

## Day 1: Addressing Pakistan Food Security: Grow, Nourish and Sustain together

By Dr Khalid Mahmood: Co-Lead Agri, UPSIGN



This webinar was on Pakistan's issues surrounding food security & hunger, developing ideas which lay the foundation for future research and collaboration with Pakistan, UK and around the world.

Pakistan faces several intractable challenges in the agricultural sector which impact not just on food security but also human and animal health. For example, climate change, water shortage, lack of crop germplasm suitable to cope with edaphic and climatic stress, poor nitrogen use efficiency (NUE) just to name a few. Sustainable food production is crucial for the food security and livelihoods of smallholders in Pakistan.

Major staple crops are affected, such as rice. Water shortage is a major issue, as rice uses the most amount of water for its production. For example, rice is 0.45 kg/m<sup>3</sup> (yield produced per unit of water use) of irrigation water which is 55% less than the average value (1 kg/m<sup>3</sup>) for Asia. Per capita water availability (less than 1000 m<sup>3</sup>) already crossed the threshold of water scarcity in 2005 and may lead to absolute water scarcity by 2025.

Fresh water availability decreased by 18.9 % during 2018-19. Efficient use of water by reducing its losses and yield gap, which is now exceeding 43%, will sustain crop production in Pakistan. The switch to low-emission cultivation has tremendous potential to reduce baseline emissions from irrigated rice by more than 26%.

Increasing nitrogen (N) fertilizer use not only greatly threatens crop sustainability but also contributes to water and air pollution due to low NUE. Among the three major crops (cotton, wheat and rice), rice has the lowest N use efficiency in Pakistan. Pakistan also has the lowest NUE among major rice producing countries including India, China and Bangladesh. Excessive use of N fertilizers along with low productivity of rice (83% yield gap) is due to poor farm management exacerbated by much generalized N fertilizer recommendations. The excessive use of N pollutes groundwater and causes N<sub>2</sub>O emission, which has never been estimated in Pakistan.

Misuse of chemicals, some of which are prohibited or adulterated, affects not just the health of operators and consumers but impacts on Pakistan's exports and its reputation. Pesticides also kill many beneficial non-target organisms, including pollinators and natural enemies of crop pests. Overuse of insecticides has also resulted in the development of resistance in many crop pests but also vectors of human diseases such as dengue transmitting mosquitoes.

The event covered a dialogue between the researchers, policy makers and industry to develop solutions to address food security through Grow, Nourish and Sustain together.

Read more & watch the video here: <https://jadarr9.wixsite.com/mysite/2020-dec-agri-day1-webinar>

## Transforming Subsistence Farming to Sustainable Agriculture Enterprise

Prof Mumtaz Cheema, Memorial University, Canada



Smallholder farmers play a key role in meeting the food demands of a growing and increasingly rich and urbanized population. However, smallholding farming is not sustainable due to limited access to seeds of new hybrids, technology, and financial institutions. Poor market information and food price vulnerability result in low income, socio-economic challenges, and poverty persistence. Additionally, climate change adversities can hamper food production, reduce farm profitability that threaten food security and livelihood of smallholder farmers.

### What are the options to make smallholder farming a sustainable enterprise?

Farm size is decreasing day by day due to division of land and consequently smaller units becoming less productive and economically non-viable. There is a need to introduce innovative and sustainable methods of crop production with improved practices to enhance yield from the same piece of land. High yield can be achieved under controlled environmental conditions where crop growth conditions are optimum to boost crop productivity. High tunnel farming is one of the approaches that can boost crops yield multifold due to controlled environmental variables. Construction of high tunnels using bamboo instead of iron, make tunnel structure cost effective and durable. Cultivation of high yield & value vegetables, for example, tomatoes, chilies, cucumber, sweet pepper, and medicinal crops can enhance farmer's profitability. Other benefits of high tunnel farming (which are reaped by both farmer & society) are:

- Cost effective
- Multifold yield
- Fresh vegetables available to the community all year
- Higher nutrient use efficiency
- Higher water productivity and water use efficiency (drip irrigation)
- Low carbon footprints (reduced greenhouse gases emissions)
- Increased number of crop cycles (2-3 in cucumber, chilies, and melon)
- Enhanced produce quality (minerals, and vitamins)
- Improved insect/pest and disease control
- Net income is higher
- Improved health, food security and livelihood of the communities particularly in urban centres

Niche crop and fruit plants under limited soil moisture conditions

- Olive
- Quinoa
- Papaya
- Dates

Biography: <https://grenfell.mun.ca/academics-and-research/Pages/school-of-science-and-the-environment/People/Faculty/cheema.aspx>

## A “Systems Thinking” approach to addressing malnutrition in Pakistan

Prof Nicola Lowe, University of Lancaster



Despite improvement in some of the indicators of Sustainable Development Goal 2 (SDG2: Zero Hunger), the current situation regarding malnutrition in Pakistan remains a cause for concern. Recent data show that 37.6% children are stunted, 52.1% women of reproductive age have anaemia, and obesity is on the rise, currently at 11.3% in women and 6% in men. The solutions to malnutrition are complex and require a “systems thinking approach” to consider the food system as a whole, and the interactions between the system components. In addition, as we have seen during the current pandemic, the global food system is vulnerable to shocks such as COVID19, climate change, increasing populations and the recent locust plague that devastated the wheat crops in the Global South earlier this year.

To address the challenge of malnutrition, historically agriculture has focussed on calories, or increasing yield. Staple foods are cheap, affordable and energy dense, but low in micronutrients. Achieving Zero Hunger is not just about providing calories, it is about improving micronutrient density, such as iron, zinc, iodine and vitamin A. One strategy for achieving this is biofortification, which enhances micronutrient content of staple crops through crop breeding and/or agronomic techniques. The BIZIFED trial, currently being conducted in North West Pakistan, is designed to determine the effectiveness of consuming zinc biofortified wheat (Zincol-2016) on health outcomes. The study also explores the acceptability of biofortified wheat to farmers, consumers and key community stakeholders.

Further information can be found here: <https://checkpoint.url-protection.com/v1/url?o=https%3A//www.uclan.ac.uk/research/explore/projects/bizifed-project.php&g=YTQ5ODI4NTJjMjA4NGUxMw==&h=MzA1YmU2MmE4MzJjZDE5YTZjNWcwYTYzOWZmYWYxMDE4NTI0MjYyZWZludDpvZmZpY2UzNjVfZW1haWxzX2VtYWlsOmMyZTUyMjc1M2I2OThiNGVknMzZTBiNThiMWUxOWNlOnYx>

## Climate Smart Agriculture and Net Zero target

Prof Bob Rees, Scottish Rural University College (SRUC)



Climate change remains one of the biggest threats to face humanity in the 21<sup>st</sup> century. As a result of increasing concentrations of greenhouse gases in our atmosphere caused by human activity the Earth's climate is changing rapidly and has potentially dangerous consequences for planetary systems and human societies around the world. The Paris climate change agreement recognises the importance of this challenge and places an obligation on countries around the world to commit to actions that will reduce the impacts of climate change. This includes commitments to rapidly reduce emissions of greenhouse gases, bringing them to net zero by the middle part of the century.

Pakistan faces a problem in responding to this challenge. Although it is a relatively minor contributor to greenhouse gas emissions, it is likely to be impacted very severely by climate change, both because of increasing temperatures and altered rainfall. The agriculture and land use sector are particularly important here given that it is both a significant source of greenhouse gas emissions whilst also being threatened by climate change. There is an urgent need for the country to develop land management and agricultural practices that increase the resilience of the systems, contributing to the mitigation and adaptation to climate change. The UK is committed to working with Pakistan to help achieve these objectives and has recently invested in a large programme of research to support more efficient use of fertiliser nitrogen in agricultural systems (nitrogen fertilisers are an important source of the greenhouse gas, nitrous oxide).

To find out more about this South Asian nitrogen hub project, please visit <https://gtr.ukri.org/projects?ref=NE%2FS009019%2F2#/tabOverview>

## One Health Agenda-Role of Livestock in Pakistan

Prof Lisa Boden, University of Edinburgh & Dr Ayesha Riaz, PMAS University



**Challenge:** Livestock is a subsector of Pakistan agriculture and contributes approximately 56% of value addition in agriculture and nearly 11% to the GDP. The livestock sector plays a vital role in underpinning Pakistan's economy and thus, the lives and livelihoods of its people. Pakistan has a large food animal population which is not only important for food production, but also for labour. However, it is also a potential hotspot infectious disease outbreaks, which spill over from wildlife and domestic animals to people who are in contact with them. The growing burden of zoonotic diseases (i.e. diseases which transmit between people and animals) increases morbidity and mortality. There is a need for a coherent and coordinated multi-sectoral approach which brings together stakeholders and decision-makers from public health, veterinary medicine, both agriculture and environmental sectors, as well as input from researchers in broader disciplinary domains, including the social sciences and humanities.

**Solution:** The Pakistan-UK collaboration network, coordinated by UPSIGN is well-placed to respond to these [One Health](#) challenges through research and development directed at improving the health of animals, plants and our shared environment. A One Health framework, which focuses on improving contingency planning for endemic, zoonotic and emerging novel infectious diseases, through the development of new diagnostics, improved surveillance and data-driven approaches, as well as appropriate training and capacity building, offers a transformative and sustainable approach to improve the lives and livelihoods of people in Pakistan.

For further information:

[https://www.uaar.edu.pk/vas/faculty\\_details.php?dept\\_id=18&fac\\_id=277](https://www.uaar.edu.pk/vas/faculty_details.php?dept_id=18&fac_id=277)

<https://www.ed.ac.uk/profile/lisa-boden>