate change is a major challenge facing the global agricultural community. Plant breeding has delivered substantial productivity gains by developing high-yielding crop varieties but requiring high input, hence negatively impacting the environment. Today, a pivotal success is the

creation of so-called ‘smart’ crop varieties, which yield more with fewer soil resources and protection products.

Plant food waste constitute parts indigestible by humans with no nutritional value. There is a better end for food waste than throwing away. Bio-based green technologies are transforming biomass into useful commodities through light aided enzymatic reaction (photobiocatalysis). Such processes can transform bio-resources into useful biomolecules, biomaterials, and biofuels.

Food systems and green deal policies in and beyond Europe

Nel de Mûelenaere
Professor of Contemporary History, VUB

Today, we are on the cusp of the most fundamental reform of European food policy since the introduction of the Common Agricultural Policy (CAP) in 1962. After decades of stimulating intensification, expansion and industrialisation in the agricultural sector, the EU has recognised that while succeeding in feeding Europeans, the CAP has also caused environmental degradation, the demise of small farming and nutrition-related health issues. With the European Green Deal (2019), the EU departs from former agricultural policy and has replaced the old dogma of maximising productivity at all costs with the new dogma of sustainability. Its central Farm to Fork strategy takes an integrated view on food production, trade, transport and consumption and aims to make European food systems more healthy and more sustainable.

In the coming years, European industries and citizens can expect a series of sector-specific policies and investments, as the green transition and climate neutrality becomes a central part of Europe’s post-Covid recovery plan. It remains unclear, however, how these policies will land. The Green Deal sets a broad and comprehensive transition agenda towards climate neutrality in 2050 that will be filled in with concrete measures. Agriculture and food will be among the trickiest policy areas to transition, with strongly conflicting views held among stakeholders from the food industry, farmers’ organisations and environmental protection advocates. Many questions remain unanswered. How will the European Commission reconcile the (nationally) fragmented needs of farmers, industries and consumers with its principles of sustainability and environmental protection? Who will define what social, environmental and economic sustainability should look like, which one should be prioritised, and what policies should be adopted on different levels to obtain it? Does the key to more sustainability and resilience lie in a neo-traditional approach towards farming or innovative new technologies? And how could and should the focus on sustainability impact European trade policies in the global South? And does the European Green Deal compare with policies on agri-food, sustainability and climate adaptability elsewhere in the world?

This BrIAS topic links the past, present and future of food production and consumption in and beyond Europe, and will bring together experts from multiple disciplines to look at how different aspects of food systems have evolved in the recent past and will change in the near future.

Proposed BrIAS activities in 2022
BrIAS Forum - Sustainable food systems in Europe and beyond: what to expect?
BrIAS Forum - The Green Deal and European trade policies in the global South
BrIAS Workshop - From farm to fork in the last 60 years. What can we learn from the history of European agricultural policy?

Agriculture and food consumption in North-East Africa (6000 BC – present): 8,000 years of resilience, adaptation and innovation in the face of drought stress and climate change.

Dr. ir. Frits Heinrich
Roman agricultural and food historian | Archaeobotanist
Department of History | Social and Cultural Food Studies (FOST), VUB
Department of Chemistry | Analytical, Environmental and Geo-Chemistry (AMGC), VUB

North-East Africa is an ideal test laboratory for the study of long-term trends in human interactions with their environment, especially with regards to agricultural strategies and choices related to drought, salinity, and water stress. The area's agricultural, food and climatic history is documented well both in terms of historical and archaeological evidence, offering much potential for the study of diachronic changes into the circumstances under which agriculture took place and how people adapted to changes in those circumstances. Relevant in this context is that throughout its history the region furthermore played an important role as a corridor for the diffusion of crops, ideas and technologies between the Mediterranean, East and West Africa, and India.

This BrIAS sub-theme focuses on both long-term historical trends as well as modern case studies in agricultural, technological and food culture adaptation, innovation and resilience in the face of drought and water stress and environmental deterioration due to (historical) climate change from an interdisciplinary perspective. The sub-theme therefore welcomes experts and contributions from any historical period as well as the present. While the geographic focus of the sub-theme is on North-East Africa, comparative perspectives on other regions in which drought and irrigation feature prominently are also encouraged.

The sub-theme aims to bring together scholars from diverse fields including agricultural and food history, development and environmental economics, agronomy, hydrology, plant biology and biochemistry, botany and archaeobotany, Egyptology, archaeology, papyrology and others. In doing so this sub-theme hopes to facilitate interdisciplinary discussion and exchange and the conception of new perspectives on both historical questions and modern challenges.

Topics that may feature within the sub-theme include: crop selection and agricultural decision making, fuel use in food preparation, diversity in irrigation technology in relation to environmental circumstances and water sourcing, irrigation and social cooperation, collective action and state formation, agricultural tax regimes, the role and influence of colonial powers on agriculture and food consumption since Antiquity, plant responses to drought, traditional food processing, preparation and preservation technologies, the nutritional content of crops and prepared foodstuffs, crop biodiversity, food security and risk management, plant phenotypic plasticity and adaptability, carbon isotope discrimination and plant water status in ancient and modern plant remains, societal resilience and climate change, and the use of wild plant resources.