



# Climate adaptation in Surkhet, Nepal

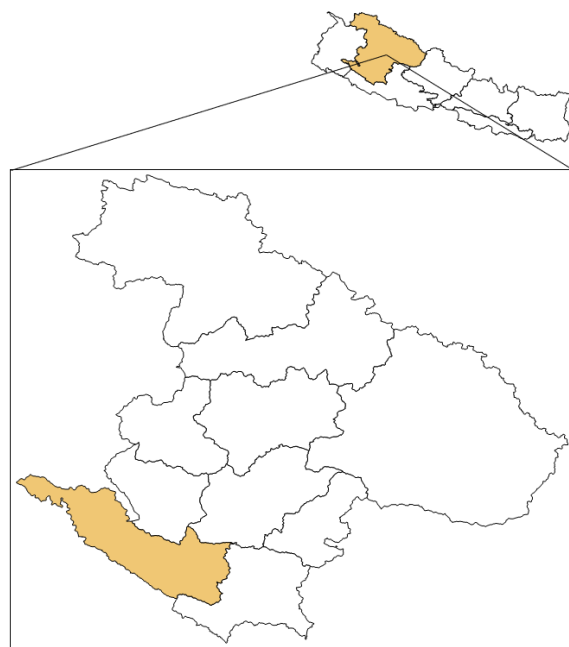
*Climate shocks, impacts,  
responses, and adaptive  
capacity of local food systems*

Data Note 14

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 climate 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 Surkhet, Nepal**



**Figure 2. Highlights from this brief**



**55.6%**

households  
report impacts  
from climate  
shocks in past 2  
years



**33.1%**

of impacted  
households  
adopt response  
strategies to  
climate shocks



**53.2%**

households  
access weather  
forecast  
information



**20.4%**

households do  
not own any land



**68.3%**

of cultivating  
households have  
access to  
irrigation

## 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

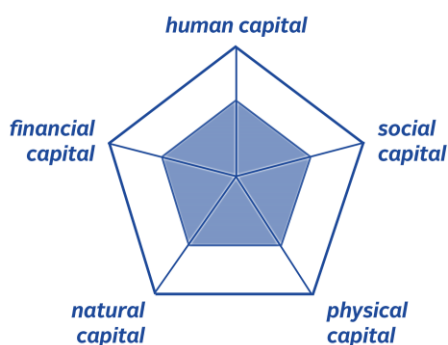
**Human capital** - the physical and mental resources to adapt

- Mortreux and Barnett (2017)

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 been included.

### FIVE CAPITALS FRAMEWORK



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# DISTRICT CLIMATE AND RESOURCE PROFILE

**Table 1. Village resource regime**

Sample villages (N)	25
<b>LAND</b>	<b>%</b>
Villages reporting land conversion -	
• From agriculture to built-up area	52
• From forest/water-body to agriculture	4
Villages reporting soil texture -	
• Sandy (light soil)	60
• Loamy and silt (medium soil)	64
• Clay (heavy soil)	88
<b>WATER</b>	<b>%</b>
Villages reporting decline in groundwater level over last 5 years	76
Villages reporting water quality issues:	
• Iron	24
• Salinity	4
Predominant source of agricultural water:	
• Groundwater	20
• Surface water	60
• Rainfed	20
Energy source for irrigation in village	
• >50% irrigation pumps in village run by diesel	12
• >50% irrigation pumps in village run by electric	32
• Villages with use of Solar pumps	8
<b>COMMON PROPERTY RESOURCES</b>	<b>%</b>
Villages with community ponds	36
Villages with community forest	88
Villages with pasture/grazing lands	28

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

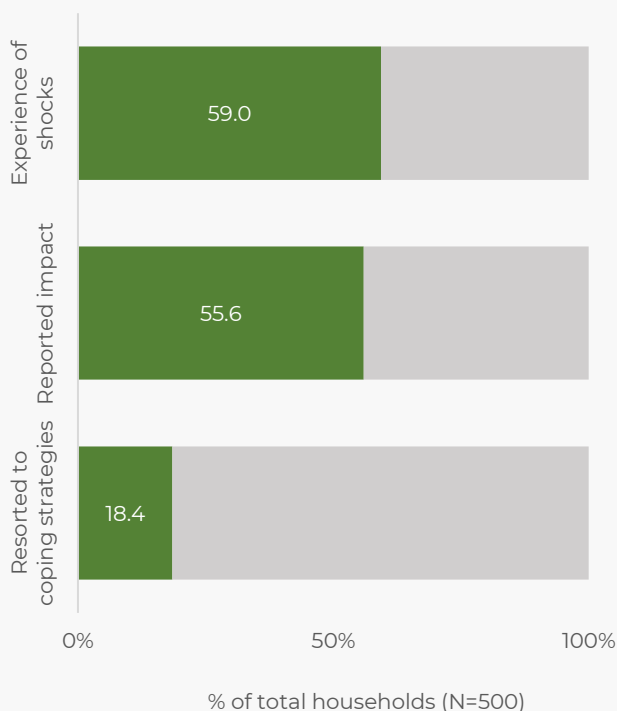
**Table 2. Household characteristics**

<b>TOTAL HOUSEHOLDS (N)</b>	<b>500</b>
Owning land %	80
Operating land %	81
Cultivating crops %	81
Irrigating land %	55
Reporting experience of shocks %	59
Main source of income	
• Crop cultivation, %	34
• Business, %	10
• Wages, %	10

## 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 2 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:

- ✓ A total of 59% of households have reported experiencing some form of climate shock.
- ✓ However, only 33.1% of the impacted households have reported resorting to response strategies to cope with and adapt to these shocks, representing 18.4% of the total sample households.

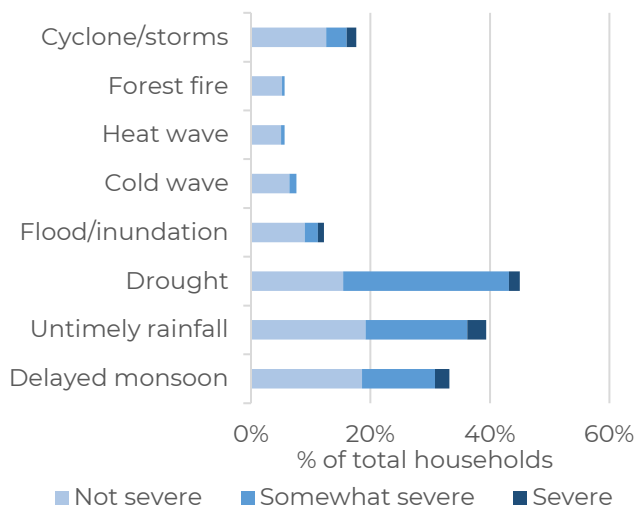




56% of households report impacts from climate shocks in past 2 years; 18% of households report adoption of specific coping and adaptation strategies

# EXPERIENCE AND IMPACT OF CLIMATE SHOCKS

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

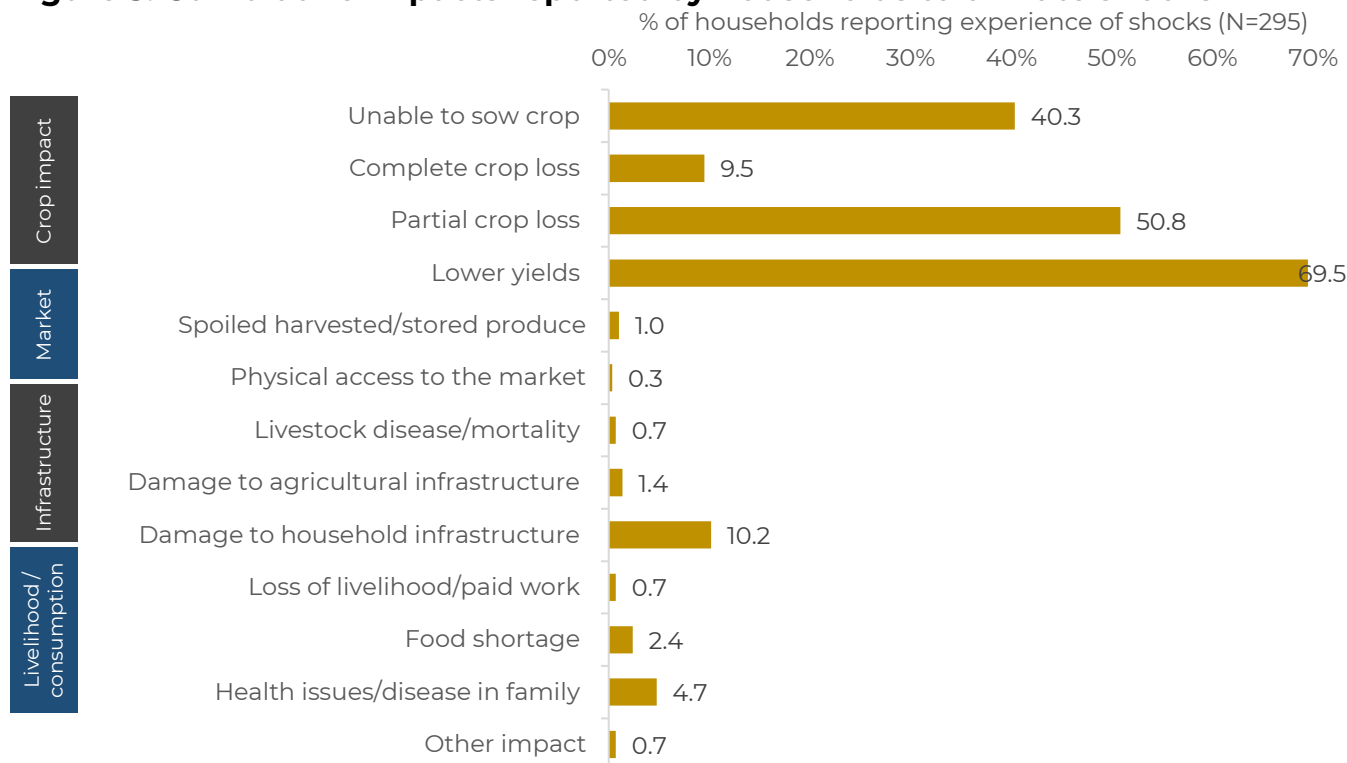


## IMPACTS AND RESPONSE |

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 of the shocks experienced by that household.

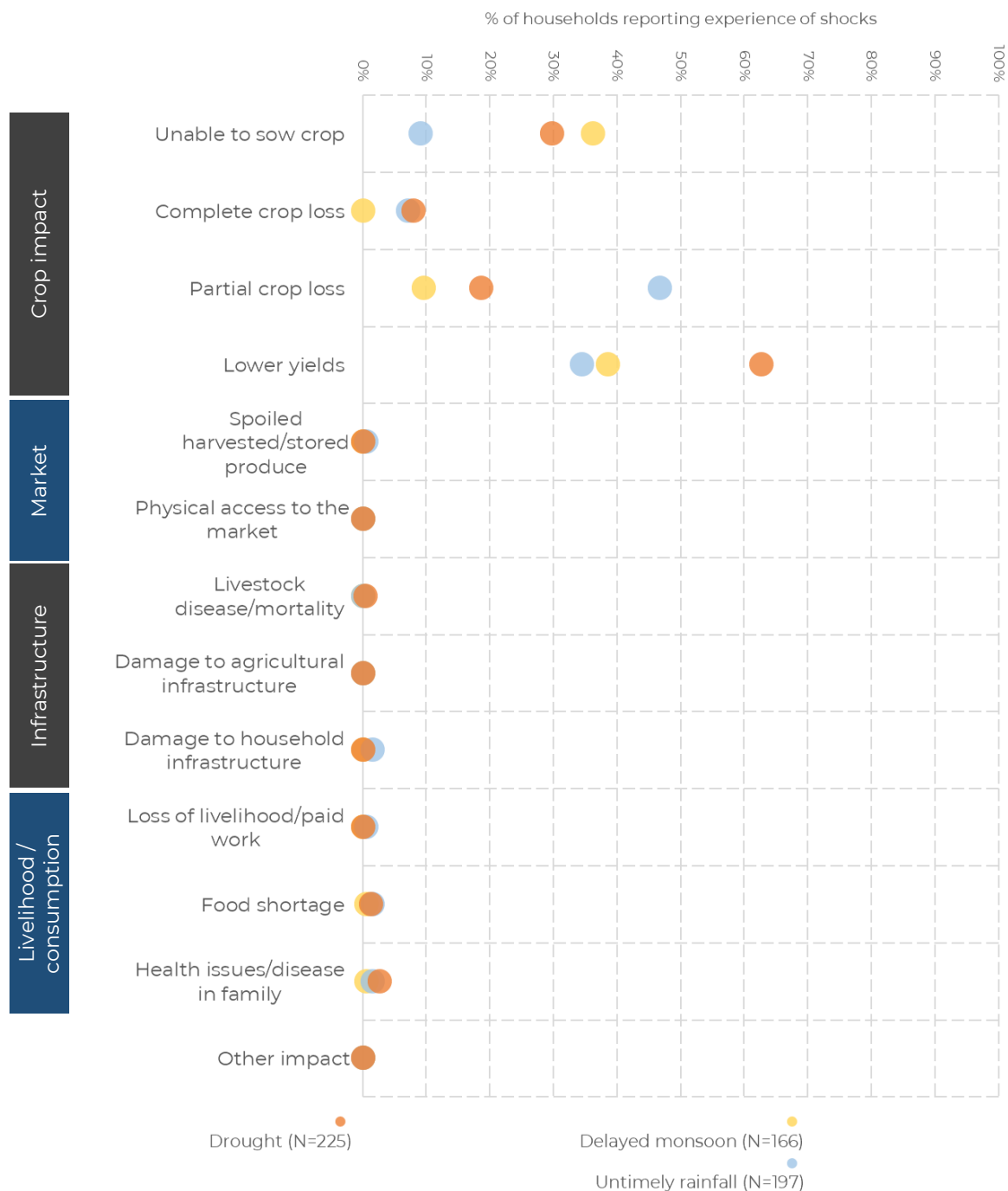
**Figure 5. Cumulative impacts reported by households to climate shocks**



## FINDINGS:

- ✓ In the past two years, the most commonly experienced shocks in Surkhet were related to precipitation uncertainties, including severe storms. Partial crop loss and lower crop yields were common.
- ✓ Additionally, the inability to sow crops and damage to infrastructure were significant impacts reported by the affected households.

**Figure 6. Impacts reported by households under different climate shocks (top 3 shocks by percentage of households experiencing shock)**



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

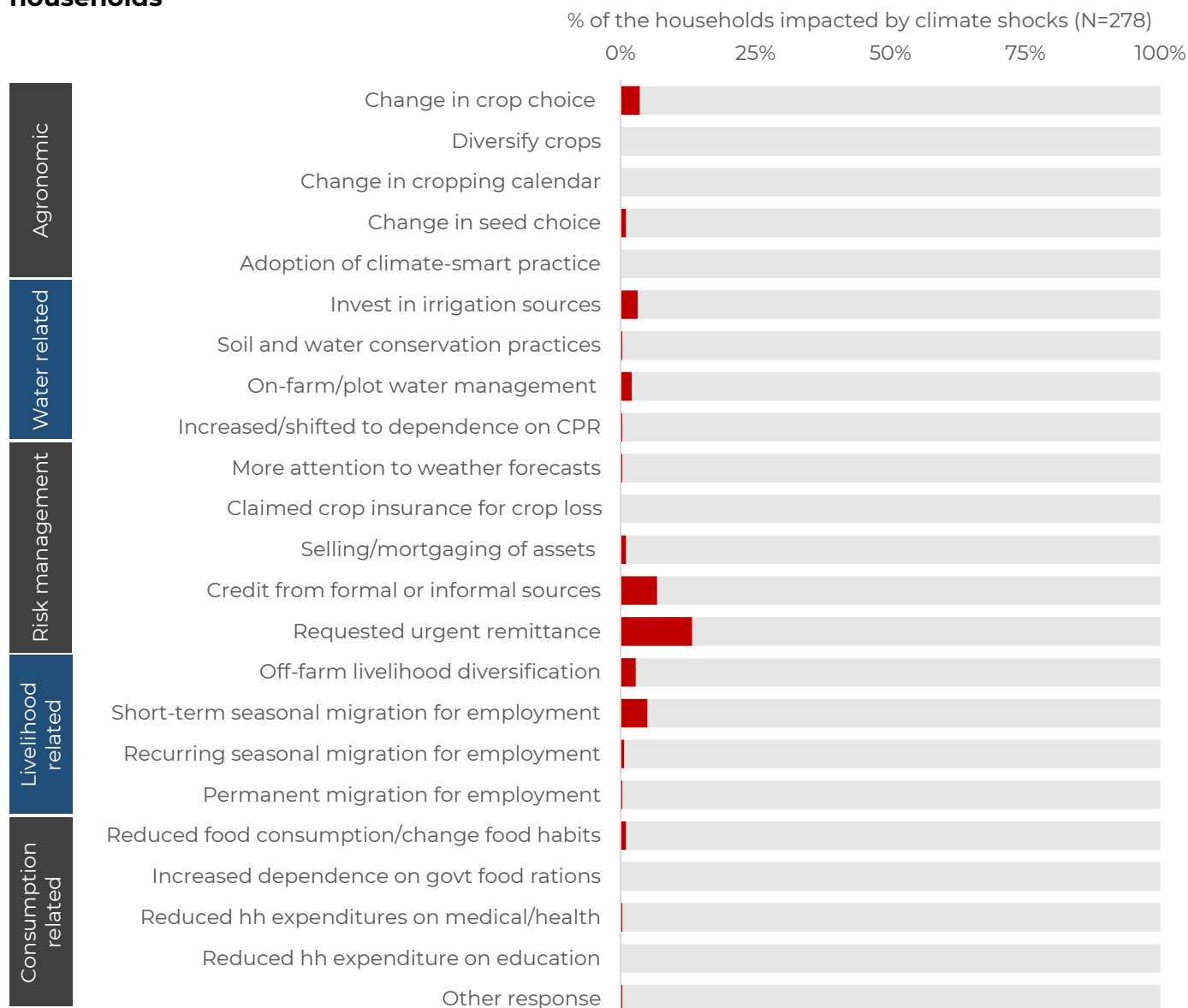
## FINDINGS :

- ✓ Crop-related impacts are the most reported outcomes for climate shocks in Surkhet.
- ✓ The nature of these crop-related impacts varies depending on the type of shock.
- ✓ Crop loss was frequently reported under untimely rainfall, while issues related to yield and the inability to sow crops are associated with delayed monsoons and droughts.



# 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

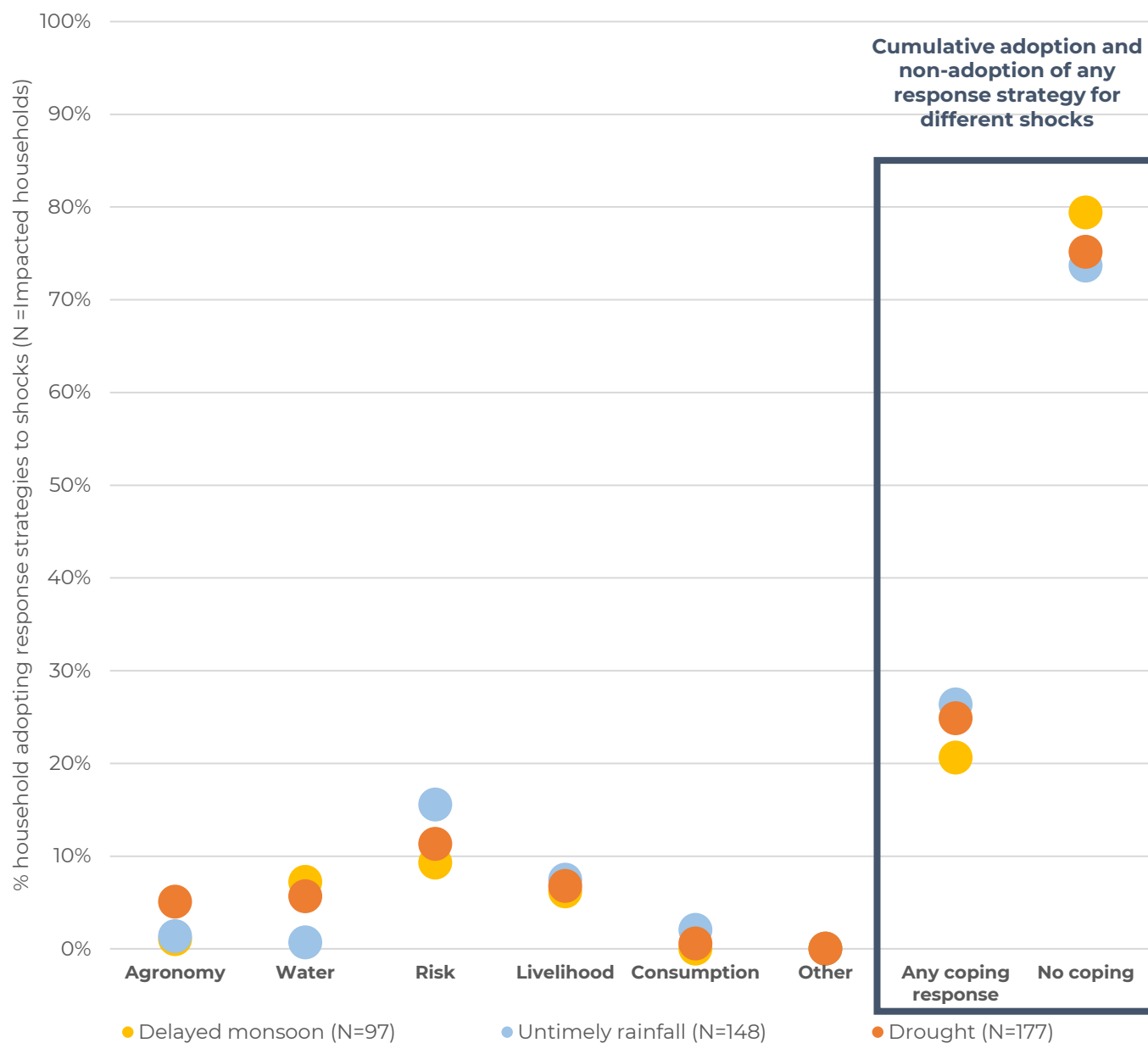
The coping strategies may reflect broader groups of strategies which were highlighted in the questionnaire as examples

- 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 :

- ✓ Short-term, urgent responses like availing available credit, remittances, and off-farm employment are commonly adaptation strategies reported by households.
- ✓ Around 33% of impacted households utilize these and other climate shock response mechanisms

**Figure 8. Response strategies to climate shocks reported by households under different climate shocks (top 3 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 wave, heat wave, flood/inundation have not been included in this list since percentage of households reporting experience of these shocks are below 30% of households reporting any experience of a shock.

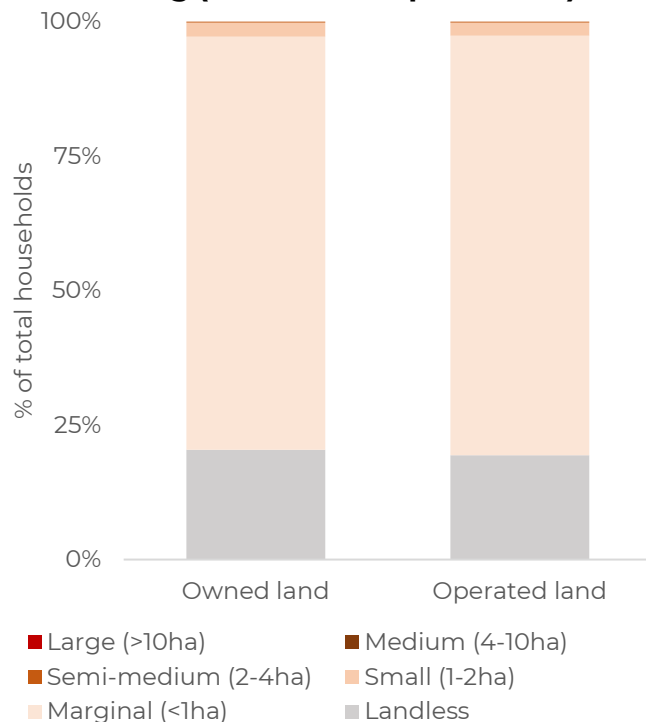
### FINDINGS :

- ✓ Although crop-related impacts were the most commonly reported outcomes from climate shocks, coping responses tend to focus on short-term risk management.
- ✓ Households affected by droughts and delayed monsoons often adopt farm-level agronomic and agricultural water-related responses, whereas impacts of untimely rainfall appears to lead to a higher prevalence of short-term risk management responses.

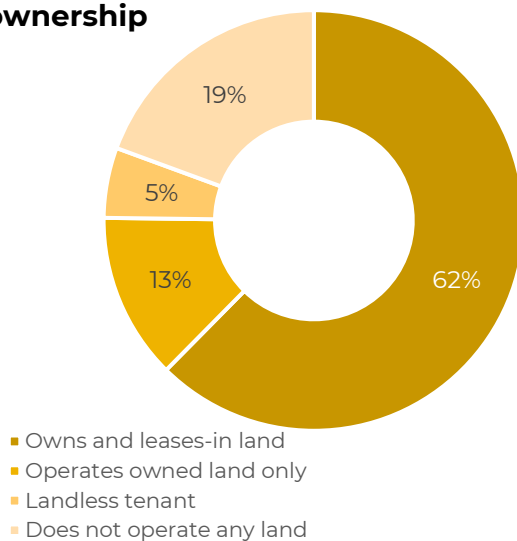


## ADAPTIVE CAPACITY – NATURAL CAPITAL

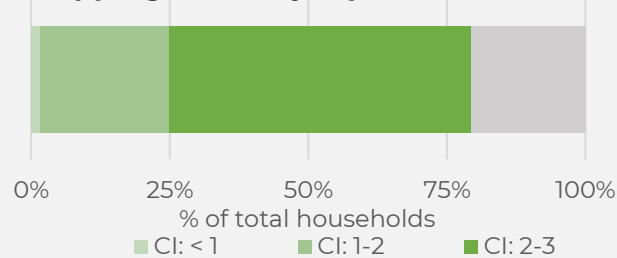
**Figure 9. Land access by size of landholding (owned and operational)**



**Figure 10. Access to land by type of ownership**

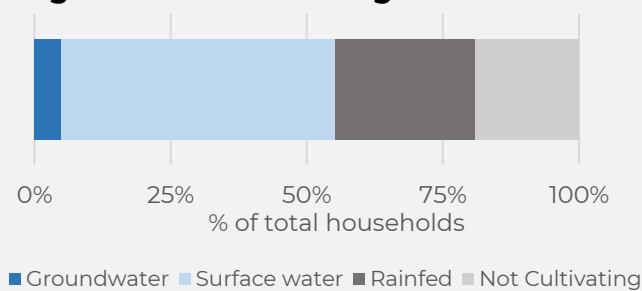


**Figure 11. Cultivated land by farm cropping intensity reported**



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

**Figure 12. Access to irrigation**



**Table 3. Water insecurity**

IRRIGATION WATER		% of cultivating households
Cultivating land but not irrigating		32.5
Reporting labor scarcity for irrigation		5.2
Reporting poor access to irrigation among their two most important challenges in agriculture		49.0
HOUSEHOLD WATER		% of total households
Reporting worry about not having enough water for all household needs ( <i>sometimes/often/always</i> )*		21.8
Reporting worry about having to change schedules/plans because of problems with water situation ( <i>sometimes/often/always</i> )*		10.2

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

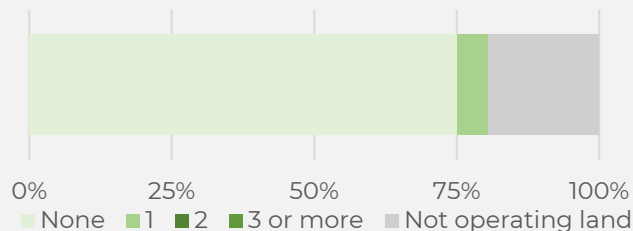
### FINDINGS :

- ✓ In Surkhhet, the incidence of landlessness is relatively low at 19%, and tenancy stands at 5%.
- ✓ Over 30% of land-operating households lack access to irrigation, and 49% of households consider irrigation access as a major agricultural challenge. Where farmers are able to access water, the primary source of irrigation in the district is surface water and/or springs, which are seasonal and difficult to reliably access.
- ✓ 20% of households report concerns regarding the adequacy of household water for all domestic purposes.

## ADAPTIVE CAPACITY – PHYSICAL CAPITAL

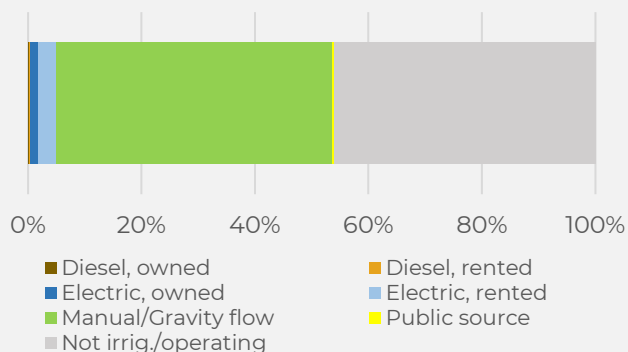
**Figure 13. Ownership of productive assets**

### 13a. AGRICULTURAL EQUIPMENT

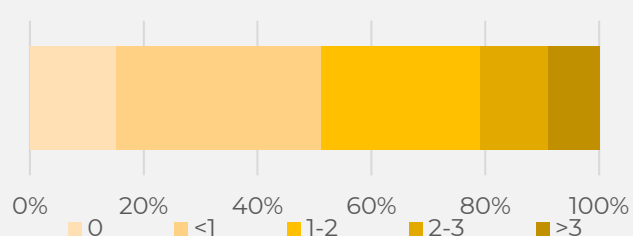


Note: The legend categories show how many types of key agricultural machines are owned by the household among the following: 2-wheel tractor / 4-wheel tractor with rotavator / 4-wheel tractor with cultivator / Thresher / Combine harvester / zero tillage/seed drill with 4-wheel tractor / Potato transplanter

### 13b. IRRIGATION ENERGY SOURCES

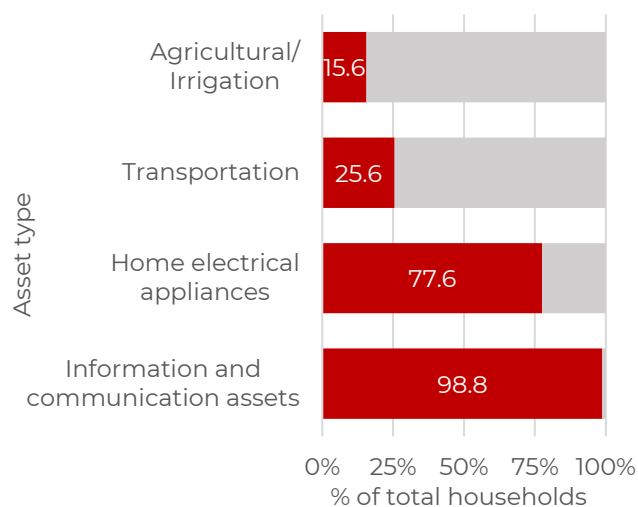


### 13c. LIVESTOCK UNITS



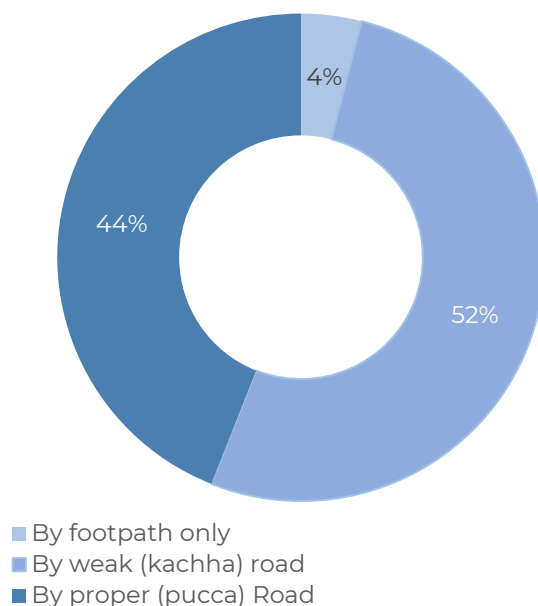
Note: Livestock Units - an 'exchange ratio' among livestock species and obtained by converting the body weight into the metabolic weight, which is multiplied by the units of animals owned by the household (Chilonda and Otte, 2006; FAOSTAT, 2022). Cow in USA is used as the reference species

**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**



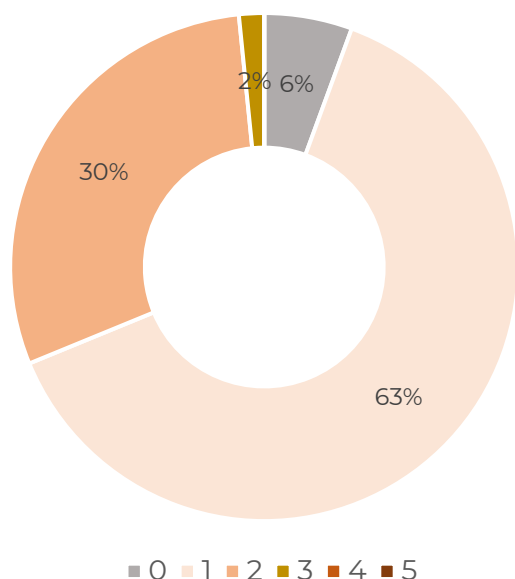
Note: The chart presents % of households in villages with access to different types of roads

## FINDINGS :

- ✓ Ownership of agricultural and irrigation assets is very low
- ✓ 85% households own livestock which can provide some income
- ✓ - Limited physical access is a significant challenge, with a very low ownership of transport assets and over 60% of households residing in villages without proper road access.

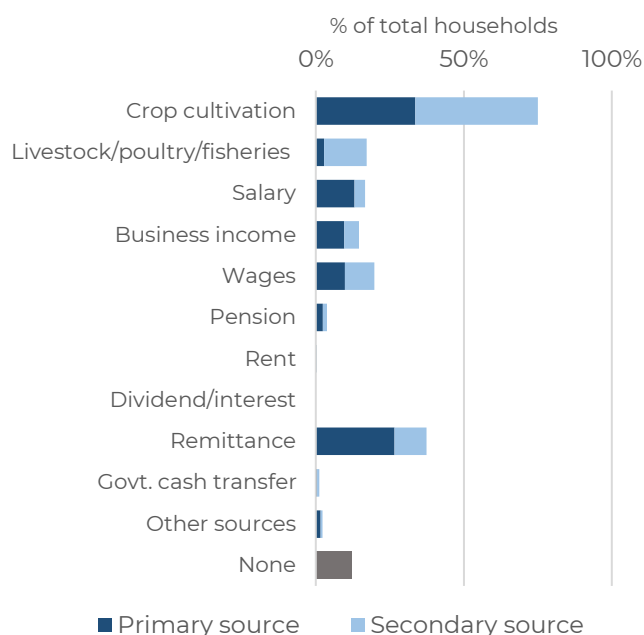
## ADAPTIVE CAPACITY – FINANCIAL CAPITAL

**Figure 16. Household occupational/livelihood diversity**

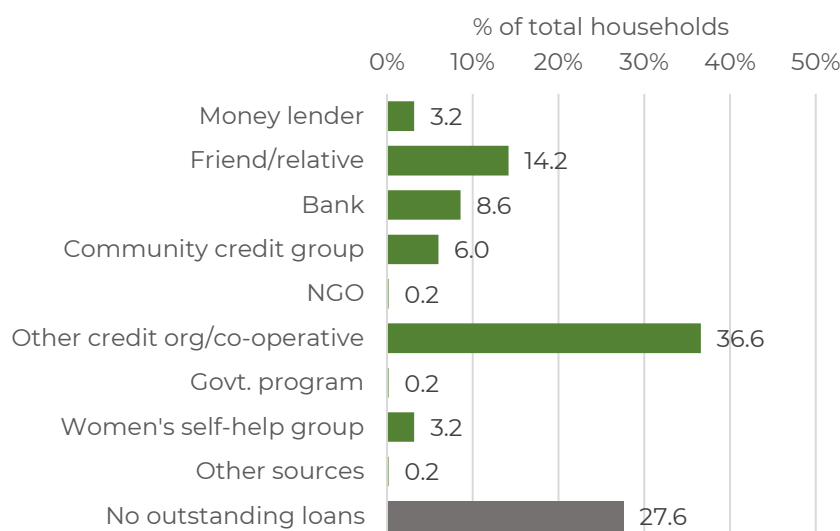


Note: Number of different **primary** occupations (longest time spent during last 365 days) household members are involved in

**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**

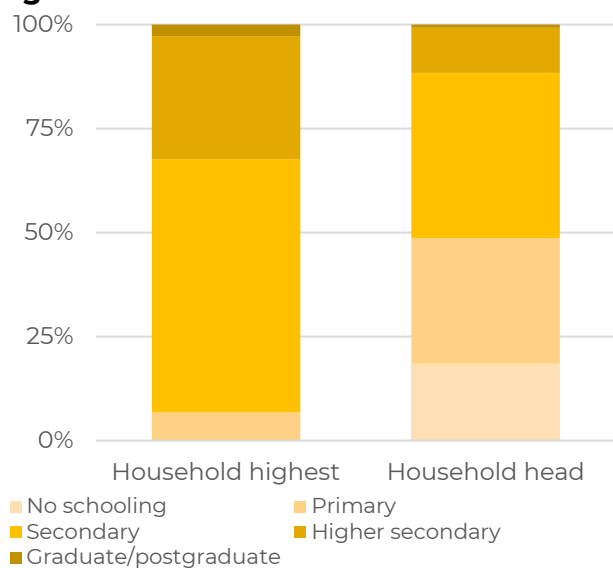
	% hhs
Bank account	76.2
Kisan credit card	0.0
Life insurance	21.6
Crop insurance	0.8
Livestock/poultry/fish insurance	4.0
Health insurance	18.0

### FINDINGS :

- ✓ More than 60% of households exhibit low occupational diversity, with 6% having no primary occupation, and over 63% relying solely on a single primary occupation.
- ✓ Remittances play a crucial role as the primary source of household income, nearly equal to income from crop cultivation.
- ✓ Informal and collective credit sources, such as cooperatives, friends, and relatives, are the most commonly accessed means for obtaining loans.
- ✓ Access to insurance services for productive purposes is very limited in Surkhet.

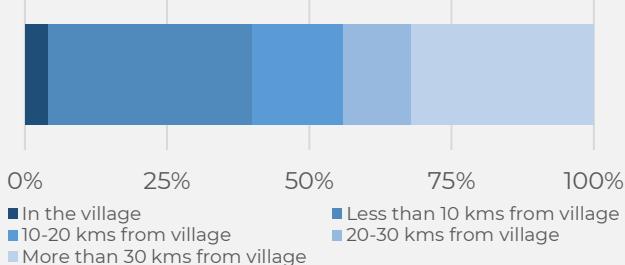
## ADAPTIVE CAPACITY – HUMAN CAPITAL

**Figure 19. Education level of household**

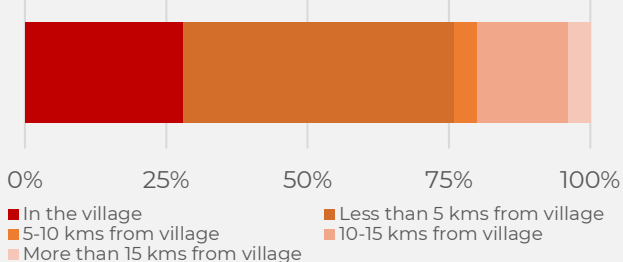


**Figure 20. Access to health facilities**

### 20a. DISTANCE TO GOVERNMENT HOSPITAL

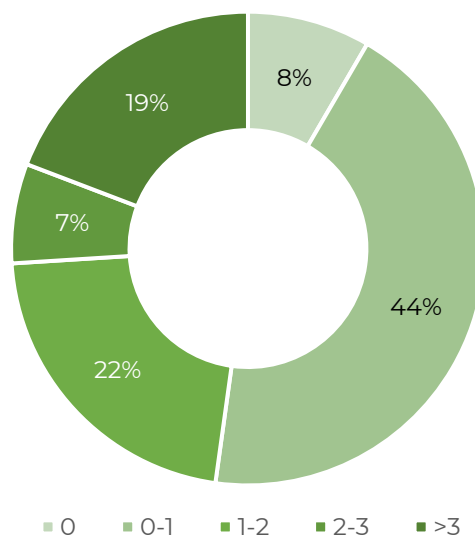


### 20b. DISTANCE TO PRIMARY HEALTH CENTRE



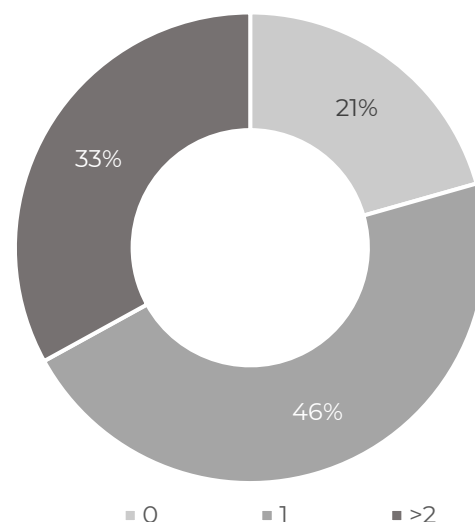
Note: The two charts present % of households in the villages in different distance categories from nearest hospital/PHC

**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

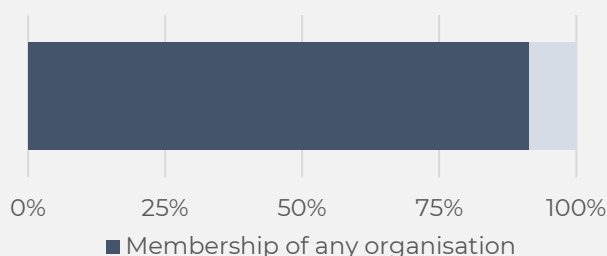
## FINDINGS :

- ✓ More than 85% of households have heads with education levels below higher secondary schooling.
- ✓ Over 50% of households have a low dependency on working members within the household (upto 1 non-working member per working member)
- ✓ Household labour use in agriculture is limited, with most households having a maximum of only one member involved in agricultural activities.

## ADAPTIVE CAPACITY – SOCIAL CAPITAL

**Figure 23. Membership of village/community organizations and groups**

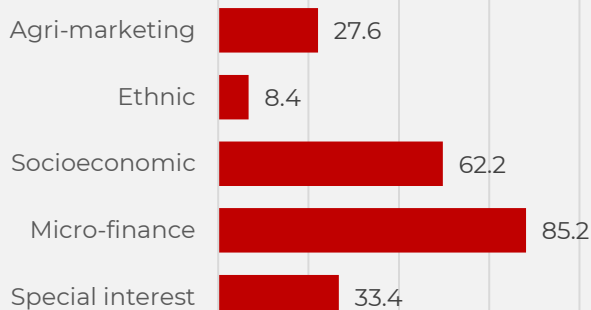
### 23a. MEMBERSHIP STATUS



### 23b. TYPE OF ORGANISATION/GROUP

% of total households

0% 25% 50% 75% 100%

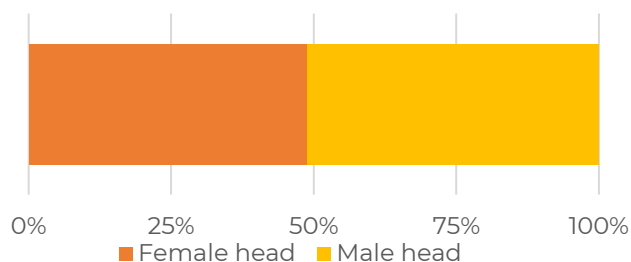


Note: The categorisation of organisation/group types include the following:

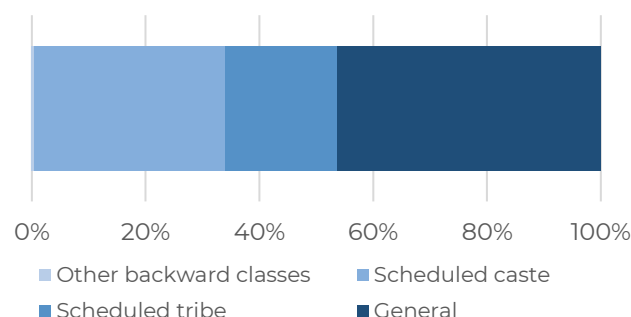
- Agri marketing - Farmer producer organization or collective (FPO/FPC); Agricultural, milk, or another co-operative
- Ethnic - Religious or social group or festival society; Caste association
- Socioeconomic - Youth club, sports group, or reading room; Development group/NGO
- Micro-finance - Self Help 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**

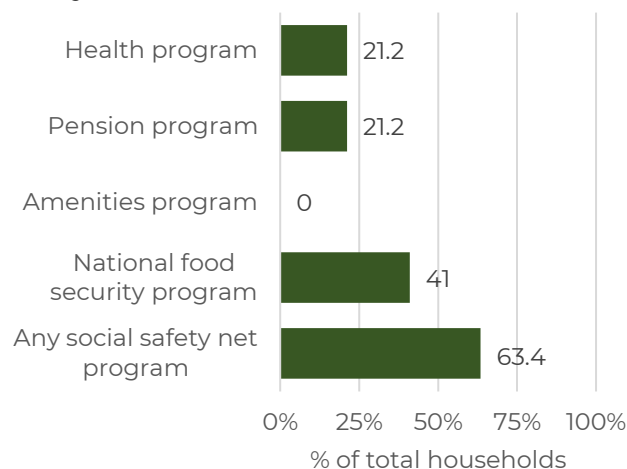
### 23a. WOMEN-HEADED HOUSEHOLDS



### 23b. SOCIAL GROUP OF HOUSEHOLD



**Figure 25. Access to government social safety nets**



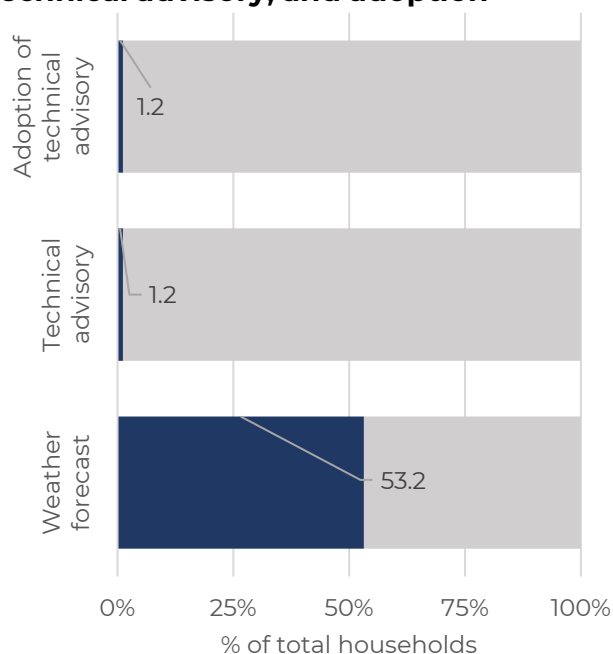
## FINDINGS :

- ✓ Membership in community groups is widespread, primarily in microfinance and other socioeconomic groups.
- ✓ Approximately half of the households in Surkhet belong to marginalized communities.
- ✓ Access to government support is relatively limited, particularly for programs other than food security initiatives.

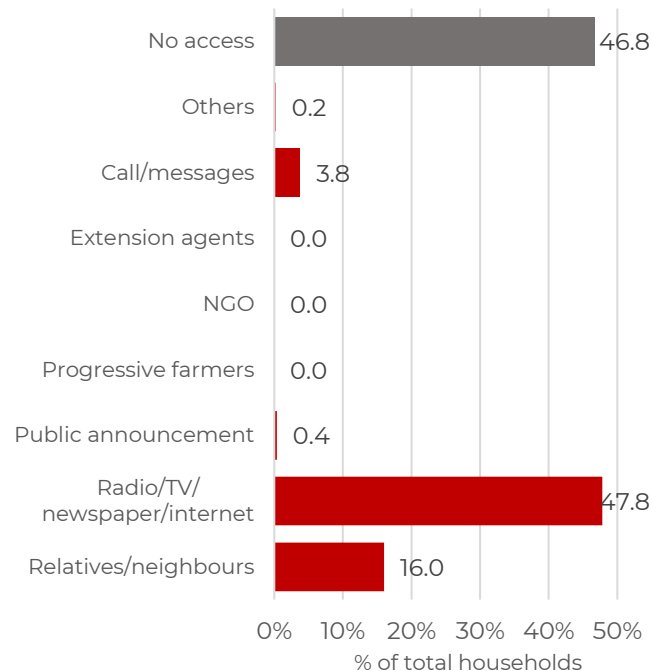


## ADAPTIVE CAPACITY – CLIMATE INFORMATION SERVICES

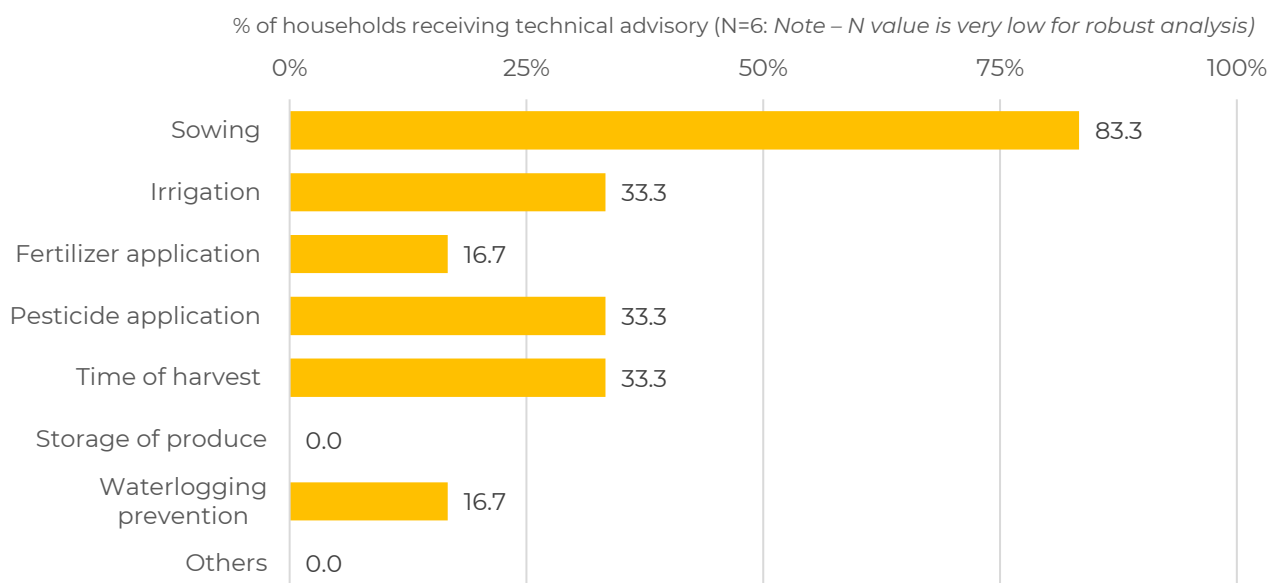
**Figure 26. Access to weather forecast, technical advisory, and adoption**



**Figure 27. Source of weather information**



**Figure 28. Subject of technical advisory based on weather forecast**



### FINDINGS :

- ✓ More than 50% of households access weather forecast information, but there is virtually no access to technical advisories to improve farm or livelihood management based on these forecasts.
- ✓ The majority of weather forecast information is obtained from informal sources or popular media-based sources, including relatives, neighbours, and radio, TV, and newspapers.



52% of households receive weather forecasts through various sources, but only 1% of households receive technical advisories for agriculture based on weather forecasts





## KEY TAKEAWAYS

1. Surkhet experiences climate shocks affecting more than half of its households, with the perception of these shocks being closely associated with the level of preparedness and sensitivity to them. It is noteworthy that certain aspects of capital access could play a crucial role in enhancing adaptive capacity and reducing sensitivity to these climate shocks within the district:
  - Almost 80% households have access to land
  - High cropping intensity of cultivated land
  - Low working members dependency rate
  - 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 collective (community, cooperative) credit organizations
2. Approximately 55.6% of households in the district have reported experiencing climate shocks, with 9.8% of them facing severe impacts from at least one of these shocks. These findings underscore the importance of implementing programs aimed at strengthening the adaptive capacities of these households and mitigating their vulnerability to such shocks. It is essential to recognize that the limited access to capital resources could play a significant role in constraining the adaptive capacity of these households:
  - Low and constrained access to irrigation for over 40% households
  - Very low ownership of agricultural/irrigation assets
  - Physical access is a major limitation with extremely low ownership of transport assets and poor road connectivity for most villages
  - 53% households access weather forecasts but only 1.2% households receiving technical advisories based on weather forecasts
  - Almost 40% households have no access to social safety net policies
  - Very low access to insurance for productive activities like cropping, livestock, poultry, fishing

## KEY AREAS FOR ACTION: QUESTIONS FOR CONSIDERATION

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 and transport limitations?
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.

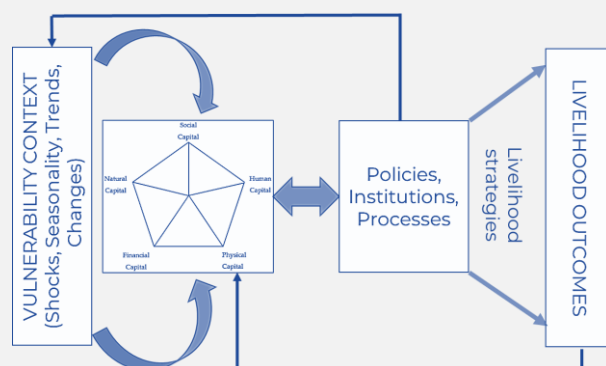
**Financial capital** - to pay for adaptation

**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 pp 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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