INITIATIVE ON
Transforming Agrifood Systems in South Asia

CGIAR

Climate adaptation in Banke, Nepal

Climate shocks, impacts, responses, and adaptive capacity of local food systems

Data Note 16

December 2023

ABOUT THIS BRIEF |

The Transforming Agrifood Systems in South Asia (TAFSSA) district agrifood systems assessments aim to provide a reliable, accessible, and integrated evidence base that links farm production, market access, dietary patterns, climate risk responses, and natural resource management with gender as a cross-cutting issue in rural areas of Bangladesh, India, and Nepal. They are designed to be a district-level multi-year assessments. Using data collected in February– March 2023, this brief describes experiences of climate shocks, perceived impacts and responses, and access to different types of resources that can contribute to the adaptive capacity of households. Here we use the term "climate shocks" to represent manifestations of climatic variability and weather extremes that households perceive and respond to. This is one of a set of data notes that, together, provide a holistic picture of the agrifood system in the district.

Figure 1. Map showing surveyed villages in Banke, Nepal

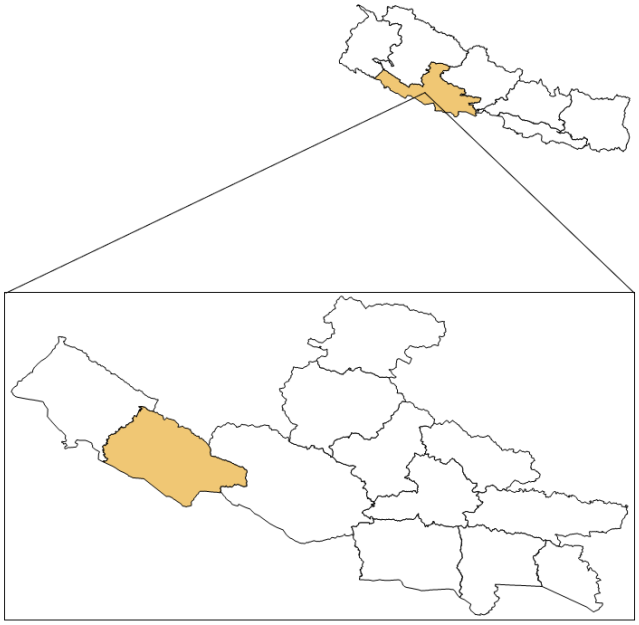


Figure 2. Highlights from this brief

61.4% of households report impacts from climate shocks in past 2 years

51.8% of impacted households adopt response strategies to climate shocks

69.2% of households access weather forecast information

28.8% of households do not own any land

70.2% of cultivating households have access to irrigation

CIMMYT · IFPRI International Food Policy Research Institute · IRRI · IWMI International Water Management Institute · CIP International Potato Center

OVERVIEW OF CONTENTS |

This brief captures the experience and impact of climate shocks on households, along with the responses that households adopt to these shocks. It then provides a picture of access to different types of capitals that constitute the basis of households' adaptive capacity. In this brief we present 'generic' adaptive capacity (Mortreux and Barnett 2017) as an outcome of a households' access to five types of capital:

Natural capital - natural resources required to sustain a livelihood to enable adaptation

Physical capital – infrastructural support and technological solutions to impacts

Financial capital – required to bear the cost of adaptation

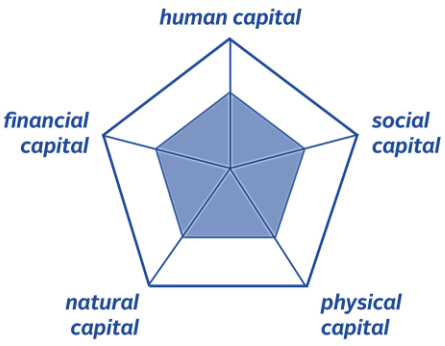
Social capital - social bonds and networks to assist adaptation

Human capital - the physical and mental resources to adapt

This conceptual framework of five capitals (Figure) emerges from the *sustainable livelihoods framework*, which is discussed in the Annex section to this brief along with the indicator selection.

Given the climate change focus of the brief, an added emphasis on 'access to climate information' has also been included.

FIVE CAPITALS FRAMEWORK



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DISTRICT CLIMATE AND RESOURCE PROFILE

Table 1. Village resource regime

Sample villages (N)	**25**
LAND	%
Villages reporting land conversion -	
• *From agriculture to built-up area*	68
• *From forest/water-body to agriculture*	4
Villages reporting soil texture -	
• *Sandy (light soil)*	76
• *Loamy and silt (medium soil)*	64
• *Clay (heavy soil)*	64
WATER	%
Villages reporting decline in groundwater level over last 5 years	84
Villages reporting water quality issues:	
• *Iron*	64
• *Salinity*	44
Predominant source of agricultural water:	
• *Groundwater*	56
• *Surface water*	8
• *Rainfed*	36
Energy source for irrigation in village	
• *>50% irrigation pumps in village run by diesel*	48
• *>50% irrigation pumps in village run by electric*	44
• *Villages with use of Solar pumps*	12
COMMON PROPERTY RESOURCES	%
Villages with community ponds	28
Villages with community forest	60
Villages with pasture/grazing lands	24

Note: The figures in this table are self reported by key village respondents through a structured community level questionnaire

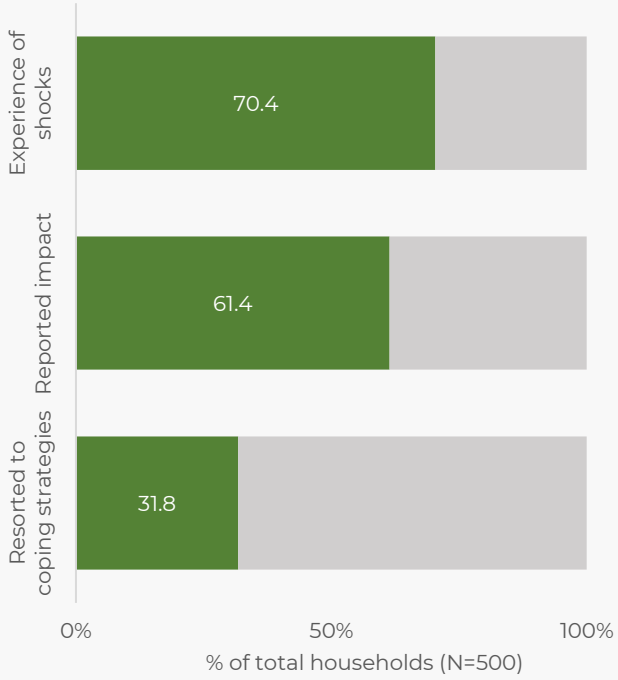
Table 2. Household characteristics

TOTAL HOUSEHOLDS (N)	**500**
Owning land %	71
Operating land %	79
Cultivating crops %	73
Irrigating land %	52
Reporting experience of shocks %	70
Main source of income	
• *Crop cultivation, %*	18
• *Business, %*	15
• *Wages, %*	15

ASSESSING ADAPTATION |

Climate adaptation is defined by the Intergovernmental Panel on Climate Change (IPCC) as "*the process of adjustment to actual or expected climate and its effects*". Here adaptation assessment is approached through three levels of related questions– whether respondents experienced any climate shocks in last two years, how were they impacted by these shocks, and how they responded to these shocks (immediate coping strategies and longer-term changes in farming practices). Perception or experience of shocks, and their impacts are a function of not only the biophysical incidence of climate shocks but also households' preparedness and capacity to cope and adapt.

Figure 3. Experience, impact, coping to climate shocks



FINDINGS:

✓ 70.4% households report experiencing some climate shocks. 87.2% of these report some level of impact (61.4% of total sample households). 51.7% of the impacted households report resorting to some response strategies to cope and adapt to these shock (31.8% of total sample households).

61% of households report impacts from climate shocks in past 2 years; 32% of households report adoption of specific coping and adaptation strategies

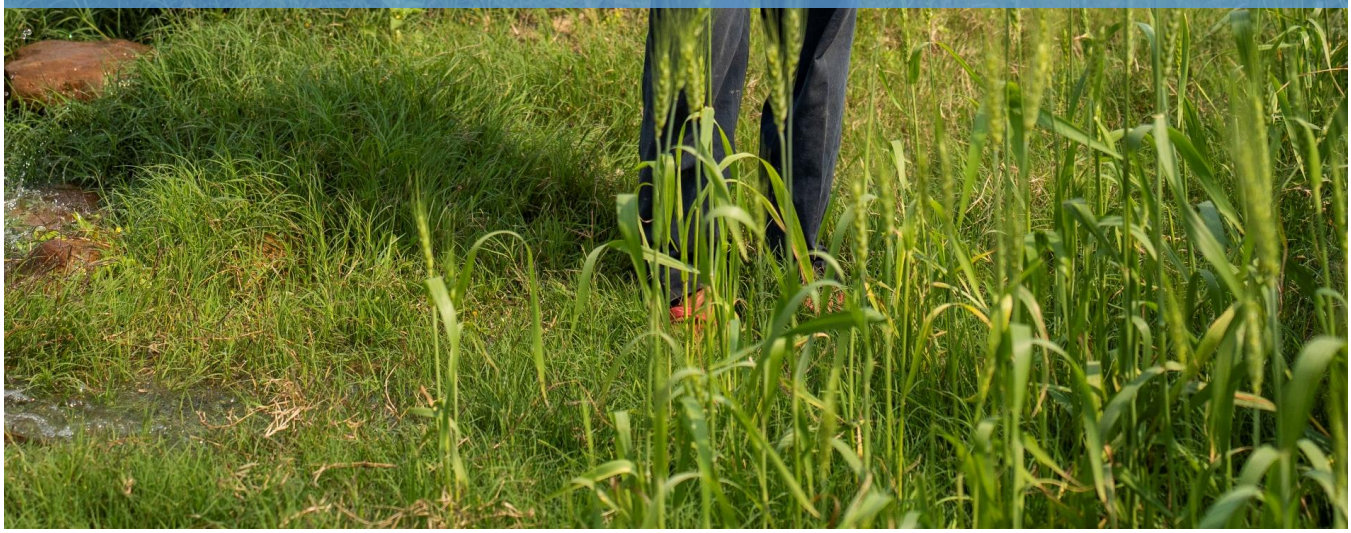
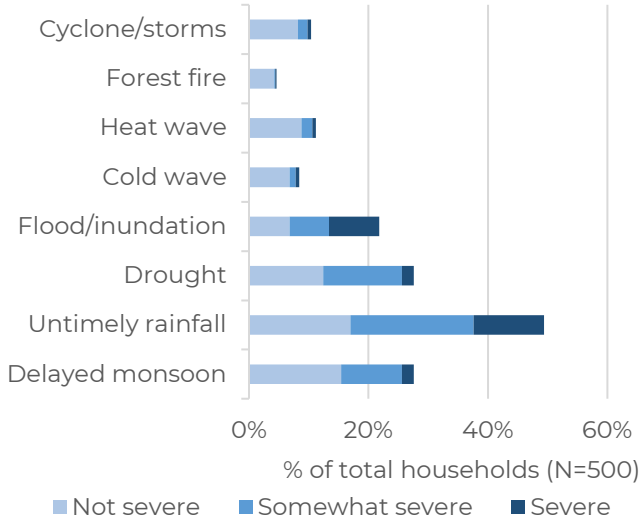


Photo credit: Abdul Momin

EXPERIENCE AND IMPACT OF CLIMATE SHOCKS

Figure 4. Perceived experience of climate shocks and severity of impact (2021-2022)

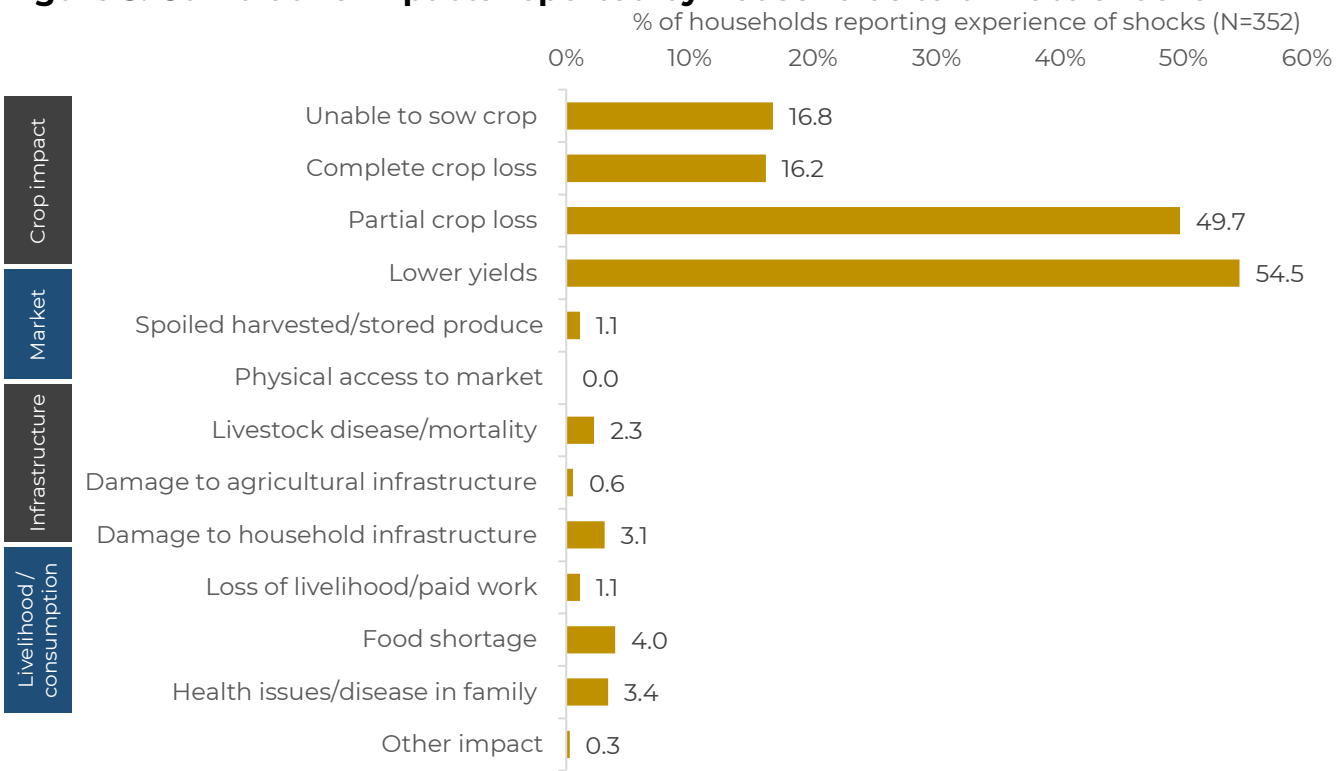


IMPACTS AND RESPONSE |

To explore the impacts of climate shocks, households were asked about (1) the perceived severity level of the impact on the household's economic condition, and (2) the type of impact(s). Response strategies included both immediate coping as well as changes in farming practices. A range of categories of response options were offered to survey participants based on literature and validated surveys.

Impacts and responses are presented at two levels – disaggregated by different climate shocks (Fig. 6 and Fig. 8), and cumulative across different climate shocks (Fig 5 and Fig. 7). The 'cumulative' assessments provide the overview picture for different impact and response categories across all shocks affecting the household i.e. at least one valid response for a particular impact or response strategy across all the shocks experienced by that household.

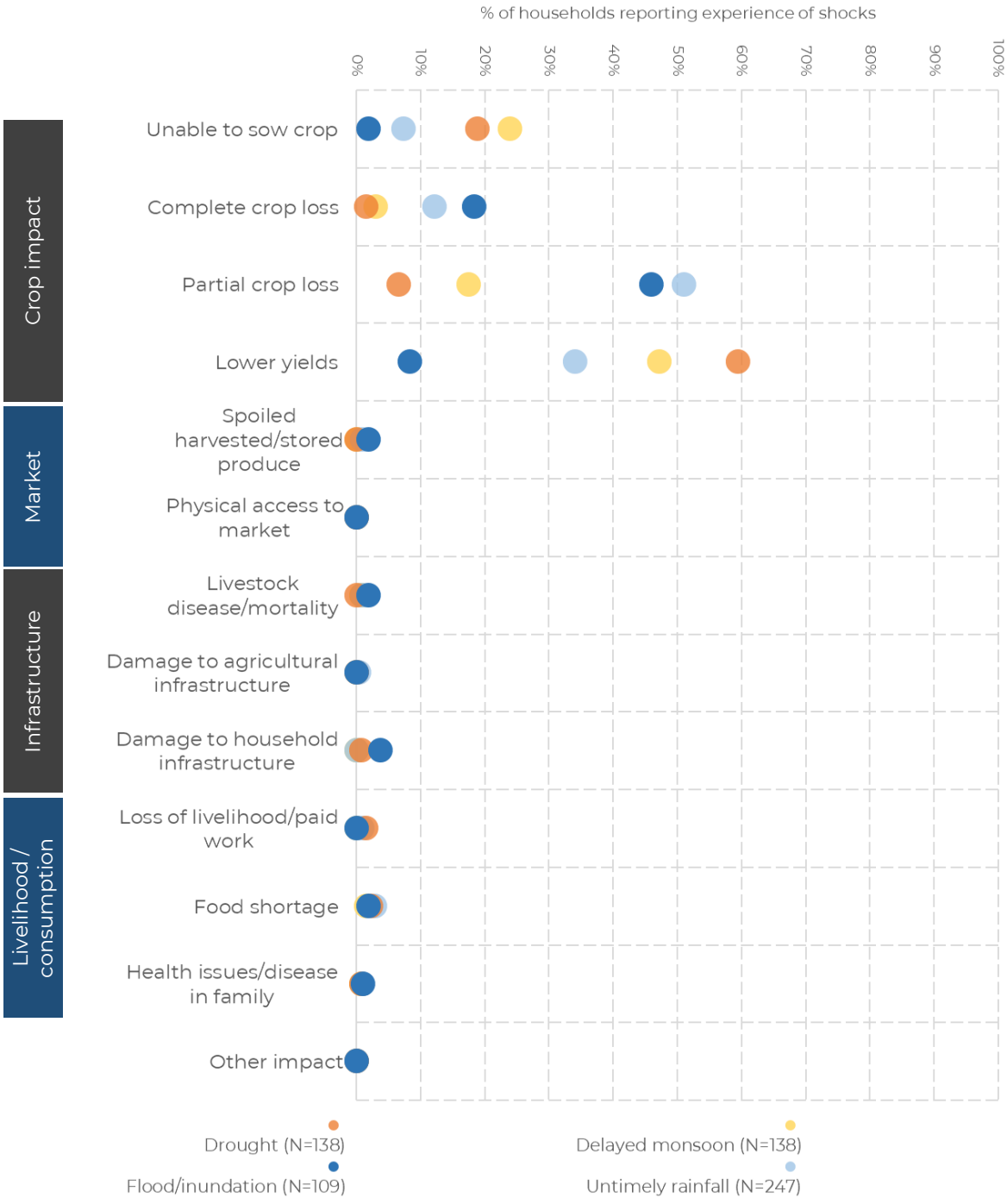
Figure 5. Cumulative impacts reported by households to climate shocks



FINDINGS:

- ✓ Partial crop loss and lower crop yields were the most predominant impacts of climate shocks reported by households
- ✓ Untimely rainfall and flood/inundation caused the most severe impacts as reported by households. Drought and delayed monsoon were also highly reported, but the severity of their impact was lower.

Figure 6. Impacts reported by households under different climate shocks (top 4 shocks by percentage of households experiencing shock)



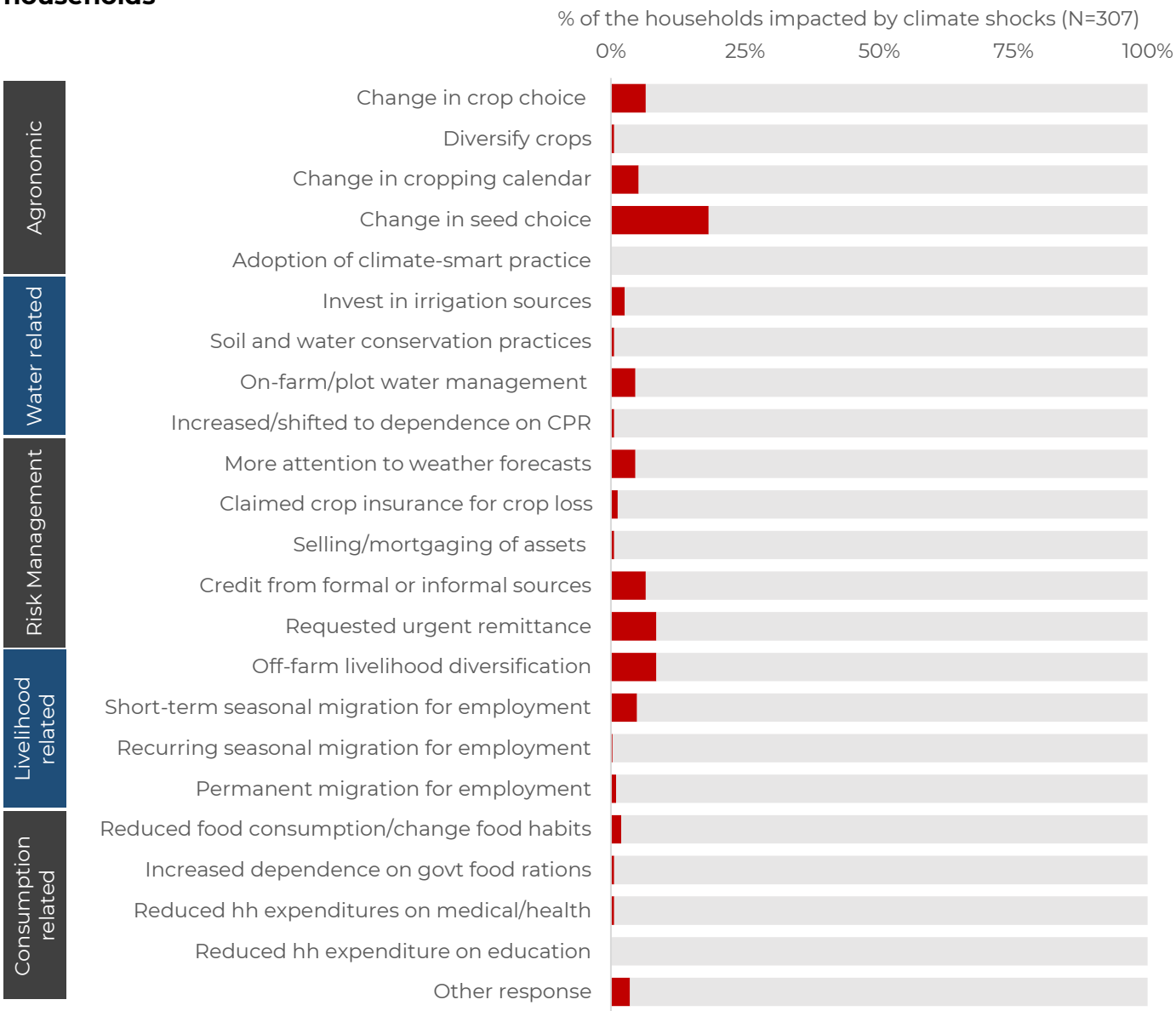
Note: Cyclone/storms, forest fires, cold waves, heat waves have not been included in this list - percentage of households reporting experience of these shocks are below 30% of households reporting any experience of a shock.

FINDINGS :

- ✓ Crop related impacts were the highest reported impacts of shocks. Other livelihood and infrastructure related impacts were minimally reported.
- ✓ Untimely rainfall and flooding/inundation mostly lead to partial or complete crop loss whereas droughts and delays in onset of monsoon affect crop sowing and crop yield.

RESPONSE STRATEGIES TO CLIMATE SHOCKS

Figure 7. Cumulative response strategies to any climate shocks adopted by households



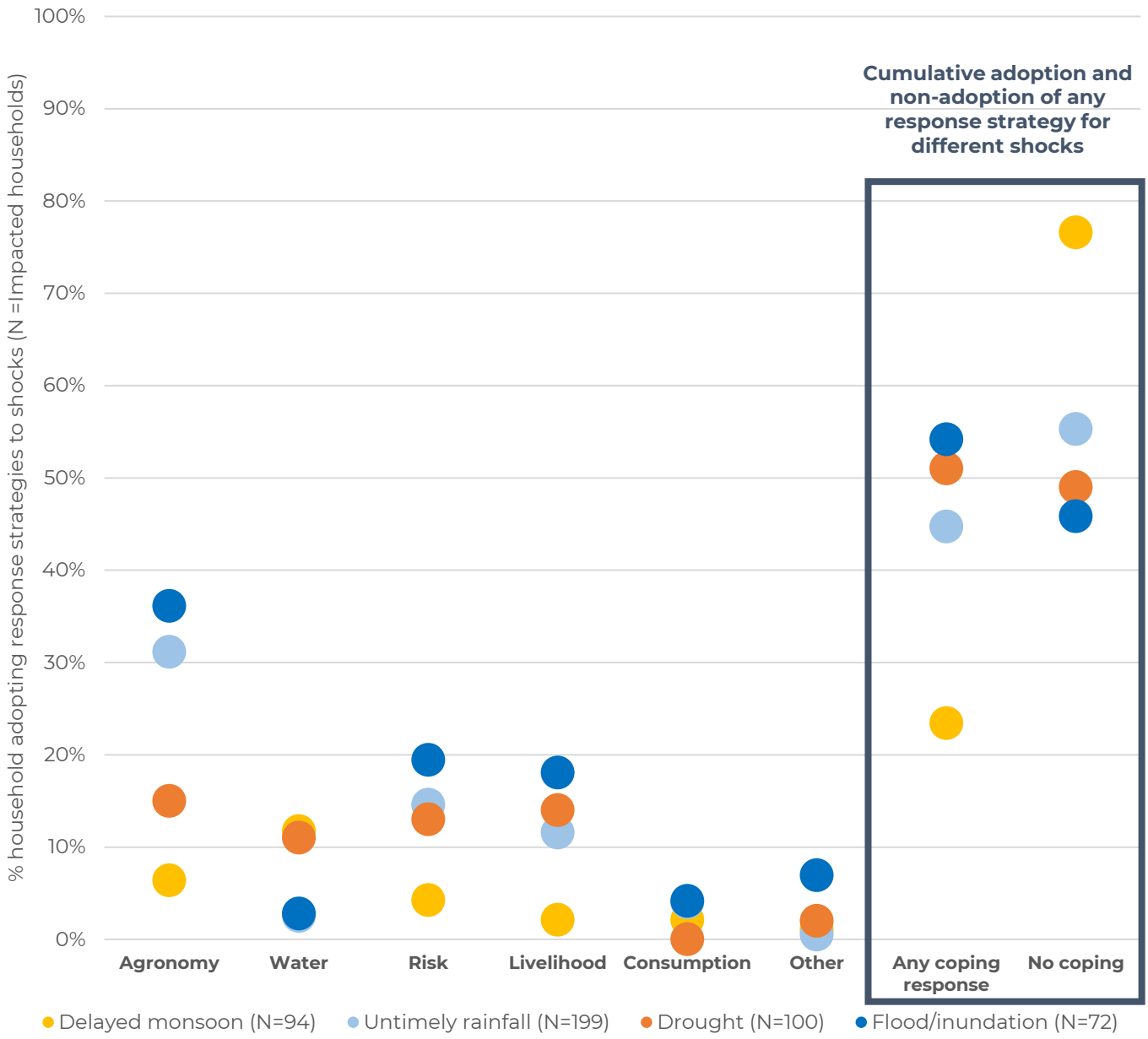
Note: Cumulative: Atleast one valid response for a household for a particular response strategy option for any shock experienced by that household
The coping strategies may reflect broader groups of strategies which were highlighted in the questionnaire as examples

- CPR – Common Property Resources (public/community land and water resources)
- Climate-smart practices – crop establishment regimes such as zero-tillage, intercropping, direct seeded rice etc.
- On farm/ plot water management - increase irrigation, decrease irrigation, drip/ sprinkler etc
- Those not reporting any response strategies either depend more on personal savings, increase dependence on production from their own farm for self-consumption, or they did not report severe impacts

FINDINGS :

- ✓ The most reported response strategies to climate shocks are agronomic, and short-term livelihood, credit and remittance-based responses.
- ✓ 51.7% of impacted households are resorting to some response mechanisms.

Figure 8. Response strategies to climate shocks reported by households under different climate shocks (top 4 shocks by percentage of households experiencing shock)



Note: The X-axis represents grouping of detailed response strategies under five broad categories as presented in Figure 5. Please refer to Figure 5. for the different types of responses under these broad categories presented.
Cyclone/storms, forest fires, cold waves, heat waves have not been included in this list - percentage of households reporting experience of these shocks are below 30% of households reporting any experience of a shock.

FINDINGS :

- ✓ Flood/inundation related impacts drew the most coping responses, and in alignment with the crop-related impacts, agronomic response strategies were most frequently used (predominantly adoption of different seed choice/varieties)
- ✓ Water management related responses were only rarely resorted to, and mostly in response to droughts and untimely rainfall
- ✓ There is a significant dependence on livelihood diversification, short-term migration, and dependence on remittances and credit for most shocks except delayed monsoon

ADAPTIVE CAPACITY – NATURAL CAPITAL

Figure 9. Land access by size of landholding (owned and operational)

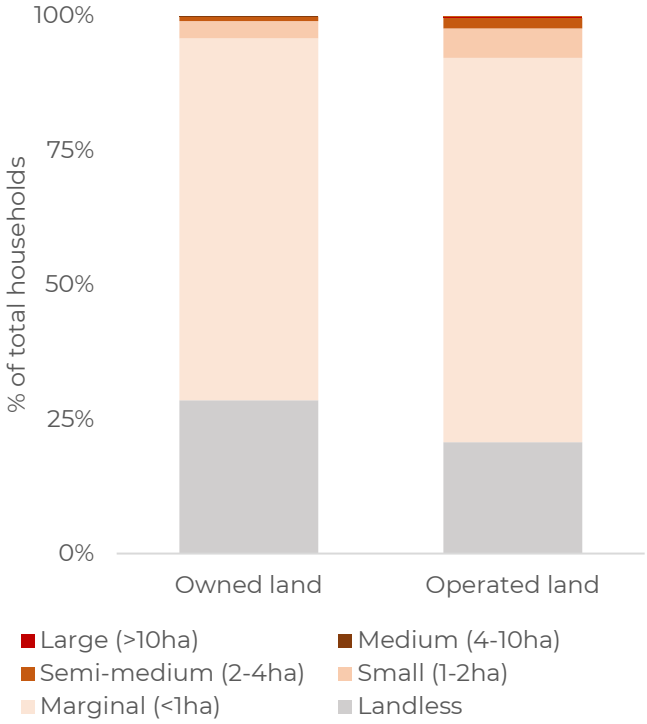
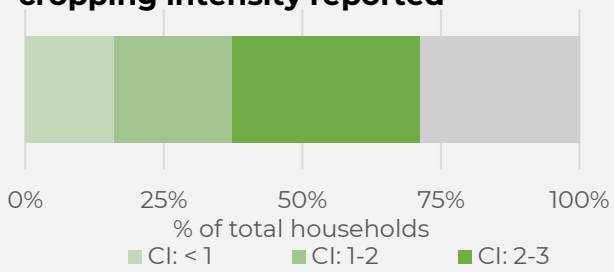


Figure 11. Cultivated land by farm cropping intensity reported



Note: Cropping intensity (CI) = Net Sown Area / Gross Cropped Area

Figure 12. Access to irrigation

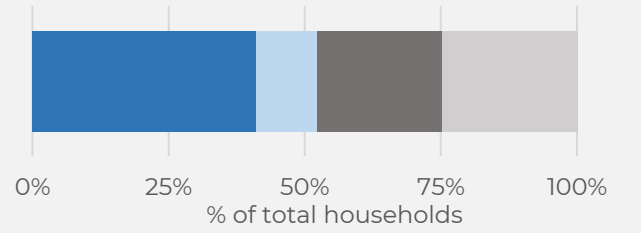


Figure 10. Access to land by type of ownership

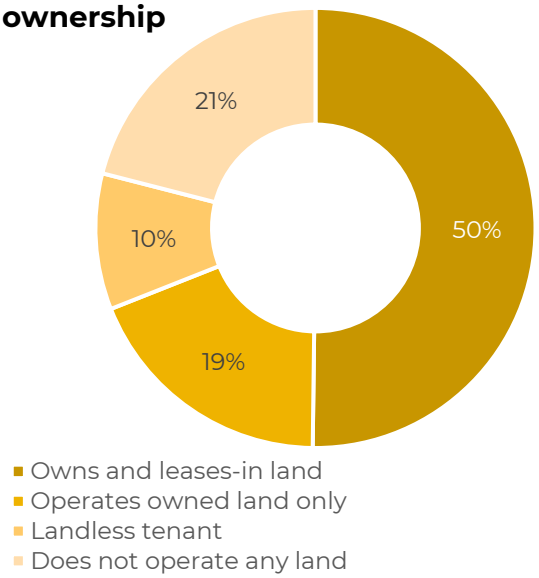


Table 3. Water insecurity

IRRIGATION WATER	% of cultivating households
Cultivating land but not irrigating	31.1
Reporting labor scarcity for irrigation	5.7
Reporting poor access to irrigation among their two most important challenges in agriculture	56.0
HOUSEHOLD WATER	**% of total households**
Reporting worry about not having enough water for all household needs *(sometimes/often/always)**	4.2
Reporting worry about having to change schedules/plans because of problems with water situation *(sometimes/often/always)**	1.6

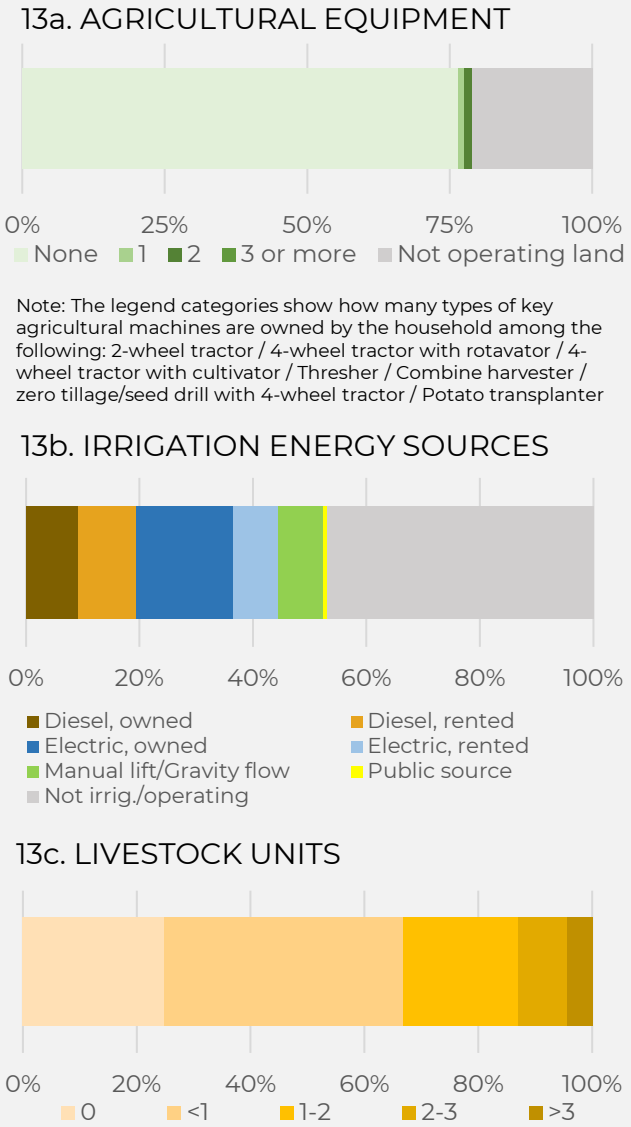
** Variables compiled from HWISE categories: Sometimes (3-10times), Often (11-20 times), Always (>20 times)*

FINDINGS :

- ✓ Almost 80% of the households operate land with close to 70% owning land
- ✓ Irrigation access is poor with over 30% cultivating households without irrigation access and over half reporting irrigation access as a major constraint in agriculture.
- ✓ There is high dependence on groundwater sources for irrigation
- ✓ Only very few households report concern about adequacy and timing of household water supply.

ADAPTIVE CAPACITY – PHYSICAL CAPITAL

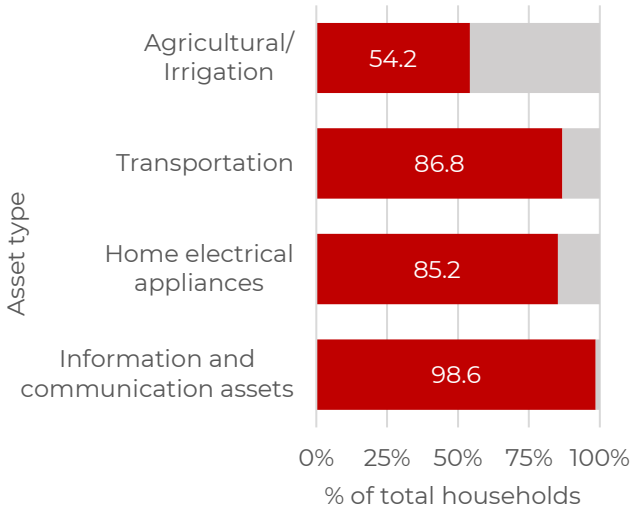
Figure 13. Ownership of productive assets



Note: The legend categories show how many types of key agricultural machines are owned by the household among the following: 2-wheel tractor / 4-wheel tractor with rotavator / 4-wheel tractor with cultivator / Thresher / Combine harvester / zero tillage/seed drill with 4-wheel tractor / Potato transplanter

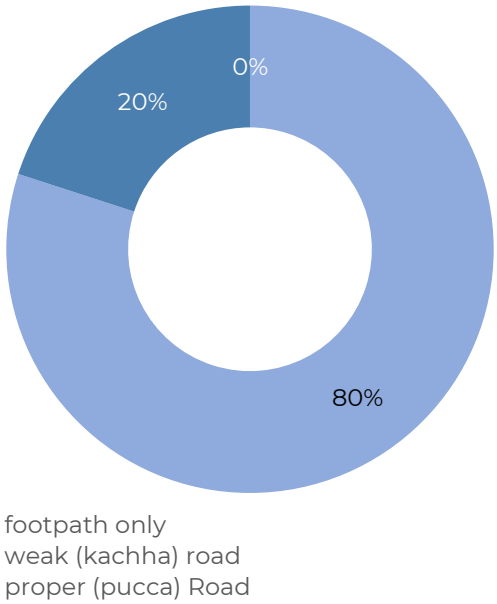
Note: Livestock Units - an 'exchange ratio' among livestock species and obtained by converting the body weight into the metabolic weight, which is multiplied by the units of animals owned by the household (Chilonda and Otte, 2006; FAOSTAT, 2022). Cow in USA is used as the reference species

Figure 14. Ownership of household assets



Note: Agricultural - include thresher, tractor and water pump
Transportation – bicycle, motorcycle/scooter, animal drawn cart, rickshaw, car
Communication - radio, TV, phone, internet, computer

Figure 15. Road connectivity



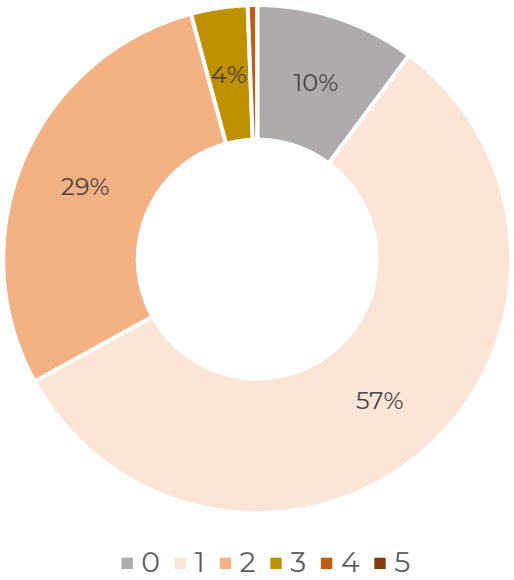
Note: The chart presents % of households in villages with different types of road access

FINDINGS :

- ✓ Ownership of agricultural and irrigation assets/water pumps is moderately high (especially compared to mid-hills regions)
- ✓ The majority households own livestock which provide income as well as insurance under shocks.
- ✓ Good access to transport assets but most villages only have access to poor road networks

ADAPTIVE CAPACITY – FINANCIAL CAPITAL

Figure 16. Household occupational/livelihood diversity



Note: Number of different **primary** occupations (longest time spent during last 365 days) household members are involved in

Figure 17. Primary and secondary sources of income of household

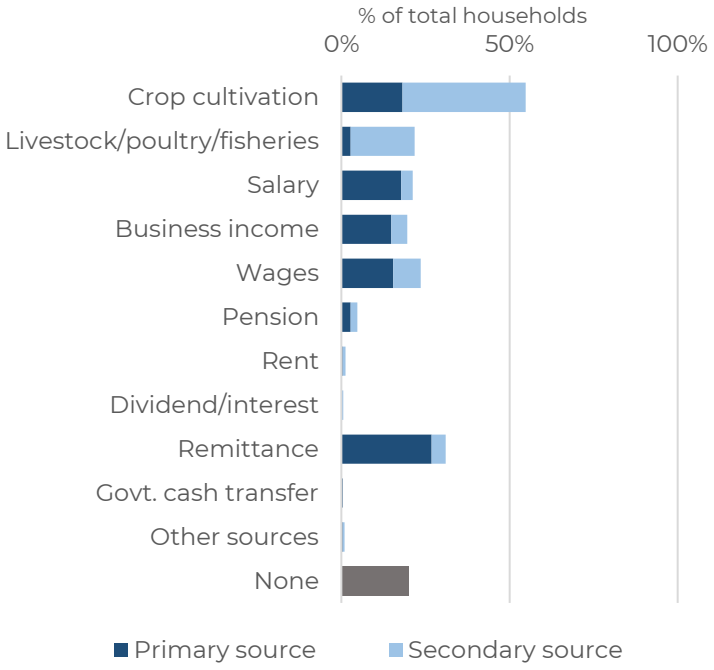


Figure 18. Outstanding loan and credit source

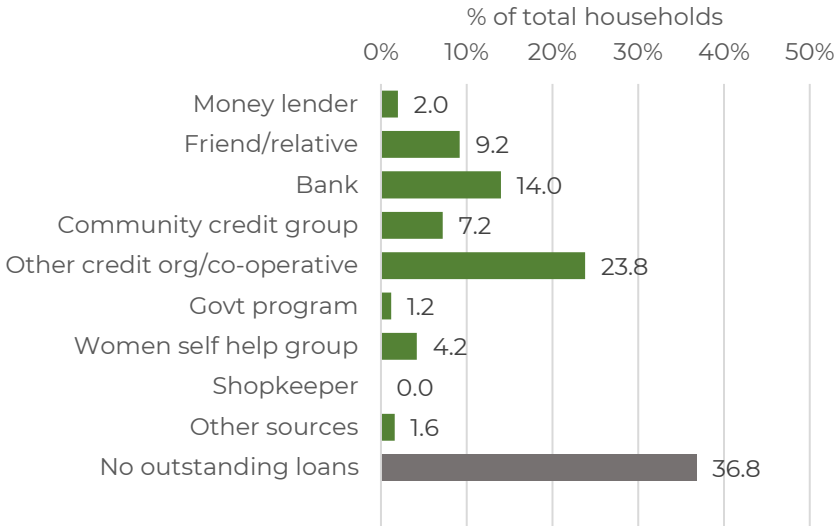


Table 4. Access to formal credit and insurance services

	% hhs
Bank account	83.8
Kisan credit card	0.6
Life insurance	27.2
Crop insurance	0.0
Livestock/poultry/fish insurance	6.2
Health insurance	12.4

FINDINGS :

- ✓ Over 60% households have low occupational diversity. 10% households have no primary occupation and over 55% have only one primary occupation
- ✓ While over 50% households are involved in crop cultivation as a major income source, for most it a secondary source of income. Remittances provide the primary income source for over 25% of households.
- ✓ Formal banking and cooperative credit sources are most accessed for loans
- ✓ Access to insurance services for productive purposes is very low

ADAPTIVE CAPACITY – HUMAN CAPITAL

Figure 19. Education level of Household

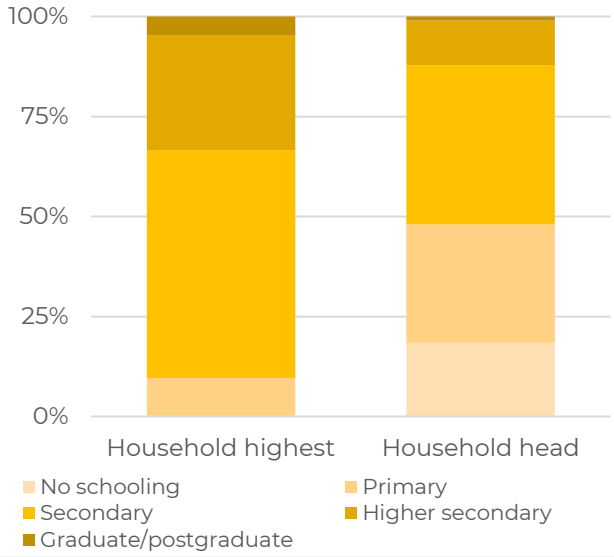
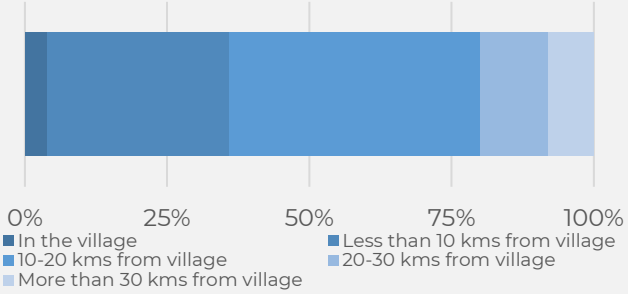
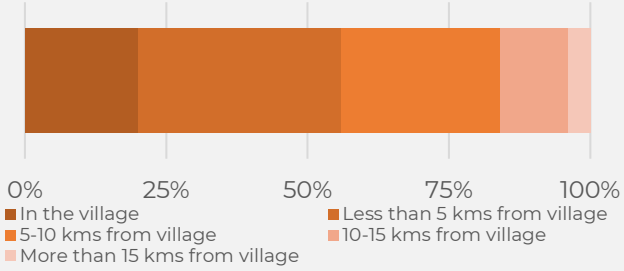


Figure 20: Access to Health facilities

20a. DISTANCE TO GOVERNMENT HOSPITAL

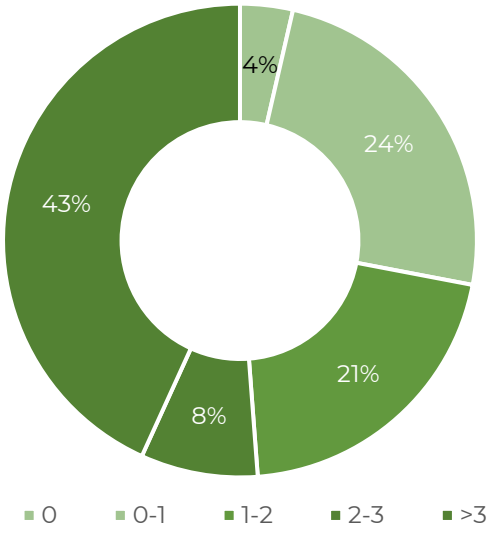


20b. DISTANCE TO PRIMARY HEALTH CENTRE



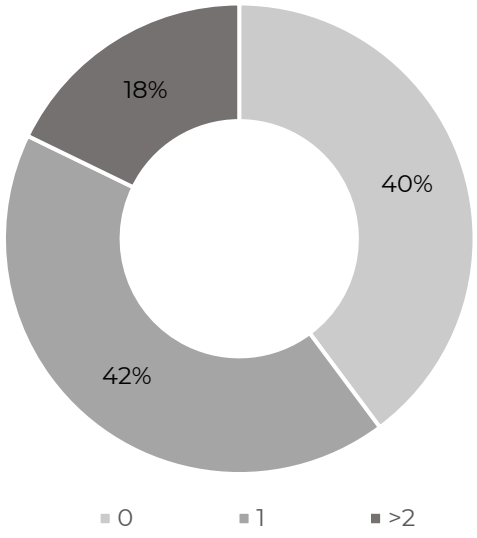
Note: The two charts present % of households in the villages in different distance categories from nearest hospital/PHC

Figure 21. Working members dependency



Note: The dependency ratio is calculated as the number of non-working members in the household per working member.

Figure 22. Family labour in Agriculture



Note: The chart shows the number of family members in the household involved in agriculture as their primary occupation

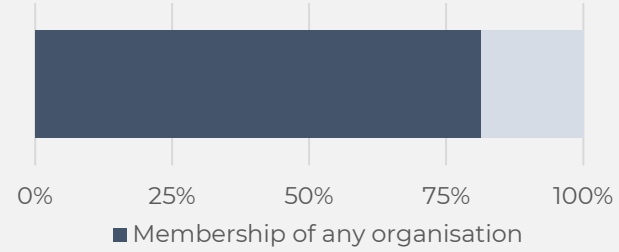
FINDINGS :

- ✓ Over 85% households have heads with low education levels (below higher secondary schooling levels)
- ✓ Over 50% households have more than 2 non-working members dependent on each working member in the household
- ✓ Household labour use in agriculture is low with most households having only a maximum of one member involved in farming activities

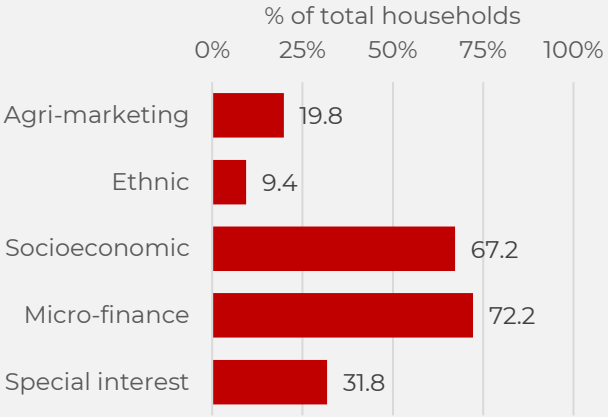
ADAPTIVE CAPACITY – SOCIAL CAPITAL

Figure 23. Membership of village/community organizations and groups

23a. MEMBERSHIP STATUS



23b. TYPE OF ORGANISATION/GROUP

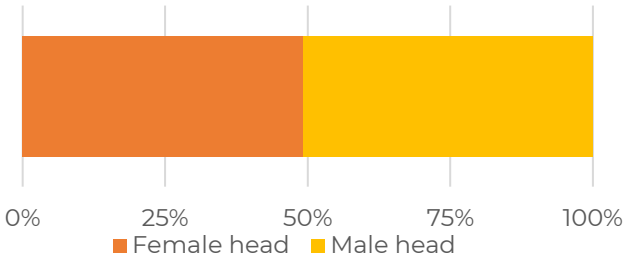


Note: The categorisation of organisation/group types include the following:

- Agri marketing - Farmer producer organization or collective (FPO/FPC); Agricultural, milk, or another co-operative
- Ethnic - Religious or social group or festival society; Caste association
- Socioeconomic - Youth club, sports group, or reading room; Development group/NGO
- Micro-finance - Self Help Group (Women Groups); Credit or savings group
- Special interest - Trade union, business, or professional group; Community forest user group; Farmer's union

Figure 24. Social category of household

23a. WOMEN-HEADED HOUSEHOLDS



23b. SOCIAL GROUP OF HOUSEHOLD

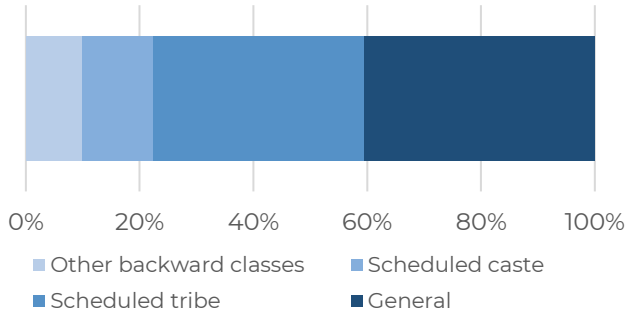
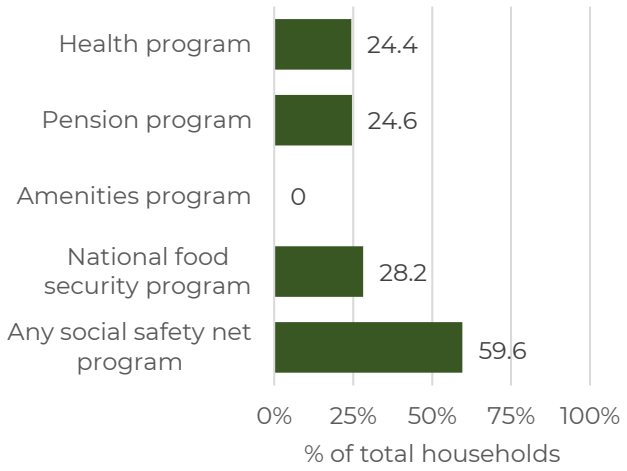


Figure 25. Access to government social safety nets



FINDINGS :

- ✓ Membership in community groups is high, with most households having access to microfinance and socioeconomic groups.
- ✓ Access to government safety nets is low with over 40% households having no access to any support.
- ✓ A low percentage of households are lower caste households. However, a substantial percentage of households belong to tribal communities.

ADAPTIVE CAPACITY – CLIMATE INFORMATION SERVICES

Figure 26. Access to weather forecast, technical advisory, and adoption

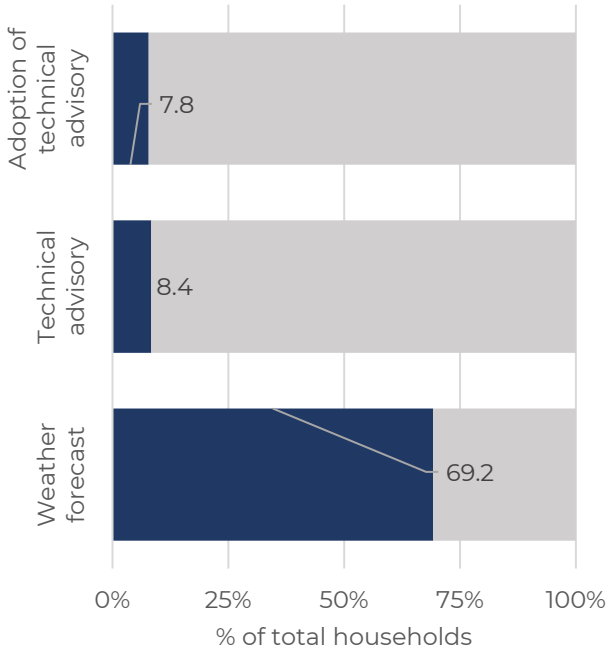


Figure 27. Source of weather information

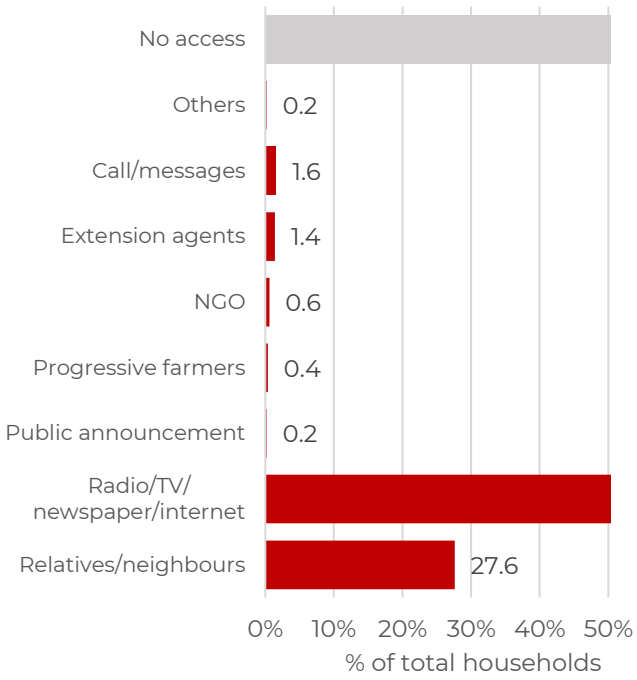
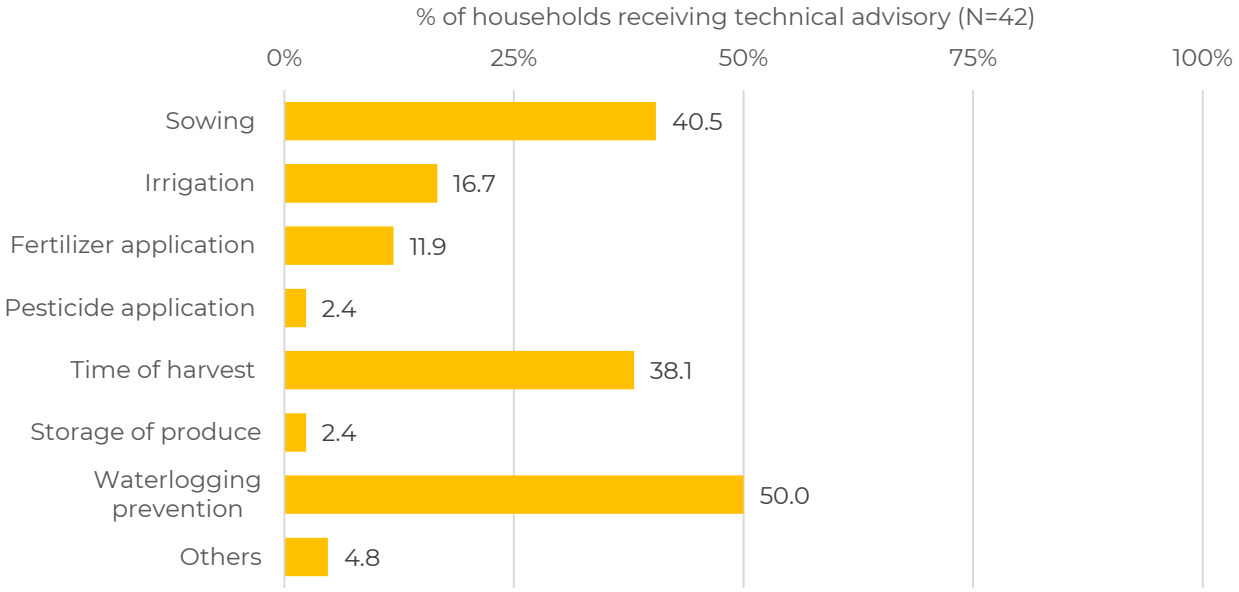


Figure 28. Subject of technical advisory based on weather forecast



FINDINGS :

- ✓ Almost 70% households access weather forecast information, but only a small percentage receive any technical advisory based on forecasts.
- ✓ Most weather forecast information are received from informal sources or popular media-based sources including relatives/neighbours and radio/TV/newspapers

69% of households receive weather forecasts through various sources, but only 8% of households receive technical advisories for agriculture based on weather forecasts

Photo credit: C. De Bode/CGIAR

KEY TAKEAWAYS

1. The overall experience of climate shocks is reported by more than 70% of the households in Banke. The perception of these shocks is closely tied to preparedness and sensitivity to them. Some essential elements of access to capital that could enhance adaptive capacity and reduce sensitivity to shocks in the district include:
   - Almost 80% households have access to land
   - Availability of both groundwater and surface water irrigation sources
   - Access to remittances as a major source of income allows for better risk management under climate shocks affecting agricultural incomes
   - High access to social capital through village/community organizations and groups
   - High access to formal credit sources
   - Moderately high ownership of agricultural/irrigation assets/water pumps

2. Over 60% of households are reporting impacts of shocks and 26.7% of these report severe impact for at least one of the shocks. These households require significant support to build adaptive capacities and reduce sensitivity to shocks. Some aspects of low capital access that could limit adaptive capacity of households are:
   - While irrigation is indeed an option in Banke, 30% of cultivating households have no access to irrigation and over 40% households report irrigation as a major challenge
   - While transport is accessible, most communities off main roads suffer from poor road quality
   - Almost 70% households access weather forecasts. Only 8.4% households receive technical advisories based on weather forecasts
   - Over 40% households have no access to social safety net policies
   - Households in Banke have low access to insurance for productive activities like cropping, livestock, poultry, fishing

KEY AREAS FOR ACTION: QUESTIONS TO CONSIDER

1. What kind of interventions can help support irrigation development and improved irrigation access?
2. What are the options to improve market access under poor road connectivity?
3. How can weather forecast services be integrated with associated technical advisories be improved?
4. How can insurance access be improved for productive purposes to offer better risk management coping response options? Is there potential for leveraging the private insurance sector?
5. Community-based collective and cooperative institutions are developed in the region. Can these be leveraged to offer social safety nets at local levels?
6. How do social inclusion and community structure influence adaptability to climate shocks? What social and community actions that play a protective role?

ANNEXURE: CONCEPT OF ADAPTIVE CAPACITY

ADAPTIVE CAPACITY |

Adaptive capacity is defined as "*The ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences*." In this data note, we present adaptive capacity through an assessment of access to different types of capital (Five Types of Capital Framework): natural capital, physical capital, financial capital, human capital, and social capital. These five types of capital form the basis of 'generic' adaptive capacity to a range of threats (Mortreux and Barnett 2017). In addition, because of the climate change focus of this brief, we emphasized access to climate information.

This framework is often used as the basis for adaptive capacity assessments. However, research initiatives employ different indicators depending on the particular context, level of assessment (household/local/sub-national/national), and availability of information, and different methods for prioritization of sub-indicators (Prabhakar and Srinivasan 2011, Siders 2018). Therefore, in this brief, the goal is not to produce a final set of sub-indicators, but to provide a picture of the access to each type of capital through several indicators that the TAFSSA local food systems assessment offers. Common indicators/groups of similar indicators were categorized based on a review of the literature on adaptive capacity assessments at the household scale and focused on the South Asia context.

FIVE CAPITALS FRAMEWORK FOR SUSTAINABLE LIVELIHOODS

The *sustainable livelihoods framework*, building on the work of Chambers and Conway (1992), provides a structure of 'five capitals' pentagon, access to which are linked to sustainability of livelihood outcomes in a vulnerability context. Mortreux and Barnett (2017) summarize their role in adaptation as:

" *Natural capital* - to provide the natural resources necessary to sustain a livelihood to adapt (such as land, water, and vegetation for farming practices)

Physical capital – to provide the necessary infrastructural support (such as roads and irrigation) and technological solutions to impacts·

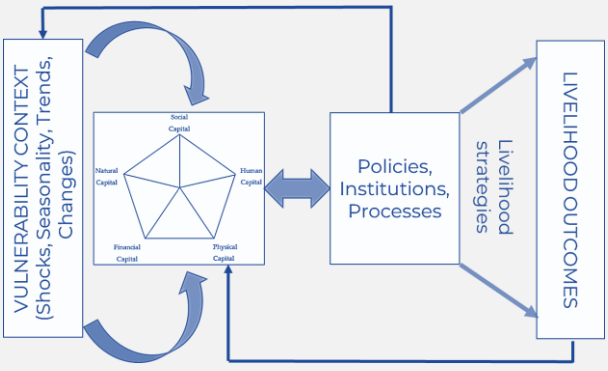
Financial capital - to pay for adaptation

Social capital - to provide the social bonds and networks to assist adaptation,

Human capital - to provide the physical and mental resources to adapt (education and health). **"**

- Mortreux and Barnett (2017:2)

SUSTAINABLE LIVELIHOODS FRAMEWORK



ANNEXURE: INDICATOR DOMAINS OF ADAPTIVE CAPACITY

Based on reviewed literature (Datta & Behera, 2022; Sardar et.al.2019; Brown et.al 2019; Maharjan et.al 2021; Khanal & Wilson 2019; Sam et.al 2019; Venus et.al 2022; Aryal et.al 2021; Devkota et.al 2021) we identified numerous household level variables that are used to represent the access to different capitals for the assessment of adaptive capacity in South Asia. These may be grouped under the following common and recurring indicator categories:

NATURAL CAPITAL
Land size
Type of land ownership
Land/soil quality/fertility
Cultivated area
Irrigation/water resources

PHYSICAL CAPITAL
Type of irrigation
Road access
Distance to markets
Household asset ownership
Agricultural equipment
Livestock ownership

FINANCIAL CAPITAL
Income source diversification
Access to credit/insurance
Total income/Household expenditure

HUMAN CAPITAL
Farming experience/Family labour
Education level
Health access
Dependency ratio/working members
Age of Household head

SOCIAL CAPITAL
Membership/leadership in networks/groups
Dependence on family and friends
Access to government/NGO/market services and support
Social category of Household (gender, caste)
Training access and information

CLIMATE SPECIFIC KNOWLEDGE AND INFORMATION
Belief/perception of climate change
Access to information about climate change and weather forecast
Access to extension/training

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ABOUT TAFSSA

TAFSSA (Transforming Agrifood Systems in South Asia) is a CGIAR Regional Integrated Initiative that supports actions improving equitable access to sustainable healthy diets, that boosts farmers' livelihoods and resilience, and that conserves land, air, and water resources in a climate crisis..

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