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Data Article

Field survey data on the effectiveness of agrometeorological services for smallholder farmers in Niger

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ABSTRACT

The dataset contains the answers of smallholder farmers to a semi-structured field survey and the 2020 yield plot measurements conducted in 8 municipalities of the Dosso and Tillabéri regions in Niger. It is a systematic sampling of about 320 questionnaires and 192 yield plot samples equally distributed in eight municipalities of intervention. The dataset contains several pieces of information about the uptake and the impacts of a tailored climate service (CS) produced by the National Meteorological Service (NMS) and disseminated through a network that involves Ministry of Agriculture extension services at the municipal level developed in the context of the *AdaptatioN Au changement Climatique, prévention des catastrophes et Développement agrIcole pour la sécurité Alimentaire du Niger* (ANADIA) Project. The material gathered by the survey gives a picture of the preferences of local farmers in the broadcasting of climate services information and their consequent strategical and tactical decisions in farm practices. Moreover, the survey investigates the preferences regarding the information that farmers would like to receive during the cropping season. Furthermore, the measurement of yield and its relation to the farmers' access to climate in-

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formation and participation in training initiatives gives an indication of the impact of the CS on agricultural production in these regions.

The dataset could benefit further studies and investigations about CSs for smallholder farmers in semi-arid regions.

This article is a co-submission of the article: "Effectiveness of agrometeorological services for smallholder farmers: the case study in the regions of Dosso and Tillabéri in Niger" submitted to the journal *Climate Services*.

Specifications Table

Subject	*Climatology* *Agronomy and Crop Science*
Specific subject area	Smallholder farmers agrometeorological survey on climate services effectiveness and yield measurement
Type of data	Table
How the data were acquired	A field survey was conducted in the municipalities of Falmey, Gotheye, Guecheme, Kieche, Namaro, Ouro Gueladjo, Tessa and Tounouga in Niger. Moreover, in the same municipalities, some crop field sample plots of 10 × 10 m were taken to obtain agronomic information about the crops and their yield. The survey was conducted between the 7th and 20th of October 2020.
Data format	Raw Analyzed Filtered
Description of data collection	The field survey was conducted by experts of the Institut National de la Recherche Agronomique du Niger (INRAN). Each interviewer was equipped with a preconfigured tablet to conduct the survey. The approach is based on a comparison between the treatment group (trained farmers) and the control group (untrained farmers). The two groups were randomly selected in each municipality by the interviewers. The survey questionnaires are conceived by the authors basing on the recent bibliography on climate services [1,2] and similar experiences on the same topic in West Africa [3,4]. The questionnaires were collected on digital tablets. The yield data was gathered on paper and afterwards it was integrated into a kobocollect form and then exported into an Excel file data sheet. A data quality check was carried out, correcting the errors and omissions by double-checking the original form. The dataset was translated from French to English. Data processing and analysis was performed using the SPSS [5], STATA [6], and EXCEL software.
Data source location	• Institutions: Institut National de la Recherche Agronomique du Niger; Direction de la Météorologie Nationale du Niger; Italian National Research Council – Institute of Bioeconomy • City/Town/Region: Municipalities of Namaro, Ouro Gueladjo, Gotheye (Tillabéri region) and Tounouga, Guéchémé, Kiéché, Tessa and Falmey (Dosso region) • Country: Niger
Data accessibility	*Bacci, Maurizio; Zini, Carlotta; Idrissa, Oumarou Allélé; Burrone, Sara; Assoumane, Tsayabou; Sitta, Adamou Aissatou; Tarchiani, Vieri (2023), "Field survey data on the effectiveness of agrometeorological services for smallholder farmers in Niger", Mendeley Data, V2, doi:*10.17632/3h873vkhzy.2 Direct link: https://data.mendeley.com/datasets/3h873vkhzy

(*continued on next page*)

Related research article	This article is a co-submission of the article: Bacci, M.; Idrissa O. A.; Zini, C.; Burrone S.; Sitta A. A.;Tarchiani, V. (2021), "Effectiveness of agrometeorological services for smallholder farmers: the case study in the regions of Dosso and Tillabéri in Niger" published in the journal *Climate Services* 10.1016/j.cliser.2023.100360

Value of the Data

- The dataset shows how the climate services (CS) could reach smallholder farmers in Niger rural areas, revealing which is the most effective channel and format to reach this community with tailored climate information and the consequent uptake of the message by farmers.
- The survey collects farmers' needs and preferences, which could support the design of new CS.
- The survey enables further considerations in the scientific community for the implementation of CS, or the improvement of the existing ones, through a better comprehension of the effective uptake of CS by farmers and how it influences their agronomic decisions.
- The survey collects data about the effectiveness of CS on smallholder farmers' agriculture production, which is a key topic for assessing the services provided. The survey intercepts the behavioural differences between farmers who received the CS and those who didn't, and farmers who received training in using this CS and those who didn't. This information could benefit stakeholders, such as policymakers and practitioners in government and non-governmental organizations, for enhancing adaptation and resilience to climate change in smallholder agriculture at local level.
- The year of 2020 has been an anomalous year in terms of precipitation. In August and September, the Niger recorded exceptionally humid conditions. The dataset represents important evidence for further analysis in agricultural production in very humid years.

1. Objective

The main objective of the survey was to assess the effectiveness of agrometeorological services for smallholder farmers in Niger. The survey identified the changes introduced by the use of the agrometeorogical advices produced by the ANADIA project and its impact on crops' yield. These field data are used to measure the "Effectiveness of agrometeorological services for smallholder farmers: the case study in the regions of Dosso and Tillabéri in Niger" published in the journal Climate Services (10.1016/j.cliser.2023.100360). Since the focus of the survey was assessing the impact of CS to the rural population of 8 municipalities in Niger, ensuring representative samples that cover a wide variety of agricultural production systems in a remote area poorly investigated by the scientific community. The published article linked to this field survey dataset describes the main behavioral changes introduced by climate information and the main characteristics of each smallholder farmer. The full dataset of the survey is made available for replication purposes and as a source of data for further research.

2. Data Description

The data consist in the survey data adopted for analysing the effectiveness of CS in Niger's rural area [7]. These data derive from the survey conducted by the INRAN as part of the ANADIA project and described in the report by Idrissa et al. [8]. The survey data file spreadsheet accompanying this article consists of 320 rows and 81 columns, see Table 1. Each row presents farmers' responses to the survey. Some of the questions in the survey are split into dummy vari-

Table 1
Summary of the variables included in the database of the farmers' survey.

Variable Label	Description	Scale type
ID	Code to identify the farmer	Numeric
REGION	Name of the region	Nominal
MUNICIPALITY	Name of the municipality	Nominal
VILLAGE	Name of the village	Nominal
ENUMERATOR_CODE	Code to identify the enumerator	Numeric
SUPERVISOR_CODE	Code to identify the supervisor	Numeric
PRINCIPAL_CROP	Principal crop produced by the farmer	Nominal
AREA_PRINCIPAL_CROP	Field area with the principal crop (ha)	Numeric
FIRST_SOWING_DATE	First sowing date in this cropping season	Date
LAST_SOWING_DATE	Last sowing date in this cropping season	Date
NUMBER_OF_SEEDINGS	Number of seeding during this cropping season	Numeric
HARVEST_DATE	Harvest date in this cropping season	Date
B1	Did you use precipitation information observed using rain gauge?	Yes/No
B2	For which activity did you use the observed precipitation information?	Nominal
B2_1	Use of observed precipitation: field preparation	Yes/No
B2_2	Use of observed precipitation: sowing date	Yes/No
B2_3	Use of observed precipitation: weed management	Yes/No
B2_4	Use of observed precipitation: fertilizer distribution	Yes/No
B2_5	Use of observed precipitation: pesticide distribution	Yes/No
B3	Did you receive predictive climate information (ANADIA)?	Yes/No
B4	What kind of predictive information did you receive?	Nominal
B4_1	Kind of predictive info: agro-meteorological advice	Yes/No
B4_2	Kind of predictive info: seasonal forecast	Yes/No
B4_3	Kind of predictive info: daily forecast	Yes/No
B4_4	Kind of predictive info: 10-day forecast	Yes/No
B4_5	Kind of predictive info: weather report	Yes/No
B4_6	Kind of predictive info: other	Nominal
B5	By which means did you receive the information?	Nominal
B5_1	By which means: radio	Yes/No
B5_2	By which means: television	Yes/No
B5_3	By which means: chief of the village	Yes/No
B5_4	By which means: agricultural extension	Yes/No
B5_5	By which means: other	Nominal
B6	Did you find the information useful?	Yes/No
B7	What kind of information did you find the most useful?	Nominal
B7_1	Most useful information: agro-meteorological advice	Yes/No
B7_2	Most useful information: seasonal forecast	Yes/No
B7_3	Most useful information: daily forecast	Yes/No
B7_4	Most useful information: 10-days forecast	Yes/No
B7_5	Most useful information: weather report	Yes/No
B7_6	Most useful information: agricultural situation	Yes/No
B7_7	Most useful information: pastoral situation	Yes/No
B7_8	Most useful information: market price	Yes/No
B7_9	Most useful information: other	Nominal
B8	Did you use the information disseminated by the project in your activities?	Yes/No
B9	In what activity did you use predictive information?	Nominal
B9_1	Predictive information used in the activity: field preparation	Yes/No
B9_2	Predictive information used in the activity: sowing date	Yes/No
B9_3	Predictive information used in the activity: weeding	Yes/No
B9_4	Predictive information used in the activity: fertilizer distribution	Yes/No
B9_5	Predictive information used in the activity: pesticide distribution	Yes/No
B9_6	Predictive information used in the activity: seed variety choice	Yes/No
B9_7	Predictive information used in the activity: other	Nominal
B9b	What variety?	Nominal
B10	What are the advantages provided by predictive information?	Nominal
B10_1	Advantage of predictive information: increased production	Yes/No
B10_2	Advantage of predictive information: risk reduction	Yes/No
B10_3	Advantage of predictive information: costs reduction	Yes/No
B10_4	Advantage of predictive information: no advantages	Yes/No

(*continued on next page*)

Table 1 (*continued*)

B10_5	Advantage of predictive information: other	Nominal
B11	What information do you prefer to receive for your activities?	Nominal
B12	What is the best way to receive this information?	Nominal
B12_1	Best way to receive this information: television	Yes/No
B12_2	Best way to receive this information: radio	Yes/No
B12_3	Best way to receive this information: chief of the village	Yes/No
B12_4	Best way to receive this information: agricultural extension service	Yes/No
B12_5	Best way to receive this information: other	Nominal
B13	Indicate preferred time	Time
C1	What are the major difficulties encountered during the season?	Nominal
C1_1	Major difficulties: seeding failures	Yes/No
C1_2	Major difficulties: dry spells	Yes/No
C1_3	Major difficulties: pathogenic attacks	Yes/No
C1_4	Major difficulties: early end of the rainy season	Yes/No
C1_5	Major difficulties: strong winds	Yes/No
C1_6	Major difficulties: no difficulty	Yes/No
C1_7	Major difficulties: other	Nominal
C2	How was the productivity of this campaign?	Nominal
C3	Do you know the yield and the area of your fields?	Yes/No
C4	How many sheaves have you produced this year?	Numeric
C5	How many kg of production have you harvested this year?	Numeric
C6	What is the area that you cultivated this year (ha)?	Numeric

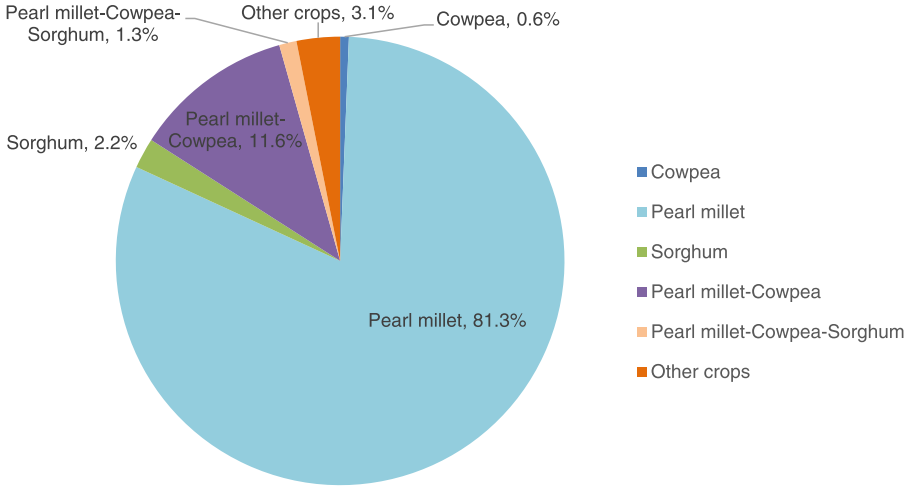

Fig. 1. Principal crop distribution in farmers sample.

ables to perform statistical analysis on farmers' answers. The original survey was conducted in French; in this version, all the answers are translated by the authors into English.

The crop distribution in the study area follows the typical agronomic distribution of Niger's semi-arid production system. According to answers of the survey as represented in Fig. 1, the principal crop is Pearl millet.

Fig. 2 shows that 46.6% of farmers claim that crop productivity was unsatisfactory with reference to the 2020 cropping season.

The division of answers about difficulties encountered by farmers during the 2020 cropping season is represented in Fig. 3. The majority of the difficulties are indicated as "other" (mainly floods and excess of rainfall), while the dry spells and the early cessation of the rainy season have the lowest values. 7.2% of farmers encountered no difficulties during the cropping season.

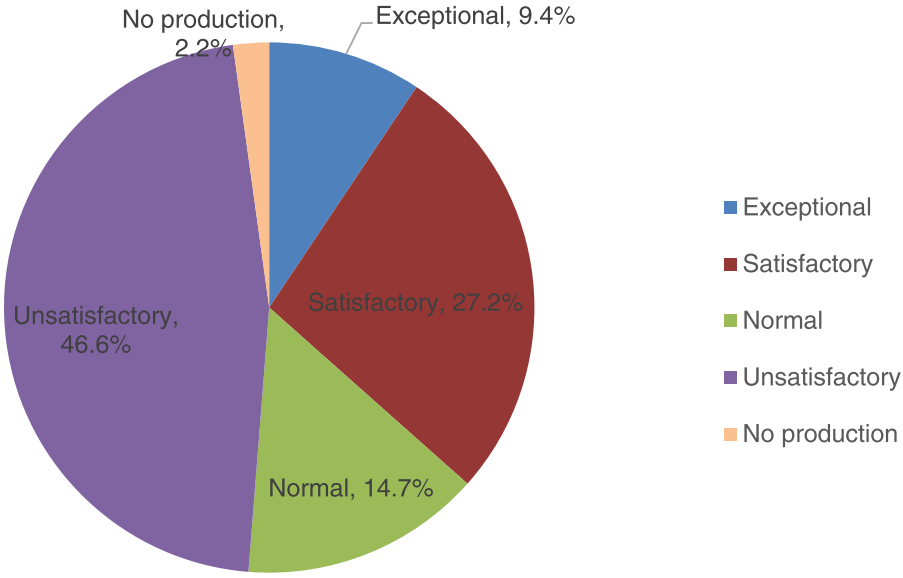

Fig. 2. Farmers' perception of productivity in relation to the agricultural campaign.

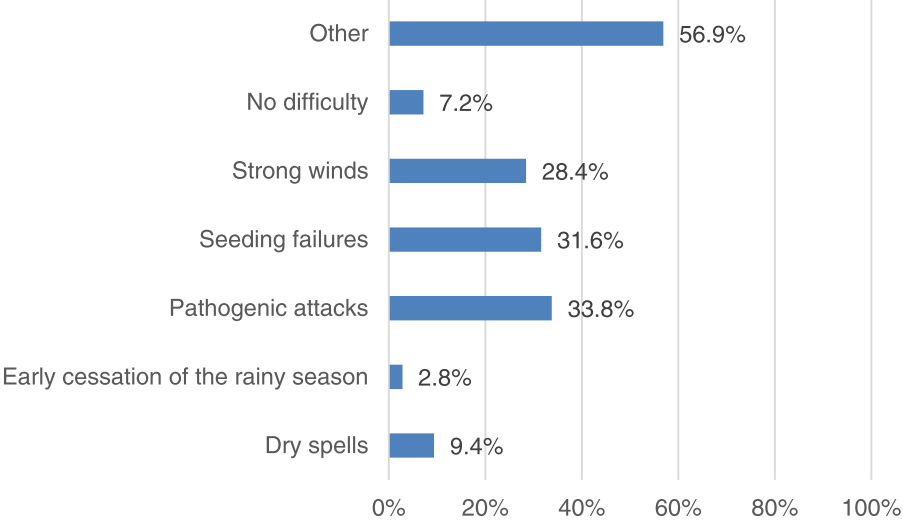

Fig. 3. Difficulties encountered by farmers during the cropping season.

74.7% of the farmers interviewed use rainfall observations from the rain gauge installed in the village. Among those farmers who use the rainfall observation, the distribution of farming decisions and activities is plotted in the following graph (Fig. 4).

In the survey, 251 farmers affirm that they received climate information. Different types of climate information reach the farmers, as represented in Fig. 5.

The means by which farmers receive the information are represented in Fig. 6.

100% of the interviewed farmers find the information useful and 97.6% of them use it for farming activities.

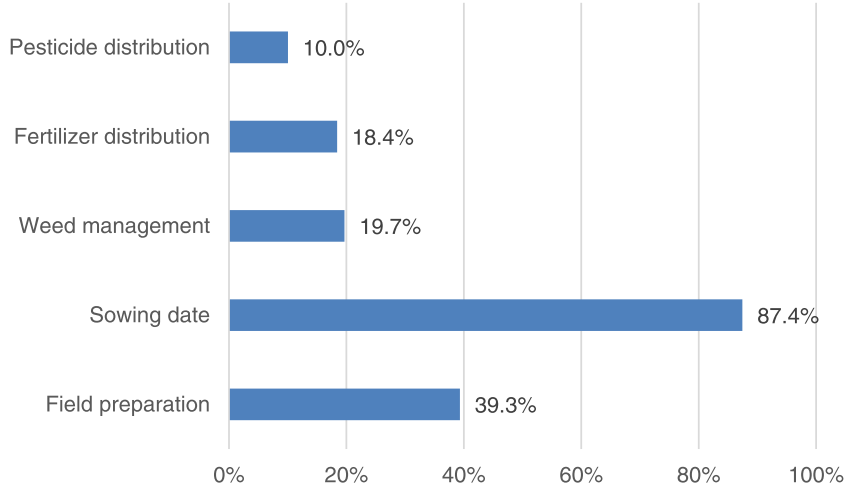

Fig. 4. Indication of the use of the rain gauge observations in farming activities by farmers who use rainfall observations from the rain gauge.

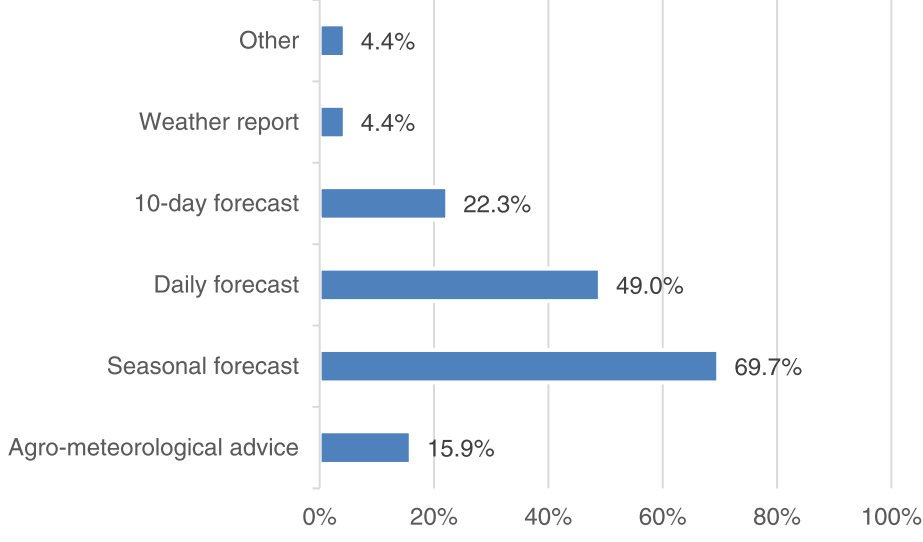

Fig. 5. Climate information received by farmers.

The second dataset collects the yield measured in field plots and some ancillary agronomic data about the crop field for the 192 farmers selected for the impact evaluation of the climate services dissemination in the Dosso and Tillabéri regions [7]. The spreadsheet consists of 192 rows and 27 columns, see Table 2.

The survey form and the yield plot measurement form are given in French (original) and English (translation) as supplementary data.

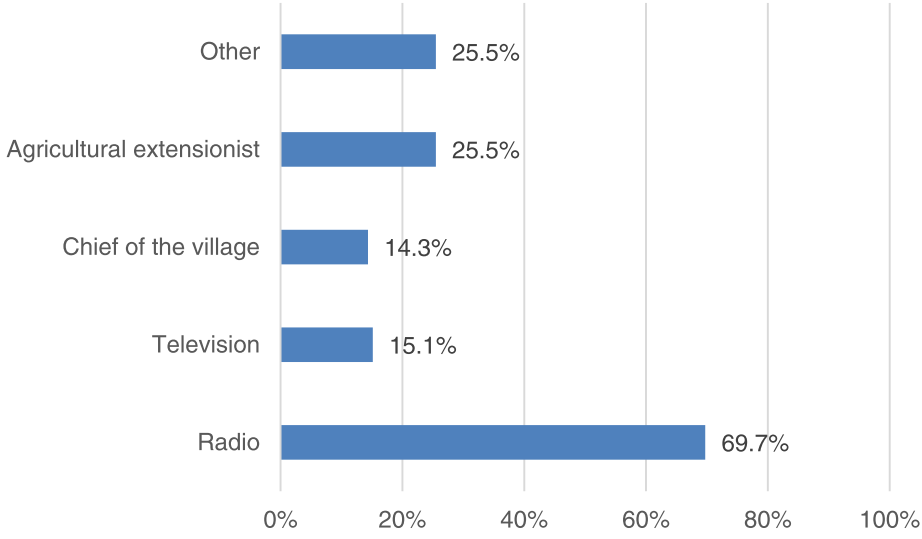

Fig. 6. Distribution of means used by farmers to receive climate information.

Table 2
Summary of the variables included in the database of the yield field plot measurements.

Variable Label	Description	Scale type
REGION	Name of the region	Nominal
MUNICIPALITY	Name of the municipality	Nominal
VILLAGE	Name of the village	Nominal
FARMER_ID	Code to identify the farmer	Numeric
TRAINING	Information about the farmer's participation in the training	Yes/No
ENUMERATOR_CODE	Code to identify the enumerator	Numeric
DATE_INTERVIEW	Date of the interview	Date
SUPERVISOR_CODE	Code to identify the field supervisor	Numeric
CULTIVATED_CROP	List of the crops cultivated in the field	Nominal
VARIETY_OF_PEARL_MILLET	Name of the variety of Pearl millet (MHL=Local early variety; HKP=Improved variety)	Nominal
VARIETY_OF_COWPEA	Name of the variety of Cowpea (NF=Fodder cowpea; NL=Local Cowpea; IT-89-90 and KVX improved varieties)	Nominal
AREA_FIELD	Measurement of the crop field in hectares (ha)	Numeric
AREA_SAMPLE_PLOT	Measure of the sample plot (m^2)	Numeric
SOWING_DATE	Sowing date of the field	Date
SPACING_PEARL_MILLET	The average row spacing of the Pearl millet (m)	Numeric
SPACING_COWPEA	The average row spacing of the Cowpea (m)	Numeric
SPACING_SORGHUM	The average row spacing of the Sorghum (m)	Numeric
POCKETS_PEARL_MILLET	Number of Pearl millet planting pockets	Numeric
POCKETS_COWPEA	Number of Cowpea planting pockets	Numeric
POCKETS_SORGHUM	Number of Sorghum planting pockets	Numeric
KG_SHEAF_HUMID	Weight of the harvested sheaves in humid conditions (Kg)	Numeric
KG_SHEAF_DRY	Weight of the harvested sheaves in dry conditions (Kg)	Numeric
KG_GRAINS_(DRY)	Weight of the grains in dry conditions (Kg)	Numeric
PEARL_MILLET_YIELD	Estimated pearl millet yield per hectare (Kg/ha)	Numeric
OBSERVATIONS_EN	Observations by farmer	Nominal
FLOOD_SUITABILITY	Information about the flood suitability of the crop field	Yes/No

3. Experimental Design, Materials and Methods

The aim of the survey is to measure the effectiveness of the CS received by the farmers in the 8 municipalities of intervention of the *AdaptatioN Au changement Climatique, prévention des catastrophes et Développement agrIcole pour la sécurité Alimentaire du Niger* (ANADIA) project for the 2020 cropping season [7]. The survey took place between the 7th and 20th of October 2020, during the harvest period of the rainfed crops in Niger, and it was conducted by the Project's focal points in the municipalities with the support of the INRAN and ANADIA staff.

The survey questionnaire was developed by the ANADIA team and implemented through the free KoBoToolbox platform and its connected application KoBoCollect (kobotoolbox.org) installed on prepared tablets.

Each municipality is characterized by different climatic and ecological conditions; as a consequence, the climate information needed by farmers could be slightly different depending on the typical production system and the most frequent climate threats affecting the municipality [9,10]. For this reason, the survey was conceived as a systematic semi-structured survey over the eight municipalities with the aim of covering the different agro-climatic conditions of these regions.

In each municipality, see Fig. 7, 4 villages were randomly selected. For security reasons, some areas in the Tillabéri region were inaccessible; therefore, these areas were not covered by the survey.

The villages involved into the survey were:

- Falmèy municipality: Djobbéizé Koara, Kantchoga Peulh, Koudjé and Malan Koira.
- Gothèye municipality: Garbay Kourrou, Kobé, Sâya, Tallé.
- Guéchémé municipality: Angoual Mâba, Guéchémé, Landara, Wassangou.
- Kiéché municipality: Baboursayé, Gouala, Kallon Mota, Rouda Adoua.
- Namaro municipality: Balati, Bangou Koarey Koira Zeno, Hondey Tegui, Yonkoto.

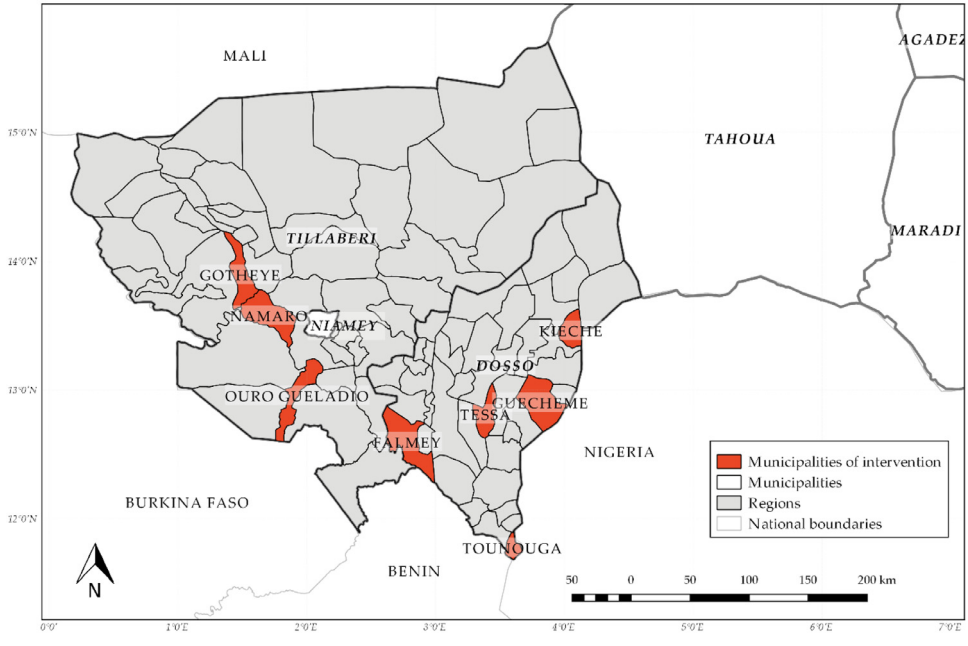

Fig. 7. Geographical distribution of the intervention municipalities.

- Ouro Gueladjo municipality: Diollaye Dialloubé, Diollaye Gourmabé, Diollaye Guédel, Diollaye Idikaou.
- Tessa municipality: Bakoubé, Sinadey, Tessa, Tombo Tessa.
- Tounouga municipality: Gondarou, Gôron Kondo, Sabon Birni, Tounouga.

To complete the survey, in each village, 10 farmers were randomly selected in the following way: five (5) farmers who did not receive training among the village population and five (5) farmers who had received agrometeorological training from the list of participants to the training. This method is applied in each of the four (4) villages of the eight (8) implementation municipalities of the ANADIA project. So, in total, forty (40) questionnaires were filled in per municipality and three hundred and twenty (320) questionnaires were filled for the eight municipalities.

From these groups of farmers, three (3) trained and three (3) untrained farmers were randomly selected in four (4) villages for each municipality with the aim of measuring its crop yields. For each farmer, one (1) field was randomly selected where one (1) plot of 10 $\times$ 10 meter was harvested to measure the yield. In total, one hundred and ninety-two (192) yield plot samples were obtained.

The crop harvested was weighted in fresh and in dry conditions in order to obtain the value of the yield per hectare. Moreover, for each plot sample, a set of ancillary agronomic data were collected to better frame the farming practices for the obtained yield. In particular, for each plot sample, the following data were collected:

- Crop and variety and presence of secondary crops;
- Owner's field total area;
- Sowing date;
- Typical crop row spacing;
- Number of planting pockets (traditional cropping system [11]).

The main staple crop in Niger is Pearl millet [12], which is the most frequent crop in the field plot samples. 175 values of pearl millet yield were retained for the impact analysis [7] and its yield per hectare was evaluated through weighing the harvest that took place in a sample plot of 10 $\times$ 10 meters.

The yield was estimated by multiplying the weight of the grains harvested in the 100 m^2 of the quadrat by 100 to reach the yield per hectare expressed in kg/ha. In some records, the grains weight is not available. For these missing data, the estimation of the grain weight was made using the regional mean of the harvested sheaves in the plot. The grain weight is calculated using the average regional conversion ratio between the sheaves weight (humid or dry) and the grain weight. This assumption is based on the following considerations: i) the agro-ecological conditions are different in the two regions; ii) there are few available data collected in some municipalities to calculate the average conversion ratio at a municipal level.

2020 was an exceptionally humid year in Niger [13] and the results of this survey represent an exceptional evolution of the cropping season. The data collected during this year could be biased by the anomalous agro-ecological conditions that farmers and crops had to face. Considering this aspect in an ex-post analysis, additional information about the flood suitability of the fields was added to the survey data using the linear distance to the river (perennial or seasonal, i.e. Dallols) using GIS tools. A distance of less than 250m between the field and the nearest river was considered as an area susceptible to flood.

Ethics Statements

We agree upon standards of expected ethical behaviour for all parties involved in the act of publishing. Our paper presents an accurate account of the work performed and an objective discussion of its significance. Underlying data is represented accurately in the article. Each respondent was informed that his/her answers would be used as a part of a research project and

agreed to that by filling in the questionnaire. Ethical approval was not necessary for this survey study following the INRAN ethical guidelines.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests.

Data Availability

Field survey data on the effectiveness of agrometeorological services for smallholder farmers in Niger (Original data) (Mendeley Data).

CRediT Author Statement

M. Bacci: Conceptualization, Methodology, Formal analysis, Data curation, Writing – review & editing, Writing – original draft, Supervision; **C. Zini:** Investigation, Formal analysis, Data curation, Writing – original draft; **O.A. Idrissa:** Investigation, Data curation, Methodology, Writing – review & editing, Writing – original draft; **S. Burrone:** Formal analysis, Data curation, Writing – original draft; **A. Tsayabou:** Investigation, Data curation; **S.S. Maïga:** Investigation, Data curation; **A.A. Sitta:** Methodology, Writing – review & editing, Writing – original draft; **V. Tarchiani:** Conceptualization, Methodology, Funding acquisition.

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