Australian Government

Australian Centre for International Agricultural Research

Final report

Project full title

Regional Foresight for Food Systems in the Eastern Gangetic Plain

project ID	WAC/2019/136
date published	22/12/2021
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final report number	FR2021-073
ISBN	978-1-922635-85-3
published by	ACIAR GPO Box 1571 Canberra ACT 2601 Australia

Contents

1 Acknowledgments

We are thankful to Shahidur Rashid, Lin Crase, Barun Deb Pal, and Himanshu Pathak for their valuable intellectual inputs throughout this project. Vartika Singh and Nicostrato Perez used modelling to create policy scenarios for a more sustainable food system in India. Prof. Sucharita Sen helped us design the primary survey to assess farmers' challenges and vision of their future for our study in West Bengal and has remained engaged with the foresight activities in the state despite a series of setbacks due to the COVID-19 pandemic, cyclone Amphan, and the state assembly elections.

Participants in the 4-day regional learning workshop in Kathmandu organized as a part of SRA-1 helped identify the relevant focus areas for regional foresight in Bangladesh, India, and Nepal.

Jyotsana Dua and Neha Sharma from IFPRI and Huilqui Noriega from ACIAR provided valuable support for project management, financial reporting, and compliance with IFPRI and ACIAR's requirements.

The SRA received immense intellectual and managerial support from Kuhu Chatterjee, Tamara Jackson, Robyn Johnston, and Jim Woodhill.

2 Executive summary

Experts dominate the discussions on foresight for food while the voices, concerns, and aspirations of local communities of farmers, entrepreneurs, and consumers remain unheard. The goal of the Short Research Activity (SRA) on 'Regional Foresight for Food Systems in the Eastern Gangetic Plains' was to undertake participatory foresight activities in Bangladesh, West Bengal, India, and Nepal with farming communities and modelling based scenario building exercises to connect the big picture context with engagements at the local and regional levels where change can take place. The two core objectives of the project were to

- build capacities of national partner institutions to organize and facilitate participatory foresight for food exercises with local farming communities and other stakeholders in Bangladesh, West Bengal, and Nepal and
- help communicate young women and men farmers' aspirations and concerns expressed during the participatory foresight exercises to the policymakers and other stakeholders in the regional food systems.

IFPRI and its partners, Bangladesh Agricultural University (BAU), Centre for Green Economy Development (CGED), and Uttar Banga Krishi Vishwavidyalaya (UBKV) had proposed to undertake four sets of activities in this project:

1. Organize a project launch workshop to finalize the focus areas and methodologies for participatory foresight exercises and use the workshop for training on mixed methods, scenario-based foresight activities, and strategies to ensure women's participation in the process.
2. Carry out three participatory foresight exercises—one each in North Bangladesh, West Bengal, and Province 2 of Nepal using mixed methods where food system maps and scenarios generated in SRA-1 were to be used to trigger discussions among farming communities in the three locations. The project teams planned to focus especially on women and young farmers.
3. Organize stakeholder dialogues in the three geographies to share the findings of the local foresight exercises with local elected leaders, extension officials, scientists, government officers, and business leaders.

4. Modelling based scenario analysis to assess the impact of change in energy policy for irrigation, lowering of tariff and non-tariff barriers for food trade, and shift from food subsidies for consumers to cash transfers on food consumption patterns, farmers' and consumers' welfare, water use in agriculture, and greenhouse gas emissions.
5. Preparation of foresight reports and modelling based analytical papers.

The SRA started on 10th September 2019 and its outputs were to be delivered by 30th June 2020. However, a no-cost extension was requested and granted due to the disruptions caused by the COVID-19 pandemic in Bangladesh, India, and Nepal. The Amphan cyclone caused further disruptions in Bangladesh and West Bengal. The UBKV team had to take part in the essential election duties in the state assembly elections in March-April 2021.

The pandemic not only delayed the project activities, but also compelled us to change our planned activities. The repeated waves of COVID-19 and the restrictions imposed by the state and the national governments made it impossible to conduct focus group discussions, essential for participatory foresight exercises, in Bangladesh and West Bengal. The team in Bangladesh could not even carry out the primary survey of farmers because of a series of health episodes and movement restrictions.

Only the CGED team could complete the participatory foresight activities in Province 2 of Nepal. The BAU team in Bangladesh and the UBKV team in West Bengal had to drop the idea of foresight meetings. The UBKV team could, however, complete a large primary survey of nearly 700 women and men farmers to collect quantitative data on farmers' perceptions of recent changes in agricultural practices, concerns about the future, and their strategies to prepare for the future. The BAU could not conduct a primary survey and had to use secondary data to study crop diversification and its links to dietary diversification of rural households in Bangladesh.

The IFPRI team used the IMPACT model to create scenarios of the potential effects of rationalized food and energy subsidies and a more open regime for international trade in food on diets, farmer and consumer welfare, and water use. The paper based on this modelling exercise is under review for publication as an IFPRI discussion paper. IFPRI also engaged Ms. Vartika Singh, a PhD student, to use the MAGPiE model to analyze the impact of change in energy policy for irrigation on cropping patterns, land use, and water use in India. The paper will be one of the three chapters in Vartika's dissertation. Finally,

the IFPRI team used the extended time to address an evidence gap flagged in the food system exercise undertaken in SRA1 to analyze different aspects of India's food enterprises, including the incomes and economic status of entrepreneurs and employees working in these enterprises.

Thus, the project team working on this SRA carried out the whole gamut of foresight activities—focus group discussions, primary surveys, analysis of secondary data, and scenario building & trade-off analysis using complex models—at different scales: household level in West Bengal and Bangladesh, community/village level in Nepal, and national level in India.

We highlight three key lessons from this SRA:

1. Crop diversity and diet diversity are not monotonically increasing over time in EGP. The data from rural Bangladesh shows a significant decline in diet diversity between 2011 and 2015 in many parts of the country. Similarly, model predictions suggest that Indian diets in 2050 may move further away from the planetary health diet recommended by EAT-Lancet.
2. Rationalization of energy subsidies to promote sustainable water use in agriculture, less restricted food trade regime, and shift from distortionary grain subsidies to income transfers, all oft-recommended policy reforms, may impose significant welfare burdens on farmers who may have to be compensated to support these reforms.
3. Conducting participatory foresight exercises requires the development of new tools, modules, and approaches to encourage or induce farmers to share their concerns and aspirations for changes over the medium and long run. Otherwise, farmers prefer to discuss their immediate concerns with outsiders organizing such exercises.

3 Objectives

The overall objective of the project is to encourage and support a core team of local partners in Bangladesh, India, and Nepal to undertake participatory 'foresight for food' exercises in their respective domains using scenario-based approaches and systems thinking.

Specific objectives of the SRA are to:

1. Build capacities of national partner institutions to organize and facilitate participatory foresight for food exercises with the local farming community and other stakeholders in Bangladesh, West Bengal, and Nepal.

2. Use modelling-based approaches and participatory foresight and scenario building exercises to assess alternate pathways that can help India shift to healthier and environmentally sustainable diets. Both modelling and participatory foresight exercises will be used to map the potential impact of each pathway on energy and water use for food production, employment generation, and farmers' incomes.

3. Help communicate young women and men farmers' aspirations and concerns expressed during the participatory foresight exercises to the policymakers and other stakeholders in the regional food systems.

Key outputs of the project include:

1. A publishable paper using IMPACT model based scenarios of the impact of different supply and demand side policies on average Indian diets, farmers' and consumers' welfare, greenhouse gas emissions, and the use of groundwater.
2. A dissertation chapter analyzing the impact of a decrease in energy subsidy for irrigation on cropping pattern, land use, and water use in agriculture in India using the MAGPiE model.
3. A discussion paper with a comprehensive analysis of the different facets of India's food enterprises and the incomes of entrepreneurs and employees who work in them.

4. A publishable paper on the interlinkages between crop and diet diversity in rural Bangladesh using panel data from three rounds of surveys of a representative sample of households in the country.
5. A preliminary report based on a primary survey of 399 men and 287 women farmers from two districts of West Bengal that tries to understand farmers' perception of unfolding changes in agriculture, their impacts, and farmers' strategies and adaptations to deal with and benefit from these changes.
6. A report based on participatory foresight activities conducted by CGED in Province 2 of Nepal. 111 women and men farmers across 6 municipalities participated in these foresight exercises to discuss their current challenges and aspirations for the future.

4 Methodology

We undertook the following steps to achieve the project objectives.

1. A project launch workshop was organized in IFPRI, New Delhi in September 2019. The partners agreed to the methodological approaches to be used in the primary surveys and the participatory foresight activities. The workshop was also used for training of all participants in mainstreaming gender in food systems research, the use of mixed methods, and different tools and techniques that can be used to conduct participatory foresight for food exercises with communities. We also discussed the policy questions that the modelling activities in the project will try to answer.
2. The repeated waves of COVID-19 and associated precautions made it impossible to carry out a primary survey and participatory foresight exercises in Bangladesh. The team tried to change the location and collaborate with an ongoing project of FAO to complete the foresight exercises but could not do so because of restrictions on the movement of people and assembling groups of farmers. Therefore, the BAU team used secondary data from three rounds of the Bangladesh Integrated Household Survey (BIHS) collected by IFPRI to analyze the change in crop diversification in the country between 2011 and 2018 and its correlations with household dietary diversity.
3. The UBKV team carried out a primary survey of 399 men and 287 women farmers in two districts of West Bengal to understand how the farmers foresee the agrarian change taking place in the state and the strategies they were adopting, or they plan to adopt to benefit from or adjust to these changes. Due to COVID-19 restrictions, the project team could not conduct focus group discussions and community level foresight exercises.
4. The IFPRI team used the IMPACT model to compare the EAT-Lancet reference diet with the Indian diet in 2020 and 2050. For the 2050 diet scenarios, we analyzed the potential impacts of climate change on Indian food production and diet composition and set it as the baseline for comparison with hypothetical scenarios where Government of India enacts policies to a) reduce distortionary subsidies on rice and wheat procurement; b) replaces energy subsidy for irrigation with a non-distortionary transfer to farmers, and c) reduces restrictions on international food trade. We

projected the impact of different policy changes on the price of food, farmer incomes, and use of water, and greenhouse gas (GHG) emissions.

5. The IFPRI team used the resources saved on travel and events to support modelling to support dissertation research of Ms. Vartika Singh where she used a dynamic partial equilibrium Model for Agricultural Production and its Impact on the Environment (MAgPIE) to assess the potential impacts of a reduction in energy subsidy for groundwater irrigation on crop cropping pattern, crop outputs, and land-use patterns in India. The resulting paper will be one of the three dissertation chapters of Vartika.
6. We had flagged the need to study the food enterprise sector that connects farmers to consumers in SRA-1. We used the no-cost extension period of the SRA-2 to analyze the data from the two rounds of a nationally representative survey of India's informal enterprises and combined it with the periodic labor force survey (PLFS) data to assess the size and the contribution of India's food enterprises to the country's economy and employment. We presented the results from our analysis in a number of online meetings and are preparing to publish it as an IFPRI Discussion paper and a journal article.
7. The CGED team in Nepal conducted participatory foresight activities with 111 women and men farmers across 6 municipalities in Province 2 of Nepal where farmers discussed their challenges and aspirations. The findings from participatory foresight activities were shared with senior scientists and policymakers in a workshop organized on 27th August 2021 in Janakpur, the capital city of the province. CGED also conducted two policy dialogues with the local government officials and other stakeholders in Mahottari and Dhanusha districts of province 2.

5 Achievements against activities and outputs/milestones

Table 1. Activities and Outputs/Milestones

no.	activity	outputs/ milestones	comments
1.	Organize a project launch workshop, including training on relevant methodologies, attended by implementing partners, Jim Woodhill, and ACIAR representatives (Tamara & Kuhu)	Partners from ACIAR, BAU, CGED, DFAT, IFPRI, JNU, and UBKV co-developed the work plan and the methodological approaches to be used in the primary surveys and participatory foresight exercises in Bangladesh, West Bengal, and province 2 of Nepal. Participants also agreed upon policy questions that the modelling activities will try to answer.	The workshop was also used for training of all participants in mainstreaming gender in food systems research, the use of mixed methods for research, and different tools and techniques that can be used to conduct participatory foresight for food exercises with communities.
2.1	Modelling based policy scenarios to analyze trade-offs involved in different policy interventions to shift diets in India	2 analytical reports with scenarios of possible impact and trade-offs associated with different energy, water, food subsidy, and food trade policies.	The report based on the IMPACT model will be published as an IFPRI discussion paper while the second report using the MAGPiE model will be part of a PhD dissertation.
2.2.	Participatory foresight exercises with local farming communities and other stakeholders in West Bengal, Bangladesh, and Nepal	A report and a policy brief based on participatory local food system foresight analysis in Nepal were prepared by the CGED team.	
2.3	Publication of analytical reports and policy briefs based on primary and secondary data analysis in Bangladesh and West Bengal.	The UBKV team in Bangladesh prepared a preliminary report based on a primary survey of nearly 700 women and men farmers. The report focuses on agrarian changes that farmers find salient and their strategies to deal with these changes. The BAU team in Bangladesh could not carry out the primary survey despite many attempts due to government/university restrictions. The team prepared a publishable article on the linkages between crop and diet diversity in rural Bangladesh.	The participatory foresight exercises could not be conducted in Bangladesh and West Bengal due to COVID-19 and cyclone Amphan (and the state assembly elections in West Bengal).
3.1	Organization of local events to share the findings of the local foresight exercises with a wider group of stakeholders and partners	The CGED team in Nepal organized two policy dialogues with a diverse set of stakeholders including provincial ministers, scientists from notational institutions, representatives of local government bodies, civil society organizations, and the private sector to share the findings from the participatory foresight exercises and discuss plans to improve farmers' welfare.	Meetings were not organized in Bangladesh and West Bengal because the foresight exercises could not be completed.

PC = partner country, A = Australia

6 Key results and discussion

The project team conducted a range of studies including a) participatory foresight exercises (Nepal), b) primary survey of women and men farmers (West Bengal), c) analysis of secondary data on households' cropping patterns and diets (Bangladesh) d) analysis of data on food enterprises and people who own them or work in them (India) and e) model based scenarios of the likely impact of different government policies on India's diets, water, and energy use for food production, GHG emissions from agriculture, food prices, and farmers' income. In this section, we briefly discuss four key results from the range of studies we undertook in this SRA.

1. *Crop and diet diversity will not increase automatically with time*

We expect crop and diet diversification to increase automatically in EGP with the increase in incomes and urbanization. However, the econometric analysis of the household panel data in Bangladesh shows that crop and diet diversity are not increasing consistently over time. The BIHS data even shows a decline in crop and diet diversity from 2011 to 2015, especially, among the poorest households. Projections from the IMPACT model show that under the business-as-usual (BAU) scenario, the 2020 Indian diet is closer to the EAT-Lancet diet than the projected average diet in 2050.

2. *Policies to promote more sustainable food production and consumption involve a series of trade-offs*

Supporting more sustainable use of groundwater by repurposing electricity subsidies for irrigation will draw the Indian diet closer to the EAT-Lancet diet, but it will also lead to welfare losses for both farmers and consumers. Combining policies for groundwater conservation with food trade liberalization will be beneficial for consumers but will hand welfare losses to farmers. Thus, the supply side policies involve a significant trade-off between producers' and consumers' welfare and between the planetary health diet and welfare. A demand side policy where the government uses income transfers to poor families in place of the current provision of subsidized rice and wheat will increase the net welfare, but more gains will accrue to consumers than producers. The welfare outcomes are similar for a comprehensive policy change that combines a more sustainable energy policy of irrigation with a more open food trade regime, and income transfers for food rather than subsidizing rice and wheat consumption. Given that producers lose in all three

scenarios, the government will need to compensate them to make these policy changes politically viable.

3. *The growing importance of food enterprises*

Informal food enterprises are growing faster than the on-farm output of India (possibly true for Bangladesh and Nepal too). These enterprises are mostly small, informal, short-lived, and have low capital and low fixed costs. They provide income opportunities to millions of the poorest women and men in the region. The low fixed costs of food enterprises allow them to be more resilient to supply or demand shocks like the COVID-19 pandemic if governments can find ways to provide them financial support to recapitalize them.

4. *Need for new ways for participatory foresight exercises*

The primary survey in West Bengal and participatory foresight exercises in Province 2 of Nepal show that we need to invest in developing methods and toolkits to carry out meaningful participatory foresight exercises with rural communities. In a standard primary survey or even a semi-structured or informal meeting, the discussions with farmers tend to get focused on one or two salient issues that are relevant in the present. For example, in Nepal, the discussions gravitated towards the need for better extension and improved access to productive inputs while in West Bengal, access to machines and markets were the main topics farmers discussed. How to encourage farmers to think and share about their future and respond to future scenarios based on national, regional, or global analysis is a question that requires more frequent community engagement and exploration of alternative ways to present scientific information and conduct group discussions and foresight exercises. We need to develop tools and modules for participatory foresight exercises and test them in the field for their effectiveness.

7 Impacts

7.1 Scientific impacts – now and in 5 years

The research under this SRA has resulted in a report based on participatory foresight exercises with more than 100 farmers in Nepal, two independent scenario analyses of the potential impact of public policies for a more sustainable food system in India using different models (IMPACT and MAGPiE), a report based on a large primary survey with high representation of women farmers, a paper with an analytical description of India's off-farm food sector—a critical component of the food system often overlooked in food system mapping exercises and a panel data analysis of the links between crop and diet diversity in Bangladesh. We expect the publication of four peer-reviewed journal articles and a PhD dissertation based on the studies completed under this project.

7.2 Capacity impacts – now and in 5 years

We used the launch workshop of this project for training of all participants in a) mainstreaming gender in food systems research, b) the use of mixed methods for research, and c) different tools and techniques that can be used to conduct participatory foresight for food exercises with communities. Dr. Sucharita Sen offered training on mixed methods and gender mainstreaming while Dr. Jim Woodhill shared information on tools and techniques for participatory foresight research. The capacity building did not stop with this initial training. We recruited Dr. Sen to work with the UBKV team in West Bengal to guide them in developing protocols for focused group discussions with women and men farmers and sampling and administering the primary survey. Her inputs have helped a team of agronomists develop a better understanding and appreciation of ways to carry out gender-inclusive studies of farming communities. Jim, Avinash, and Tamara worked with the CGED team in designing the participatory foresight activities in Nepal. The project is also supported a Ph.D. candidate, Vartika Singh with her research on using modelling techniques for policy analysis. Vartika used the MAgPIE model to assess the potential impacts of different kinds of electricity tariffs and subsidies on water use in agriculture in India. A revised version of her paper will become one of the chapters of her Ph.D. thesis.

7.3 Community impacts – now and in 5 years

Our research will contribute new ideas and perspectives on the region's food systems and its future course. The participatory foresight exercise with farmers in Nepal and the workshop organized to share farmers' views with the policymakers generated greater interest among researchers and policymakers to continue the process and to come together to better serve farmers' needs. These are perhaps the most important impact of the SRA.

7.3.1 Economic impacts

This SRA did not have any direct impact on the region's economy. We analyzed trade-offs involved in making India's food production less water and energy-intensive and weighed the pros and cons of different policy options being considered to ensure the production of healthy diets from a sustainable food system in India using modelling. These reports will contribute to the scientific and policy discussions that started with the publication of the EAT-Lancet report in India and its neighboring countries.

7.3.2 Social impacts

We do not expect any direct social impacts of this project. Our partner, CGED's close coordination with local and provincial level officials in province 2 of the country has informed the strategy for agriculture extension there. The policy dialogue in Nepal also generated an interest in the different arms of the government in the province to come together to deliver better services to farmers and to continue the dialogue between farmers and policymakers that started in this SRA.

7.3.3 Environmental impacts

The two modelling-based papers show that change in energy prices for irrigation can reduce groundwater use in agriculture and the resulting loss of domestic production can be set off by a more open food trade policy. Thus, energy policies and policies for food trade have to be used together to reduce the environmental footprint of India's food system. Findings from these papers will broaden the discussion on potential strategies to address environmental challenges for Indian agriculture.

7.4 Communication and dissemination activities

a. CGED conducted participatory foresight activities with 111 women and men, farmers, across 6 municipalities in Province 2 of Nepal where farmers discussed

their challenges and aspirations. The findings from participatory foresight activities were shared with senior scientists and policymakers in a workshop organized on 27th August 2021 in Janakpur, the capital city of the province. The Hon. Member of the Provincial Policy and Planning Commission participated in the workshop along with a close advisor to the Minister of Agriculture; Directors of Agriculture Research, Agricultural Development, and Extension, and Forestry; and the heads of all eight Agriculture Knowledge Centres (AKCs) of province 2. As an outcome of the meeting, the representatives of the Planning and Policy Commission, the Ministry of Agriculture, the AKCs, and the Deputy Mayors showed a willingness to work with us to carry the process forward to jointly plan a better future for the farmers of the province. It was decided in the meeting that a series of demonstrations will be organized in three Municipalities of the province to help farmers get a better understanding of ways to practice more market-oriented agriculture.

b. CGED also conducted two policy dialogues with the local government officials and other stakeholders in the Mahottari and Dhanusha districts of province 2. The information gleaned from participatory foresight exercises conducted in the area provided an entry point for the stakeholder dialogue that focused on ways to improve agricultural extension in the two districts and the province to prepare farmers better for current and future challenges to smallholder agriculture in the region.
c. IFPRI organized a virtual dialogue on the impact of COVID-19 restrictions on India's food system. 20 academics, entrepreneurs, commodity traders, and representatives from the food retail industry and fintech institutions joined the dialogue and jointly prepared a status report published in the Economic and Political Weekly (an output reported in SRA-3 annual report).
d. Workshops planned in Bangladesh and West Bengal could not be organized due to repeated waves of COVID-19. We plan to organize foresight workshops as a part of SRA-3.

8 Conclusions and recommendations

We could not carry out the participatory foresight exercises in Bangladesh and West Bengal due to COVID-19 restrictions. We had to substitute participatory foresight work by analysis based on a primary survey of farmers (West Bengal) and analysis of secondary data (Bangladesh). Given the differences in data sources, methods of analysis, and focus areas, we do not have comparable lessons across the three countries. Therefore, our conclusions and recommendations also cover multiple themes where we can work on in the future.

8.1 Conclusions

a. Participatory foresight exercises with farmers pose methodological challenges especially when one tries to anchor discussions around possible future scenarios prepared by scientists. Scientists need to translate scenarios based on global or regional analysis into local impacts for such activities. It is also challenging to get poor farmers to articulate their long-term aspirations and expectations of change.
b. The primary survey of 287 women and 399 men farmers in West Bengal showed that the role of women in agriculture is increasing and farmers expect women to become even more central to decisions related to farming. According to the respondents of the survey, this change is driven mainly by the increase in the migration of male members of the family.
c. Projections using the IMPACT model show that under the business-as-usual scenario, the Indian diet in 2020 is closer to the EAT-Lancet recommendations than the diet in 2050.
d. Reducing energy subsidies for groundwater use will save groundwater but also lead to reduced production of food crops and fruits & vegetables, but a more open food trade policy can help make up for the deficit and make most food groups more affordable to consumers.

8.2 Recommendations

- *Participatory foresight exercises:* We need to invest in developing methods and toolkits to carry out meaningful participatory foresight exercises with rural communities. The discussions with these communities tend to get focused on one or two salient issues that are relevant in the present. How to encourage farmers to think and share about their future and respond to future scenarios based on national, regional, or global analysis is a question that requires more frequent community engagement and exploration of alternative ways to present scientific information and conduct group discussions and foresight exercises.

- *Demand for training on modelling tools:* Researchers from the EGP countries—both students and NARES scientists—are keen to learn advanced modelling techniques to generate future scenarios and evaluate the pros and cons of different policy strategies to increase farmers' incomes, improve resource use efficiency, and reduce greenhouse gas emissions. Training programs on modelling followed by collaborative research where these models are used will have many takers in the region.

- *Partnership with individual research scholars:* It is becoming increasingly difficult to hire local PhD scholars for short-term projects that align with their interests and the project deliverables. However, such collaborations have high payoffs—for the donors, project leaders, and the local collaborators.

- *Interview women farmers:* Male respondents are grossly over-represented in the primary surveys of farm households. Given the growing role of women in agriculture in many parts of the EGP, it is increasingly important that researchers collect data from both women and men farmers in primary surveys.

9 References

9.1 List of publications produced by the project

Pre-publication Discussion Papers

Nicostrato Perez and Avinash Kishore. Towards a planetary health diet for India: The role of climate change, food Policies, demand shifts and income growth.

Singh, Vartika. Irrigation costs and crop production: Integrated assessment of increasing irrigation costs on land-use change and crop cultivation in India using a partial equilibrium modelling approach.

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Journal Articles and Conference Presentations/Posters

Jackson, Tamara., Madhav Karki, Avinash Kishore, and Jim Woodhill. 2020. "Participatory food system futures in Nepal: Matching macro, meso and micro level future". Poster presented at the *4th International Conference on Global Food Security*, 7-9 December.

10 Appendixes

10.1 Appendix 1: Meeting photos