Data Article

Survey data on climate change adaptation and barriers to adoption among smallholder farmers in Nepal

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The dataset presents the raw data collected through household surveys of smallholder farmers on adaptation to climatic variabilities and change in Sudurpaschim Pradesh (Far Western Province), Nepal. The dataset comprises farmers’ responses on the likely determinants of adaptation decisions, actual uptake of adaptation measures, and the barriers to adaptation. We collected the data by conducting face-to-face interviews of 327 farmers using structured questionnaires in all nine districts representing the Mountain, Hill, and Terai agroecosystems in the province. We employed a stratified random sampling technique to recruit participants and interviewed them during December 2019 and March 2020. The interview methodology was approved by the Human Ethics Review Committee at Deakin University, Australia. The dataset is important for understanding the drivers of climate change adaptation and the barriers to adaptation to enhance the resilience of smallholder agriculture in far-western Nepal and can inform climate change adaptation strategies for the region and for the smallholder agroecosystems more broadly. The data are provided with this article.

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Specifications Table

Subject: Environmental Sciences
Specific subject area: Resilience and climate change adaptation in smallholder agriculture
Type of data: Categorical and numerical data presented in tables and figures
How data were acquired: Data were acquired through face-to-face interviews of smallholder farmers using a structured questionnaire in the Nepali language. The questionnaire is provided as a supplementary file.
Data format: Raw, Analysed
Parameters for data collection: The data were obtained from nine districts of the Sudurpaschim Pradesh, Nepal. 327 smallholder farmers were recruited from each district for a face-to-face interview that satisfied the following eligibility criteria: (a) willingness to participate, (b) have at least five years of farming experience, and (c) be aged >18 years.
Description of data collection: Data were collected from a household survey using structured questionnaires in Sudurpaschim Pradesh, Nepal. Questionnaire was developed and administered in Nepali language. Given lower level of literacy among farmers in the study area, face-to-face interviews were conducted by researchers and a trained surveyor with extensive socio-ecological understanding of the study area.
Data source location: Sudurpaschim Pradesh, Nepal. The province extends between 28°30′–30°03′ N Latitude and 80°03′–81°25′ E Longitude (Fig. 1) that encompasses the Mountain, Hill and Terai agroecosystems.
Data accessibility: With the article

Value of the Data

• The dataset is important to understand smallholder farmers’ adaptation to climatic variabilities and adaptation barriers in the socio-ecologically heterogeneous agroecosystem of far-western Nepal.
• The dataset benefits stakeholders such as policymakers and practitioners in government and non-governmental organisations as it offers a detailed account of farmer’s perception, barriers, and adaptation decisions that could be used in developing programs and inform strategies for enhancing adaptation and resilience in smallholder agriculture both at local and regional levels.
• The dataset may be used for a comparative assessment of adaptation, including the knowledge and perception of farmers, across heterogeneous smallholder agroecosystems. In addition, the dataset may be used to evaluate the adaptation policy effectiveness in the future as the dataset may form a baseline for longitudinal adaptation research in smallholder agriculture.
• Beyond climate change adaptation, with smallholder agriculture being the economic mainstay of the study area, the dataset could be relevant for various other purposes, including local/regional planning, community development and livelihood promotion programmes and research at local and regional levels.
1. Data Description

The dataset contains the responses of 327 smallholder farmers in Far Western Province, Nepal, collected through face-to-face interviews (Table 1, Fig. 1). Smallholder agriculture is the province's mainstay and engages a significant proportion of the population in the sector [1,2]. Climate change is evident and has already impacted smallholder agriculture in the province [3]. Most of the districts in the province are chronically food insecure [4], and climatic change has further exacerbated food insecurity [5]. This dataset captures farmers' resilience, adaptation, and barriers to climate change adaptation in smallholder agriculture in the province and could inform adaptation policy.

The dataset contains: (a) Socio-economic and demographic characteristics, (b) Smallholder farm characteristics, (c) Smallholder farm management practices, (d) Farmers perceptions on climatic impacts/risk and its management, and (e) adoption of climate change adaptation measures and barriers to adoption.

Table 1
Interviewees recruited for the survey in the study area. Interviewees were recruited from the Mountain, Hill and Terai agroecosystems in the study area.

| Study area                     | Agroecosystem | Number of interviewees | Proportion (%) |
|--------------------------------|---------------|------------------------|---------------|
| Far Western Province, Nepal    | Mountain      | 100                    | 30.58         |
| (Fig. 1)                       | Hill          | 148                    | 45.26         |
|                                | Terai         | 79                     | 24.16         |

Fig. 1. Study area, sampling locations, and the sample size. Respondents were recruited from the Mountain, Hill, and Terai agroecosystems.
1.1. Socio-economic and demographic characteristics

The socio-economic characteristics of the respondents and the household were collected using multiple-choice questions, and they include characteristics including gender (sex), age, education, training, and the household income (Fig. 2). Data are provided as a supplementary file.

![Fig. 2. Socio-demographic characteristics of the respondents in the survey.](image)

1.2. Smallholder farm characteristics

Attributes, including the farm size, crops grown, affiliations, income, and agricultural markets characterising the study participants was collected using multiple-choice responses and is presented in Table 2. Data are provided as a supplementary file.
### Table 2
Smallholder characteristics \((n = 327)\).

| Characteristics                              | Category          | Frequency | Proportion (%) |
|----------------------------------------------|-------------------|-----------|----------------|
| Farm size                                    | \(< 0.5 \text{ ha}\) | 194       | 59.33          |
|                                              | \(0.5 - 1.0 \text{ ha}\) | 83        | 25.38          |
|                                              | \(1.0 - 1.5 \text{ ha}\) | 35        | 10.70          |
|                                              | \(1.5 - 2.0 \text{ ha}\) | 12        | 3.67           |
|                                              | \(> 2 \text{ ha}\) | 3         | 0.92           |
| Households growing crops                     | Rice              | 314       | 96.02          |
|                                              | Wheat             | 323       | 98.78          |
|                                              | Maize             | 229       | 70.03          |
| Farming experience                           | Less than 10 years| 21        | 6.42           |
|                                              | More than 10 years| 306       | 93.58          |
| Land ownership (tenure)                      | Outright ownership| 165       | 50.46          |
|                                              | Partly            | 126       | 38.53          |
|                                              | None              | 36        | 11.00          |
| Food sufficiency from smallholder            | Suffice          | 175       | 52.52          |
|                                              | Insufficient      | 152       | 46.58          |
| Sell cereal crop production                  | Sell production   | 86        | 26.30          |
|                                              | Self-consumption  | 241       | 73.70          |
| Production of cash crop                     | Produce cash crops| 100       | 30.58          |
|                                              | Do not produce cash crop | 227 | 69.42 |
| Cash generation from livestock               | Yes              | 89        | 13.46          |
|                                              | No               | 238       | 86.54          |
| Off-farm income                              | Yes              | 245       | 74.92          |
|                                              | No               | 82        | 25.08          |
| Investment of off-farm income in agriculture | Yes              | 114       | 46.53          |
|                                              | No               | 131       | 53.47          |
| Market distance                              | \(< 5 \text{ km}\) | 64        | 19.57          |
|                                              | \(5 - 10 \text{ km}\) | 147       | 44.95          |
|                                              | \(> 10 \text{ km}\) | 116       | 35.47          |
| Cooperative group membership                | Yes              | 74        | 22.63          |
|                                              | No               | 253       | 77.37          |
| Farmers’ group membership                   | Yes              | 111       | 33.45          |
|                                              | No               | 216       | 66.55          |
| Labour intensiveness                         | Labour intensive | 251       | 76.76          |
|                                              | Labour + machinery| 76        | 23.24          |

### 1.3. Smallholder farm management

This section presents the farmers’ responses associated with irrigation, fertilisation, and selection of the crop varieties in smallholder agriculture. Tables 3 and 4 present data on irrigation frequency in rice, wheat and maize, and irrigation coverage in smallholdings. Irrigation systems in the study area are dependent upon monsoon rainfall [6]. Table 5 reports the dependency of irrigation systems on monsoon rainfall. Table 6 presents the use of soil moisture conservation practices in the study area.

More than 93\% \((n = 305)\) of the respondents stated that they change crop varieties. However, such change often occurs between locally available crop varieties rather than via the introduction of new varieties. Table 7 presents farmers’ responses relating to the change in crop varieties and the reasons for change. 64\% of the farmers reported mixed cropping practice in smallholdings.
Table 3
Frequency of irrigation in Rice, Wheat, and Wheat.

| Crop  | Crop growth stages | 2 times a week | Once a week | Once in 10 days | Once in >10 days | No irrigation |
|-------|--------------------|----------------|-------------|-----------------|-----------------|---------------|
| Rice  | Early-stage        | 169            | 72          | 10              | 0               | 63            |
|       | Mid-stage          | 157            | 80          | 10              | 4               | 63            |
|       | Late-stage         | 64             | 75          | 94              | 8               | 73            |
| Wheat | Early-stage        | 0              | 0           | 16              | 136             | 171           |
|       | Mid-stage          | 0              | 0           | 11              | 114             | 198           |
|       | Late-stage         | 0              | 0           | 6               | 147             | 170           |

Maize  No reported irrigation for Maize at any stage of crop development.

Table 4
Irrigation coverage during crop seasons (% of landholding).

| Crop  | No irrigable land | Under 25% | 25 - under 50% | 50 - Under 75% | 75% and above |
|-------|-------------------|-----------|----------------|----------------|---------------|
| Rice  | 63                | 34        | 27             | 84             | 106           |
| Wheat | 144               | 21        | 56             | 43             | 59            |
| Maize | No reported irrigation for Maize. |

Table 5
Irrigation system’s dependency on monsoon rain.

| Level of dependency | Responses | Proportion (%) |
|---------------------|-----------|----------------|
| Dependent           | 257       | 78.59          |
| Partly independent  | 40        | 12.23          |
| Independent         | 30        | 9.17           |

Table 6
Soil moisture management practice.

| Practice                                           | Responses | Proportion (%) |
|----------------------------------------------------|-----------|----------------|
| Mulching                                           | 21        | 6.42           |
| Framing in terrace with shoulder bund              | 201       | 61.47          |
| Rainwater harvest for use in the dry season        | 34        | 10.40          |
| Hedgerow/Agroforestry                              | 109       | 33.33          |
| Others (e.g., reduced tillage, tillage scheduling, planting stabilisation grass along the terrace bund, and sprinkler irrigation) | 32        | 9.79           |

The data on farmers’ perceived land fertility and fertiliser application is presented in Tables 8 and 9, respectively. Table 10 presents the farmers’ perceived suitability of their smallholding for growing major cereal crops. Table 11 illustrates smallholder farmers’ dependency on external resources and inputs.

1.4. Farmers’ perceptions on climatic impacts/risk and its management

The details of farmers’ adaptation knowledge, self-efficacy, adaptation effectiveness, adaptation cost, impact knowledge, probability of occurrence, the severity of occurrence, subjective norms, risk experience, incentives, impacts on related systems, and adaptation motivation were measured using indicators and are illustrated in Fig. 3. Data are provided as a supplementary file.
Table 7
Rationale of change in crop variety.

| Reasons                                         | Responses | Proportion (%) |
|-------------------------------------------------|-----------|----------------|
| New variety is high yielding variety            | 291       | 88.99          |
| New variety performs good in less rainfall      | 9         | 2.75           |
| New variety can tolerate more droughts          | 70        | 21.41          |
| New variety has a short crop cycle              | 115       | 35.17          |
| New variety has a better market value           | 10        | 3.06           |
| New variety has a better nutritional value       | 30        | 9.17           |
| Other reasons                                   | 70        | 21.41          |

(farmer reported other reasons include the availability of seed, past success/failure experiences for change in variety, cultural practices, and the community decisions)

Table 8
Perceived land fertility for cropping.

| Perceived fertility | Responses | Proportion (%) |
|---------------------|-----------|----------------|
| Good                | 84        | 25.68          |
| Average             | 229       | 70.04          |
| Poor                | 14        | 4.28           |

Table 9
Households applying manure and chemical fertilisers in rice, wheat, and maize.

| Crops                 | Manure application | Fertiliser application |
|-----------------------|--------------------|------------------------|
|                       | Yes | No | Yes | No |
| Rice (n = 314)        | 291 | 23 | 104 | 210|
| Wheat (n = 323)       | 312 | 11 | 165 | 155|
| Maize (n = 229)       | 216 | 13 | 64  | 165|

Table 10
Perceived suitability of land for various crops.

| Perceived fertility   | Rice | Wheat | Maize |
|-----------------------|------|-------|-------|
| Suitable              | 129  | 88    | 46    |
| Moderately suitable   | 168  | 228   | 217   |
| Not suitable          | 30   | 11    | 10    |
| No response           | 0    | 0     | 54    |

Table 11
Smallholder’s dependence on external resources/inputs.

| Degree of dependence | Number of responses | Proportion (%) |
|----------------------|---------------------|----------------|
| Hardly any           | 67                  | 20.49          |
| Some degree          | 216                 | 66.05          |
| Everything           | 44                  | 13.46          |

1.5. Adoption of adaptation measures and barriers to adoption

The research collected smallholder farmers’ adoption of the adaptation measures for crop adjustment, farm management, fertiliser management, non-farm adjustments, and off-farm adjustments in 1-5 Likert scale (Fig. 4). In addition, farmers’ responses on barriers to adaptation associated with social, techno-informational, economic, environmental and institutional barriers measured in 1-5 Likert scale are illustrated in (Fig. 5).
2. Experimental Design, Materials and Methods

The dataset was constructed based on face-to-face interviews with a total of 327 smallholder farmers from the three agroecosystems in the Far Western Province, Nepal. We used a stratified random sampling approach to recruit respondents for the interview [6]. We first identified the survey locations and then selected participants from those identified survey locations for the face-to-face interview using a structured questionnaire. Given the environmental and socio-
economic heterogeneity of the study area, survey locations were allocated across all districts (N = 9) in the study area (Fig. 1) to recruit participants representing the heterogeneous agroecosystems [7]. We randomly selected two municipalities from each district (N = 18), and then a ward from the selected municipalities was randomly selected for farmers’ interviews (N = 18). Our approach of stratified multi-stage random recruitment of respondents better represents the heterogeneous study area [6–8]. We acquired a list of residents from ward offices based on the Election Commission’s voters’ list. Then, we randomly selected potential interviewees from the selected wards that satisfy the recruitment criteria (Fig. 6). Along with a willingness to participate, farmers with at least five years of farming experience and at least 18 years of age were eligible to participate in the survey. We contacted the potential respondents, enquired about their interest to participate in the survey (supplied a copy of the Plain Language Statement), and confirmed their participation by collecting their consent to participate. Consent to participate in the interview was obtained verbally or in writing based on the preference of the participant. The respondents were the household heads and/or their representatives. A questionnaire containing both closed and open-ended questions was used to interview the respondent. Open-ended questions were designed to collect the narratives behind the responses [9,10]. The 5-point Likert scale was used to quantify subjective responses, e.g., the perceptions, knowledge, or the behavioural interests associated with climate change adaptation, adoption of adaptation measures, and the extent of barriers to adaptation. Questions designed to draw socio-demographic

Fig. 4. Farmers’ responses on the degree of adoption of adaptation measures.
Fig. 5. Farmers’ response on the extent of barriers associated with adaptation measures.

Fig. 6. Participant selection process for face-to-face interview; only 15–20 participants were recruited from each ward (N = 18) in the study area for interviews.
information and farm management practices were mainly alternative-choice type questions. Data were entered into Microsoft Excel and imported to R for visualisation [11].

Ethics Statement

Ethical approval was obtained from the Faculty of Science, Engineering and Built Environment Human Ethics Advisory Group, Deakin University (ref. no. STEC-43-2018-LAMICHHANE). Consent to participate in the interview was acquired, verbally or in writing based on participant’s choice, from all participants. Respondent identities are completely anonymised in the dataset. Qualitative responses collected during the field survey are not incorporated in the dataset to ensure the anonymity of the respondents to the fullest extent.

CRediT Author Statement

Prahlad Lamichhane: Conceptualization, Methodology, Data curation, Visualization, Writing – original draft; Kelly K. Miller: Conceptualization, Methodology, Writing – review & editing; Michalis Hadjikakou: Conceptualization, Methodology, Writing – review & editing; Brett A. Bryan: Conceptualization, Methodology, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships which have or could be perceived to have influenced the work reported in this article.

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Supplementary Materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.dib.2021.107620.

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