



zef  
Center for  
Development Research  
University of Bonn

NO. 50  
APRIL 2025

# ZEF NEWS

**THREADS  
OF CHANGE**

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## IMPRINT

**Publishers:** Center for Development Research (ZEF)  
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**ISSN:** 1438-0943

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ZEF news is published in English twice a year.  
Issue No. 50 is published digitally and in print.

## THROUGH HER LENS: UNCOVERING GENDER DYNAMICS IN GHANAIAN AGRICULTURE THROUGH PHOTOVOICE

This research explores the gendered roles of men and women in agriculture in Northern Ghana. We used a participatory approach to analyze the realities, identify priorities, and highlight the needs of the participants while minimizing researcher influence. The study employed a photovoice activity. This is an innovative qualitative method in which participants take photos and videos to share their experiences and translate them into actionable knowledge. The activity was conducted in four communities in Northern Ghana, where we distributed two cameras to each community: one for men and one for women. Participants were asked to record the differences between male and female farmers. In three communities, the women did not feel comfortable handling the cameras and selected a man to handle the camera, while in one community, a woman was chosen.

### Men at the farm, women at home

The videos and photos taken by the men to document their perspectives fall into four categories: agricultural tasks such as planting, weeding, spraying, and clearing land; livestock rearing; cultural practices like funerals; and men weeding around their compounds. Three images show women farming alongside men. In contrast, the visual content recorded by men of women largely shows women in domestic spaces performing household chores and secondary livelihood activities, such as shea nut processing or charcoal production. Out of 181 videos and pictures taken, only 4 images show women planting and weeding. These videos and pictures suggest that women in Northern Ghana are much less involved in agricultural activities than men, devoting their time to domestic life and complementary economic activities. We could stop there and draw our conclusions. But, fortunately, one of the photographers was a woman.

### Proud of being women farmers

The videos and pictures made by a woman of women contrast with the content of the other groups. They do not show any housework and petty business but focus on farming. We see girls and women of all ages working the land with vigor and taking on tasks considered masculine, such as weeding with hoes, digging holes for planting, or even spraying herbicide. No men are seen participating in the agricultural activities.

### Photovoice hides as well as discloses

There are several ways to explain why the male photographers did not capture more women farming. It may be related to factors like local gender norms, seasonality, proximity, time constraints, or discrepancies in translation. However, their videos and photos reveal a perception of two separate worlds, with men farming among themselves and women concentrating on activities within their compounds. Women's contributions to agriculture are almost non-existent and therefore invisible. What emerges from this exercise is a vision of women, and the norms associated with their gender, through the male gaze. Interestingly, this is not the vision that women farmers



want to show of themselves when given a camera. "Farming is our profession" one of them insisted. Like the men, they were eager to share their knowledge and the challenges of cultivating the land. The photovoice method played an essential role in gaining a better understanding of local contexts while building relationships with male and female farmers. It enabled participants to reflect on their lives within traditional gender norms, while offering counter-narratives. Like any research method, Photovoice remains influenced by power imbalances between research participants. Critical analysis and reflexivity on the part of the researcher are essential to navigate these power dynamics with sensitivity and ethical awareness.

**Acknowledgments:** This research is part of the [INTER-FACES project](#), funded by the [German Federal Ministry of Education and Research \(BMBF\)](#). At the request of the research participants, the photovoice activities have been broadcasted as video reports on a local TV channel. [This video](#) highlights water scarcity issues in Tarikpaa.



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## IMPACT OF MIGRATION ON HOUSEHOLD INCOME AND FOOD SECURITY IN BANGLADESH

**M**any rural households in low- and middle-income countries are involved in migration. Migration can take different forms, such as short-term versus long-term, domestic versus international, etc. Research suggests that short-term migration tends to be less effective in alleviating poverty than longer-term migration. This raises the question of why many rural poor still prefer short-term migration? In a new study, we explore this question using survey data collected in northern Bangladesh, where short-term domestic migration is prevalent.



### Choosing short-term over longer-term migration

Our data reveal that short-term migration, for a few days to a few weeks, is more common among rural households, particularly those dependent on small-scale subsistence farming and local agricultural labor markets. Farm labor opportunities in northern Bangladesh peak during the planting and harvest seasons, which span 6–8 months over two major crop seasons per year. During the remaining 4–6 months (2–3 months per season), local wage opportunities decline sharply, causing hardship for agricultural workers. These periods of hardship are locally known as "Monga" (hunger seasons). To cope with these recurring hunger seasons, many of the rural poor migrate seasonally to cities or other rural areas with different crop calendars. Short-term migration is preferred because it is more affordable than longer-term migration and allows migrants to return home for their own farming activities. Family obligations also discourage long absences, especially if neighbors are unreliable in caring for dependents during the migrant's absence. Risk aversion also contributes to the preference for short-term over long-term migration. Short-term seasonal migration to other rural areas is often organized in groups, which reduces the risk of migration for the individual. However, migration needs vary from place to place. In areas where hunger seasons last longer, for instance due to floods or droughts, households may have to choose longer-term migration in spite of family obligations and risk aversion.

### Short-term migration smoothens income and improves diets

Poor rural households have low dietary diversity throughout the year, which is exacerbated during hunger seasons due to food and income shortages. Seasonal migration helps mitigate income shortfalls. Our findings suggest that remittances from short-term migrants are often used to improve diets during the hunger seasons, particularly through the consumption of protein-rich foods such as meat, fish, and eggs. In contrast, households with longer-



term migrants, who are often somewhat better off and already have a more diverse diet, are more likely to invest their remittances in asset accumulation rather than additional food consumption during the hunger season.

Our study findings confirm that longer-term migration has larger positive income effects, whereas short-term migration has more immediate positive effects on food security and dietary quality during hunger seasons. Therefore, improving the conditions for short-term migration is important for addressing seasonal hunger in poor agricultural communities.

**Acknowledgments:** This research was funded by the [German Academic Exchange Service \(DAAD\)](#) and [Foundation fiat panis](#).

Link to original journal article in "Agricultural Economics": <https://doi.org/10.1111/agec.70030>

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## “WE SURVIVE BY THE GRACE OF GOD”: TEXTILE AND GARMENT INDUSTRY WORKERS IN ETHIOPIA

**B**ackground: Ethiopia has pursued industrialization since 2010, becoming a key player in the textile sector. Apparel exports rose from \$44 million in 2015 to \$143 million in 2021. Key to this growth is the establishment of industrial parks like Hawassa Industrial Park, 300 km from Addis Ababa. Since 2016, the park has attracted foreign textile firms, employing 35,000 workers and generating \$54 million in exports in 2023. Its success is driven by low labor costs and government incentives. This research examines labor practices in Ethiopia’s textile sector, focusing on Hawassa Industrial Park.

### Low wages and poor working conditions

Despite industrial success, workers at Hawassa earn as little as \$26 per month, among the world’s lowest wages. A human resource manager confirmed that cheap labor and the lack of a minimum wage attract investors. Workers report earning 2000-2300 ETB (€16-18) per month while sharing cramped housing. Many struggle to afford basic needs and rely on family support. With limited alternatives, they accept poor wages and harsh conditions, facing dismissal for complaints.

Labor conditions remain poor despite claims of improvement. Sick leave denial is common—ill workers receive only painkillers and must return to work. Many report verbal abuse, being called "stupid" or "donkeys." Workers are also forced into overtime without consent, facing penalties for refusal.

### Poverty and workplace exploitation

Ninety percent of workers are female, living in overcrowded housing and often surviving on a single employer-provided meal. Some skip meals, leading to fainting at work. Officials acknowledge that some women resort to prostitution for survival. Workers describe their struggle as "*surviving by the grace of God.*"

Despite strict control, resistance persists. High turnover rates—sometimes exceeding 10% per month—reflect dissatisfaction. Workers engage in slowdowns, walkouts, and strikes. In October 2024, 2,600 workers staged a one-and-a-half-day strike for higher wages, followed by another strike involving 5,000 workers.

### Labor unions and challenges

Recent years have seen unionization efforts, despite employer and government resistance. However, unions remain weak due to leadership dismissals, internal divisions, and employer interference. According to an industrial park official, unions have failed to fulfill their intended role. While unionization was expected to improve conditions, its impact has been minimal. Nevertheless, workers continue to resist through strikes and informal strategies.

**Acknowledgments:** *This research was funded by the [German Academic Exchange Service \(DAAD\)](#).*



Read the full ZEF Blog article here:  
<https://bit.ly/ZEF-Blog-Ethiopia>



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# INNOVATIONS FOR SUSTAINABLE FOOD SYSTEMS IN AFRICA: A DECADE OF PARI RESEARCH 2014 – 2024

**A**griculture is the backbone of many African economies, playing a critical role in food security, economic growth, and poverty reduction. Despite significant progress in agricultural development, the resilience of food systems has been severely challenged by the COVID-19 pandemic, global economic decline, conflicts, growing debt burdens, and climate change. In 2022, Africa accounted for 39% of the world's 722 million undernourished people, highlighting the urgent need for action to drive progress towards Sustainable Development Goal (SDG) 2: Zero Hunger. The Kampala Declaration of the Comprehensive Africa Agriculture Development Programme (CAADP), adopted in January 2025, reaffirms the commitment of African leaders to transform agri-food systems through sustainable production, agro-industrialization, and trade. However, achieving these ambitious goals will require innovation and evidence-based policymaking to guide investments and ensure effective implementation.

## PARI's achievements

The Program of Accompanying Research for Agricultural Innovation (PARI) provides research and independent evidence-based advice to help guide policy and investment decisions to promote agricultural growth, food security, employment generation and food system transformation in Africa and India. The program was launched as part of the German government's 'One World – No Hunger' (SEWOH) initiative. Over the past decade, PARI has made significant contributions to shaping food and agricultural policy-making through evidence-based recommendations. PARI in itself represents an innovative approach to development investment by integrating independent accompanying research into the traditional program cycle, enabling two-way learning, rapid use of emerging insights and reduced overhead costs.

## PARI in Numbers

RESEARCH ON AGRICULTURAL INNOVATION FOR FOOD & NUTRITION SECURITY IN AFRICA AND INDIA

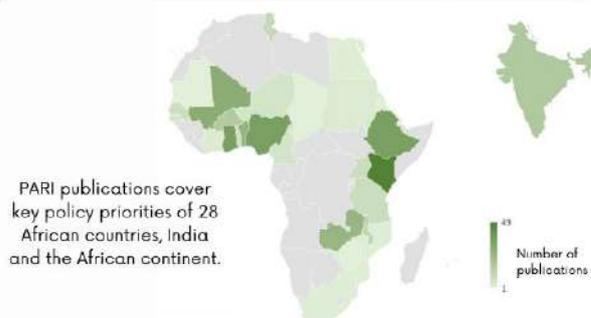
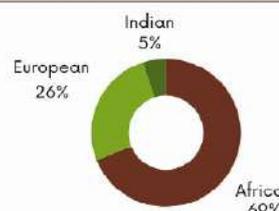
research4agrinnovation.org

### RESEARCHERS

360 authors

87 organisations

26 countries



### PUBLICATIONS

268 research publications  
38 policy briefs



Publications by main research themes:



### EVENTS

59 research seminars and policy events in 14 African countries, India, Germany and online

### SKILLS

Research grants for 33 Masters students, 18 PhD students from 15 African countries



## Key insights and recommendations from PARI's research

**Promote context-specific innovation packages for productivity growth**, including access to high quality seeds, small-scale irrigation and feed, breeds and fingerlings in the livestock and aquaculture sectors.

**Scale locally adapted mechanization and related services along agricultural value chains**, including by strengthening the local machinery manufacturing sector.

**Connect producers to domestic and intra-African markets** by investing in infrastructure and fostering farmer associations and public-private partnerships.

**Strengthen women's voice and economic empowerment** by improving women's access to land, technologies, education, finance, childcare support and fair wages.

**Encourage India-Africa learning and international cooperation** in food systems-related research, innovation and capacity strengthening, including triangular cooperation with Germany.

**Recognize the value of farmer innovations and scale them up** by providing support for documentation, validation and commercialization

**Accelerate the digitalization of food and agriculture** with a focus on improving digital skills, expanding connectivity, developing integrated digital service platforms and strengthening data protection.

**Harness the job creation potential of the food sector** by increasing agricultural productivity and sales, expanding the agro-processing sector and investing in workforce development.

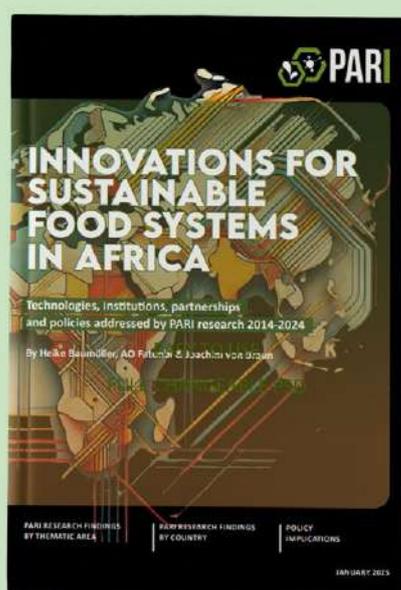
**Enhance innovation systems** through tailored investment plans that address local conditions and combine infrastructure elements to maximize employment and economic benefits.

Read the full report here:  
<https://bit.ly/PARI-report>



**Acknowledgments:** The program is funded by the [German Federal Ministry for Economic Cooperation and Development \(BMZ\)](#).

For more information visit:  
<https://research4agrinnovation.org/>



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## FACTORY FARMING AND ASYMMETRICAL DEPENDENCIES: A SYSTEM OF EXTERNALIZED VIOLENCE

**F**actory farming is one of the most significant yet overlooked systems of asymmetrical dependency in the modern world. In my recent research at the Bonn Center for Dependency and Slavery Studies (BCDSS), I applied the theory of asymmetrical dependencies—typically used in historical analyses of slavery and servitude—to investigate the hidden power structures within industrial agriculture.

### Factory farming: a global issue

More than 80 billion animals are slaughtered worldwide each year, with nearly all of them raised in high-intensity industrial farming systems. Despite marketing images that suggest otherwise, most animal products come from factory farms. Factory farming operates on a model of externalized violence in which the consequences of mass production are shifted onto animals, workers, and the environment. Animals are commodified and reduced to production units, bred for efficiency, deprived of natural behaviors, and subjected to suffering. Meanwhile, workers in slaughterhouses and industrial farms endure hazardous conditions, low wages, and psychological trauma, yet remain economically dependent on these jobs. In addition, the environmental impacts of factory farming contribute to deforestation, water pollution, biodiversity loss, and climate change, disproportionately affecting vulnerable communities, particularly in the Global South.

### How consumers exacerbate the problem

Factory farming does not operate in isolation. It follows the logic of externalization, where those who profit from the system avoid responsibility for its consequences. Consumers remain largely unaware of the realities behind industrial farming, as laws in many countries criminalize the documenta-

tion of slaughterhouse conditions. The environmental damage caused by factory farming is also concealed and outsourced to regions far from the centers of consumption. Additionally, the long-term health risks associated with red and processed meat consumption, including heart disease and cancer, are well-documented but largely ignored in mainstream discussions about food production.

### Revealing and recognizing the hidden costs is key

Factory farming restricts movement, enforces control, and creates economic entrapment—not only for animals but also for workers and entire ecosystems. These findings show that asymmetrical dependencies are not limited to human relationships but extend to the exploitation of nonhuman beings and natural resources.

As factory farming continues to expand, the question remains: how long can we ignore its hidden costs? Understanding factory farming as a system of externalized violence and asymmetrical dependencies allows us to see its full impact—not as isolated ethical concerns, but as deeply interconnected historical and modern structures of exploitation. It is time to recognize that the price of cheap meat and dairy is paid not only (!) by animals but also by workers, rural communities, and the planet itself.

*This research contributes to a volume on ecological dependencies and modern systems of exploitation (forthcoming: late 2025). By applying historical perspectives on coercion and dependency, it draws direct parallels between past and present structures of violence.*

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## BLING-BLING, LENINISM, AND THE RAINFOREST: THE TIKTOK CULTURE OF GUERRILLA FIGHTERS IN COLOMBIA



In Colombia, an armed group known as *Estado Mayor Central* (EMC) is using social media, and particularly TikTok, as a tool to rebrand its guerrilla warfare. Their messages blend displays of wealth, Leninist rhetoric, and environmental claims, reshaping the link between armed conflict and deforestation in the Amazon.

### Guerrilla influencers

“Hi, I’m Nayala<sup>1</sup>. Follow me”, says a smiling young guerrilla woman in a TikTok video filmed in the Colombian jungle. The 1.5-minute clip shows her crossing rivers in the dense rainforest, jumping off rocks and dancing in a cocaine lab to the sound of an electro-cumbia remix of a revolutionary song.

Nayala is a member of the EMC, a guerrilla federation founded by former commanders of the *Fuerzas Armadas Revolucionarias de Colombia* (FARC). This faction refused to demobilize after the Colombian government signed a peace agreement with the FARC in 2016. Since then, the EMC has financed itself through cocaine trafficking and illegal mining, while maintaining a Leninist narrative. It is now believed to have around 5,000 fighters. Like Nayala, some of them have become “guerrilla influencers”, serving as attractive role models and making TikTok a key recruitment tool.

<sup>1</sup> Username has been changed so as not to reveal the identity of the guerrilla fighter

### De facto environmental authority

Historically, Colombian rebels have helped protect the country’s vast forests, which provide resources and tree canopies that allow them to escape aerial surveillance and attacks during the civil wars. Since the 1980s, guerrilla groups have controlled the northern edge of the Colombian Amazon, a strategic area for cocaine production. When the original FARC laid down their arms in 2016, deforestation skyrocketed, reaching a record 2,200 km<sup>2</sup> per year in 2017, an area the size of the German state of Saarland. In the region now controlled by the EMC, the guerrillas responded by imposing strict logging restrictions. By 2023, deforestation in Colombia had reached an all-time low of 800 km<sup>2</sup> per year. According to the International Crisis Group, the EMC became the “de facto environmental authority” in much of the Colombian Amazon rainforest.

### A hybrid discourse

As part of ZEF’s Doctoral Studies Support Program (DSSP) on “Environmental Peace-Building and Development in Colombia”, conducted jointly with the *Universidad Nacional* in Bogotá, this study analyzes the use of EMC’s propaganda strategy in the current context of President Petro’s ambitious “Total Peace” policy<sup>2</sup>. Preliminary findings based on an analysis of TikTok posts reveal four main themes: First, the EMC claims that growing coca can both bring wealth to the peasants and protect the rainforest. To illustrate their point, the guerrillas display jewelry, alcohol and luxury cars. Second, they position themselves as defenders of the Amazon rainforest against outside threats such as large landowners and investors or the Colombian army, which they describe as a force that pushes peasants deeper into the forest to clear land. Third, the EMC fighters celebrate a nomadic, outdoor lifestyle that they say is in harmony with the forest. Finally, the EMC emphasizes its practical ability to reduce deforestation in order to put pressure on the government, thus presenting itself as the solution to Colombia’s environmental problems.

### Towards environmental peace?

Why does an armed guerrilla group achieve better results in the fight against deforestation than a government? If Colombia’s environmental peacebuilding strategy is to succeed, it must address this paradox. Understanding EMC’s narratives and hybrid discourses is a crucial step in this direction.

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<sup>2</sup> Total Peace is a policy currently being implemented by the presidency of Gustavo Petro (2022-2026). It allows the government to negotiate with armed groups simultaneously, using different approaches and instruments for each of them.



## MALARIA AND MALNUTRITION IN INDIA: A SYNERGISTIC CHALLENGE

**M**alaria and undernutrition are two of the biggest public health challenges in rural parts of India. This challenge is exacerbated in remote tribal villages, which are often difficult to reach by any means of transportation. The most vulnerable populations are children and pregnant women. Lack of awareness among people of undernutrition, and environmental conditions conducive to the malaria parasite's reproduction put the population at even higher risk. Malaria and undernutrition are known to coexist in synergy. Of India's total population, 8.6% belong to tribal communities, yet they account for more than 21% of plasmodium falciparum infections and about 29% of malaria-related deaths. Existing estimates of child undernutrition paint a grim picture; and actual estimates may be even higher. Approximately 44% of tribal children are stunted, 27% are wasted, and 45% are underweight. Despite India's overall economic progress, it is surprising to see such alarming statistics for malaria and malnutrition. This shows the stark economic divide between rural and urban areas in India. Rural tribal areas continue to lag behind in access to health, nutrition, sanitation, clean water and education. This disparity keeps the poor people in tribal areas in a vicious cycle. Without adequate support mechanisms and systems, this cycle cannot be broken.

### Collaborations are key

A major obstacle to addressing this challenge is the lack of comprehensive data on nutrition and malaria in rural tribal areas. India is a large country; the existing National Family Health Survey (NFHS) is not representative of the entire population. These surveys provide a broad estimate, but do not capture the reality on the ground in remote tribal villages. For example, while NFHS data show a high prevalence of stunting, wasting and overweight, some localized studies reveal a grimmer picture in certain tribal-dense regions.

To address these challenges, collaborative research initiatives between international institutions like Germany's Center for Development Research (ZEF) and Indian universities/institutes could play a crucial role. The Nutrition and Planetary Health (HEALTH) research division at ZEF has already established a first contact with the Shiv Nadar University in Noida, India. In October 2024, a junior researcher from ZEF visited the Shiv Nadar Institute for a one-week guest researchers' program funded by the German Academic Exchange Service (DAAD). As part of the research visit, a public talk was organized to present the scope of work and research done by the HEALTH group in Bonn. This public talk led to some fruitful meetings between professors from different facul-

ties and the guest researcher. To further strengthen the collaboration between ZEF and Shiv Nadar University, an in-person meeting was held between Prof. Dr. Dr.h.c. Michael Hoch (Rector, University of Bonn), Prof. Dr. Birgit Ulrike Münch (Vice Rector for International Affairs, University of Bonn) and Dr. Samit Bhattacharyya (Associate Professor, Shiv Nadar University) in March 2025 to discuss prospects of joint research projects in future.

Such initiatives are an excellent vehicle not only to promote and strengthen academic research but also to generate evidence that can help reduce the burden of malaria and undernutrition in tribal villages in India. Joint research studies could focus on data collection at individual and community levels to analyze the associations between environmental factors, malaria infection, and undernutrition – and, in addition, develop a tailored intervention for the tribal population. For example, by combining malaria control with nutrition-sensitive programs - such as providing fortified foods or treating anemia.

By prioritizing tribal regions, where these issues are most prevalent, and fostering partnerships between institutions like ZEF and Shiv Nadar University, it is possible to make meaningful progress in improving health and nutrition outcomes in some of India's most vulnerable communities.

#### **Anecdotal experience shows relevance of transdisciplinary approach**

I had the opportunity to interact with a young man who has worked with nongovernmental organizations (NGOs), primarily in remote tribal areas in the eastern part of India. I learned from his experience that the solution to malaria and undernutrition in rural India requires a transdisciplinary approach that involve better data collection and targeted interventions that include multiple stakeholders. Talking to him I realized that how the fate of a person or a community is determined by where they are born. Countless preventable deaths occur every day, not just in India, but worldwide. We already know how to cure malaria and prevent undernutrition; the problem still persists and the most vulnerable people are the victims. As a research community, there are steps we can take to ensure that our work generates evidence and helps communities around the world.

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## BALANCING DEVELOPMENT AND CONSERVATION: CAN SUB-SAHARAN AFRICA EXPAND ROADS SUSTAINABLY?

*For some, roads drive economic growth, opening markets and creating business opportunities. For others, they accelerate deforestation, agricultural expansion, and biodiversity loss. Researchers Philipo Mtweve and Vincent Moseti explore these conflicting perspectives in Africa. Both are PhD students of Lisa Biber-Freudenberger and members of the projects LANUSYNCON and Future Rural Africa at the University of Bonn.*

Roads improve access to goods, services, and opportunities. They help smallholder farmers reach markets, enhance rural-urban connectivity, and support education and healthcare. Governments see roads as economic stimulants and symbols of modernity. Yet, limited road access leaves some regions isolated, fostering frustration, while well-connected areas benefit from improved civic engagement and democratic participation.

“Scientific studies often depict roads as either economic drivers or environmental threats,” says Mtweve, lead author of a literature review on road impacts. Few explore the trade-offs between infrastructure expansion and biodiversity conservation (Mtweve et al., 2025). The key question in development planning remains: should roads be built in biodiversity-rich areas if it risks environmental degradation?

Ecologists highlight roads’ role in biodiversity loss through habitat fragmentation, pollution, and deforestation, driven by legal and illegal logging and agricultural expansion. Conversely, well-maintained roads support conservation by facilitating eco-tourism.

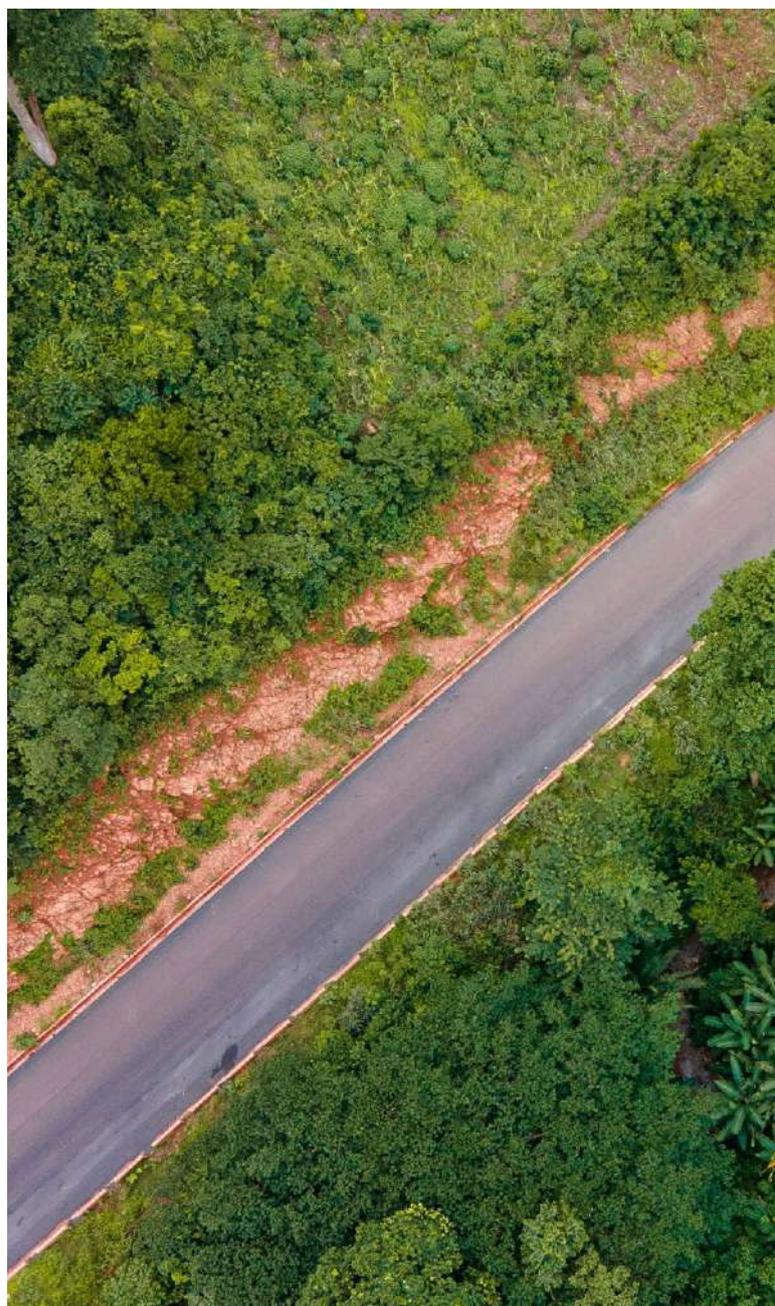
Road development is closely tied to financing mechanisms, particularly international loans in Africa. Without sufficient economic returns, these investments can lead to long-term debt, hindering growth. Environmental costs, often overlooked in economic evaluations, can further impact local communities. “Roads can’t be reduced to a simple good-or-bad equation,” says Biber-Freudenberger.

Context shapes road impacts. In rural areas, roads are welcomed for development, while wealthier neighborhoods may resist them. Road construction can boost property values in remote regions but lower them in affluent ones. Economic benefits aren’t guaranteed—residents without vehicles or resources may struggle to leverage new roads. Marginalized groups, such as small-scale farmers, often lack the capital to expand, allowing wealthier individuals to profit, furthering social inequality. While roads create economic potential, their broader consequences must be carefully assessed for truly sustainable development (Biber-Freudenberger et al., 2025).

### **Democracy and governance: Roads for whom, by whom and for what?**

Road development is deeply political, often used as a tool to secure votes. “Politicians in Kenya used road

promises during elections,” says Vincent Moseti. This politicization distorts spending and reinforces top-down planning, where community input is often superficial. Corruption in land procurement for roads has even led to forced evictions.



While roads aim to benefit local communities, they sometimes serve corporate interests, granting access to natural resources at the expense of locals. Some traditional tribes resist roads, fearing threats to their cultural identity.

Governments also use roads for security patrols and infrastructure projects, but these same roads become spaces for protest. Recently, Kenyan youth opposed the 2024 National Finance Bill through road demonstrations. Conservationists and activists also mobilize against roads threatening protected areas. Roads even serve as artistic canvases for political and social messages.



### Balancing development and conservation: Can Sub-Saharan Africa expand roads sustainably?

Many Sub-Saharan African countries prioritize road infrastructure to boost economic growth and reduce poverty. However, these nations are also rich in biodiversity. Instead of choosing between development and

conservation, integrated models can help minimize trade-offs. The following steps are key to sustainable road expansion.

#### 1. Enforce rigorous planning

Environmental Impact Assessments (EIAs) are required for major projects, but enforcement varies. Transparent planning and political commitment to EIA regulations are crucial to prevent uncontrolled land-use changes.

#### 2. Adopt wildlife-friendly designs

Eco-bridges, underpasses, and wildlife corridors can reduce roadkill and preserve habitats. Policy-makers should integrate these measures into national transportation plans and provide incentives for green infrastructure.

#### 3. Strengthen governance

Anti-corruption policies and accountability frameworks ensure local communities benefit. Strict penalties for fraud and public participation in planning can improve governance and transparency.

#### 4. Engage communities

Indigenous and local groups should have a voice in road development. Community-based monitoring and projects that enhance livelihoods while protecting ecosystems can create more inclusive development.

**Take-aways:** Roads shape economies, politics, and the environment. As road networks expand, governments, developers, and communities must carefully balance growth, conservation, and social change.

#### References

Biber-Freudenberger, L., Bogner, C., Bareth, G., Bollig, M., Dannenberg, P., Diez, J. R., & Börner, J. (2025). *Impacts of road development in Sub-Saharan Africa: A call for holistic perspectives in research and policy*. *Science*.  
 Mtweve, P., Moseti, V., Mahmood, N., Kramm, T., Bogner, C., Ibisch, P., & Biber-Freudenberger, L. (2025). *Exploring socioeconomic and environmental impacts of road infrastructure development in Sub-Saharan Africa: A systematic literature review*. *Environmental Development*, 101177.

**Acknowledgments:** This research is funded by the [German Federal Ministry of Education and Research \(BMBF\)](#)

Read the full ZEF Blog article here:

<https://bit.ly/ZEF-Blog-Roads>



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## “I ENCOURAGE MY STUDENTS TO THINK BEYOND TECHNICAL SOLUTIONS AND FOCUS ON THE REAL-WORLD IMPACT OF THEIR RESEARCH”

Interview with ZEF Alumnus Mohsin Hafeez

### Looking back at your doctoral education and post-doctoral research at ZEF, what have been the long-term professional benefits for you?

ZEF’s interdisciplinary approach shaped my career, integrating hydrology with social sciences and ecology. This perspective guided my work in Africa, Central Asia, and the Philippines, where I worked on water scarcity and flooding, translating research into practical solutions for policymakers. In Australia, I helped tackle the millennium drought, focusing on the system-level impacts of water scarcity. This experience has been key to my roles in consultancy, academia and at the International Water Management Institute (IWMI), where I still work today. Under my leadership, IWMI’s staff in Pakistan grew from 5 to 100 members and projects on water-food-energy sustainability were initiated. My work on the water-energy-ecosystems nexus and my leadership role as regional representative for Central Asia reflect how the ZEF-education has shaped my career in global water challenges.

### From your perspective as a hydrologist, what is the biggest global water challenge facing countries today?

The main challenge countries face is the lack of evidence-based information, which leads to mismanagement of water resources. In countries like Australia, China, and the United Kingdom, evidence-based decisions shape policy and infrastructure. But in developing countries such as Pakistan, Uzbekistan, the Philippines, and parts of Africa, infrastructure decisions often lack this foundation and are driven by political interests. While politics also plays a role in places like Australia, decisions there are still based on solid evidence, which is often lacking in many developing countries.

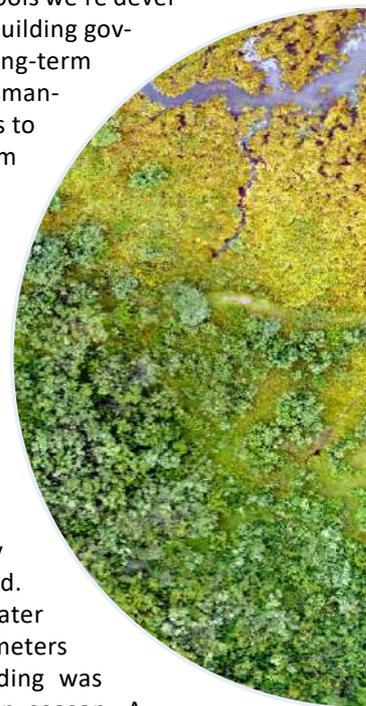
### What measures do you see as most promising to address Pakistan’s water management challenges?

Pakistan’s water management faces significant challenges, including outdated water allocation systems, unregulated groundwater use, and industrial pollution. A mix of technical, institutional, and interdisciplinary measures is essential to address these challenges – for example updating the 1991 Water Apportionment Accord to reflect current water availability for provincial

water allocation. Groundwater management requires a regulatory framework supported by real-time monitoring tools. This is what we are doing in Punjab to integrate quality and quantity data for better decision-making as part of the Water Resource Accountability in Pakistan (WRAP) project, funded by the UK’s Foreign, Commonwealth & Development Office (FCDO). In agriculture, inefficient irrigation wastes water. Technologies like soil moisture sensors and AI-based forecasting can optimize use, as we’re doing in hundreds of fields to guide irrigation schedules. Institutional policies like the Punjab Water Act can improve water allocation, but success depends on the data and monitoring tools we’re developing. Engaging policymakers and building government capacity is essential for long-term implementation and scaling. Water management must also consider its links to agriculture, energy and ecosystem security. A cross-sectoral approach, as demonstrated in our projects, is key to creating sustainable water management.

### Could you please share your views on strengthening environmental flows and utilizing nature-based solutions in water management?

In 2019, when I introduced nature-based solutions in Pakistan, many officials saw it as a European trend. However, we found that groundwater in Islamabad was dropping by 1.2 meters annually, and localized flash flooding was a significant issue during monsoon season. A hydrological study revealed that rainwater recharge could address both water scarcity and flooding. We built a small lake in a park, injecting 11.58 million gallons of rainwater over 1.5 years, reducing flooding and proving its value. This led Pakistan’s Capital Development Authority to adopt nature-based solutions, creating 200 recharge sites and storing 40 million gallons of water. We also influenced policy, requiring new housing societies to assess water availability and install rainwater harvesting tanks.



Additionally, we helped improve water access in marginalized towns through groundwater harvesting systems. Regarding environmental flows, Pakistan faces challenges with the Indus River system. The 1960 Indus Waters Treaty allocated water rights, but India's control of the eastern rivers has caused ecological harm. In 2023, as part of the Consultative Group on International Agricultural Research's (CGIAR) Nexus Gains project, we began assessing environmental flow needs along the Indus. We found that some areas were in poor ecological health due to insufficient water. That is why we are working to raise awareness among policymakers, highlighting the need for year-round water to maintain healthy ecosystems and gain political support.

**What advice would you give to young researchers from the "Global South" who are pursuing a PhD, for example at ZEF?**

My advice is to focus on system-level thinking and an interdisciplinary approach. As a young researcher, I believed that technical development was the ultimate goal, but I learned that understanding how your work fits into the bigger picture, especially for policymakers, is key. Hard work matters—

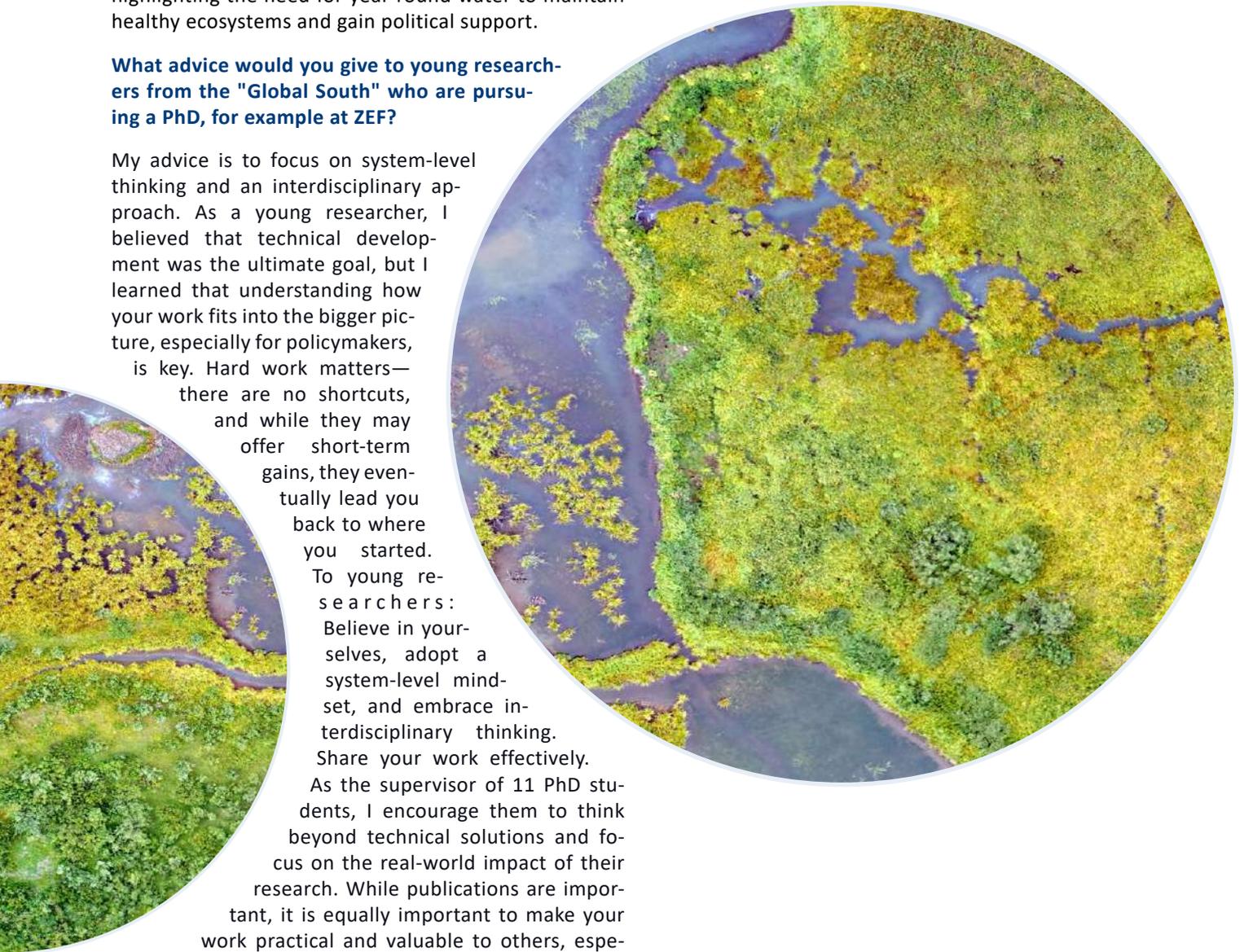
there are no shortcuts, and while they may offer short-term gains, they eventually lead you back to where you started.

To young researchers: Believe in yourselves, adopt a system-level mindset, and embrace interdisciplinary thinking. Share your work effectively.

As the supervisor of 11 PhD students, I encourage them to think beyond technical solutions and focus on the real-world impact of their research. While publications are important, it is equally important to make your work practical and valuable to others, especially policymakers.

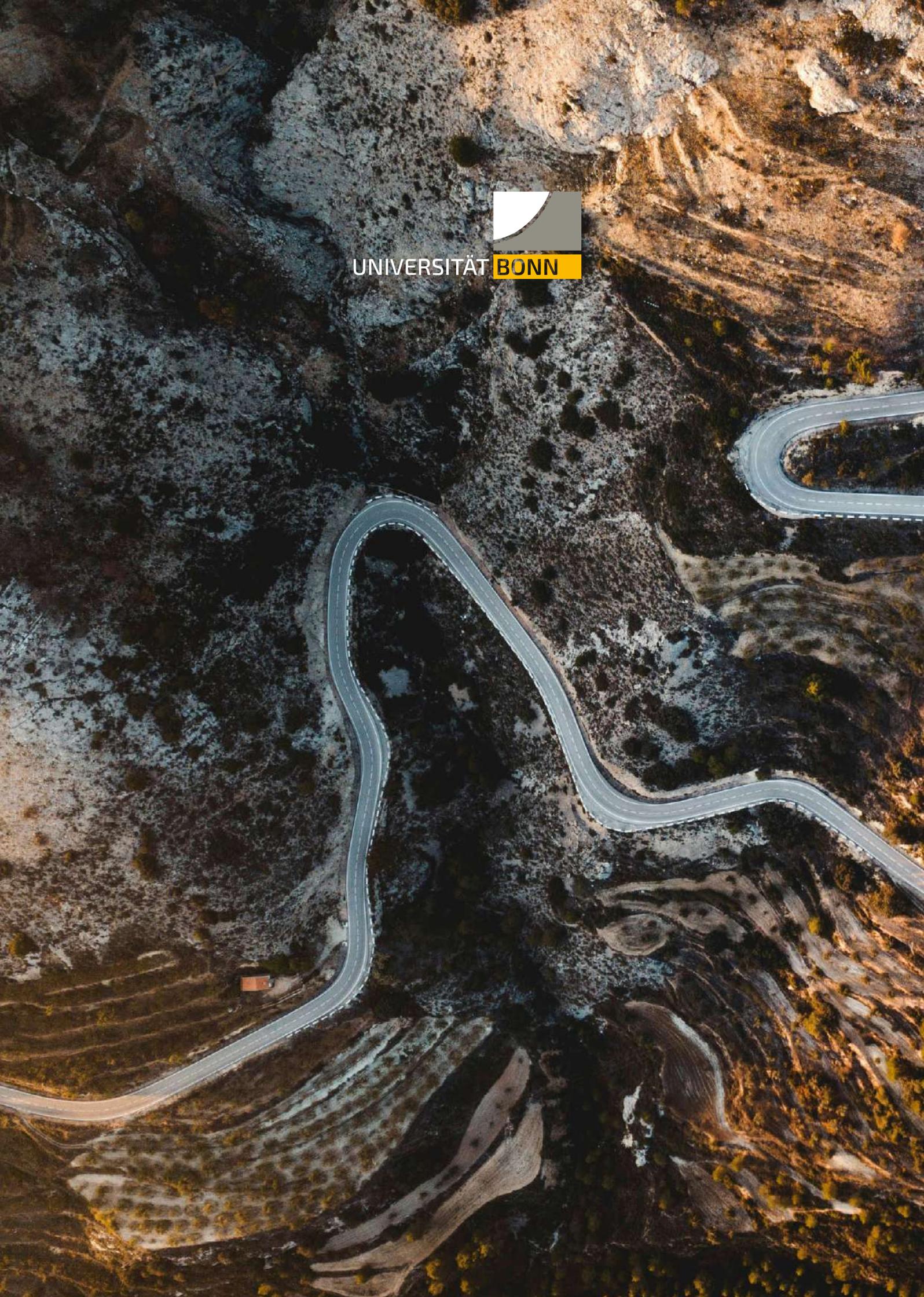
**Dr. Mohsin Hafeez** pursued his PhD at ZEF from 1999-2002. His research was funded by the German Academic Exchange Service (DAAD) and the International Rice Research Institute (IRRI).

He wrote his doctoral thesis on "Water Accounting and Productivity at Different spatial Scales in a Rice Irrigation System: A remote Sensing approach" (2003). Mohsin obtained his doctoral degree from the Faculty of Agriculture of Bonn University.



*Dr. Hafeez, we thank you for this interview.*

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