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Quantifying the Gap Between the Local Perceptions of Farming Households and What Experts Say About Climate Change in Haiti and the Dominican Republic

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Abstract

This study quantifies and assesses the gap between the perceptions of 550 farming households on the Caribbean island of Hispaniola and the opinions of 60 regional experts on climate change. This quantification draws on the traditional knowledge of farming households, which is based on environmental observations, including meteorological, biological, and astrological ones, as well as on the experts' opinions, which are grounded in scientific observations. To measure this gap, we asked 24 identical questions to both the experts and the farming households, using the experts' responses as a benchmark. The experts' statements were used as a reference to reflect the reality of climate change, given that the majority of experts' answers converge. We then quantified the average distance for each farming household relative to these references. Fisher's exact test and Pearson chi-square (χ^2) test were used to assess this distance. A binary regression model was then used to identify the main factors influencing the gap in farming households' perceptions, as well as to examine whether this gap is associated with greater socioeconomic vulnerability. The results revealed that in Haiti, 70% of farming households had a different perception from experts'one. In the Dominican Republic, this proportion was 47.50%. Vulnerable (OR = 12.94, $p < 0.001$) and very vulnerable (OR = 4.18, $p < 0.05$) farming households were more likely to have a different perception of climate change compared to experts.

Keywords: climate change; environmental perception; farming households; expert opinion; Haiti and Dominican Republic

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1. Introduction

Climate change constitutes a major systemic disruption for rural socio-ecosystems in the Caribbean, whose stability depends on essential ecosystem services such as fisheries, agriculture, and forestry [1]. This phenomenon increases the frequency and intensity of hydrometeorological hazards (recurring droughts, floods, and hurricanes), thereby accelerating the decline in agricultural productivity and directly threatening the livelihoods of the most vulnerable farming households [2,3].

Globally, the scientific literature provides a comprehensive account of how farming households perceive environmental changes, primarily through rainfall anomalies and rising temperatures [4,5]. In Haiti, local dynamics are characterized by empirical observations

of irregular rainfall and an increase in droughts [6,7], while in the Dominican Republic, farming households report more intense hurricanes associated with seasonal phenological changes [5,7]. Although this body of research has enhanced our understanding of local climate change perceptions, studies quantifying the gap between farming households' perceptions and expert opinions remain scarce. Conducting such a study is essential to obtaining a more comprehensive view of local perceptions and beliefs regarding climatic conditions. This gap could then be linked to individual factors such as vulnerability, enabling us to identify the households most likely to hold biased perceptions and to better understand the underlying causes of these biases. This knowledge would facilitate the implementation of environmental adaptation policies better suited to local realities in the context of climate change [8].

Today, it is becoming increasingly clear that environmental challenges evolve dynamically over time. Through continuous experimentation and ecological interactions, rural farming households have developed local knowledge and endogenous adaptation strategies to better cope with climate change [9,10]. This accessible knowledge deeply rooted in collective memory, and transmitted orally is a fundamental driver of sustainable natural resource management and agricultural development [10–12]. Nevertheless, despite official recognition of its value by Intergovernmental Panel on Climate Change (IPCC) working groups, local knowledge remains marginalized in favor of global scientific models, limiting the scope of resilience measures intended for the most vulnerable anthropized ecosystems [11,13].

In environmental science, the debate over the legitimacy of local knowledge revolves around two epistemological schools of thought. The first views rural knowledge as subjective constructs lacking the rigor inherent in weather station networks and climate models, thereby favoring objective biophysical data [14]. The second school of thought argues that the systemic integration of local knowledge and climate science is essential to implementing sustainable adaptation strategies tailored to the local biophysical context [15].

Attempts to compare subjective perceptions with scientific observations reveal contrasting trends. Comparative analyses show that while farmers often accurately anticipate temperature trends, significant discrepancies frequently arise regarding rainfall patterns [4,16]. These discrepancies can be explained in part by the concept of "ideal precipitation," according to which perception is biased by crop water requirements rather than actual rainfall totals [17–19]. Furthermore, long-term environmental memory is often distorted by recency biases linked to immediate climatic anomalies or by difficulties in distinguishing structural changes in production systems from natural climatic fluctuations [20].

Based on these conceptual frameworks, we formulate the central hypothesis that climate change perceptions among farming households in Haiti and the Dominican Republic differ from those of experts. Given these arguments, this research aims to answer three interrelated questions: (i) How is climate change perceived by experts and farming households in Haiti and the Dominican Republic? (ii) Are the perceptions of these two groups similar? (iii) Is the gap between these perceptions linked to individual differences, particularly in terms of socioeconomic vulnerability?

To date, few studies have compared local climate change perceptions among farming households with expert opinions grounded in scientific observations. This article fills this key gap in the literature by precisely measuring the discrepancy between farmers' traditional knowledge (based on meteorological, biological, and phenological indicators) and scientific data provided by experts from weather stations and institutional reports [21,22]. We also examine whether this gap is linked to the socioeconomic vulnerability of farming households. We hypothesize that divergences in observational frameworks explain this gap, and that a larger gap is associated with greater socioeconomic vulnerability. This study

is essential for deepening our understanding of climate change perceptions and guiding policies designed to strengthen the resilience of farming households.

The remainder of this article is organized as follows: Section 2 presents the materials and methods, Section 3 details the results, Section 4 provides a discussion, and Section 5 presents conclusions and policy recommendations.

2. Materials and Methods

2.1. Study Areas

The island of Hispaniola, geographically located between 17.6–20.0° N and 68.3–74.5° W, covers a total area of approximately 76,480 km^2 and is home to a population of more than 21 million people. Geopolitically, the island is divided into two sovereign nations: the Republic of Haiti in the west (covering 27,750 km^2) and the Dominican Republic in the east (covering 48,310.97 km^2) (Figure 1). In terms of climate, the region's unimodal-to-bimodal transition or bimodal annual precipitation pattern is characterized by two distinct precipitation peaks occurring in April–May and August–October, a major winter minimum extending from November to March, and a particularly pronounced mid-summer drought (MSD) centered around July [3,23].

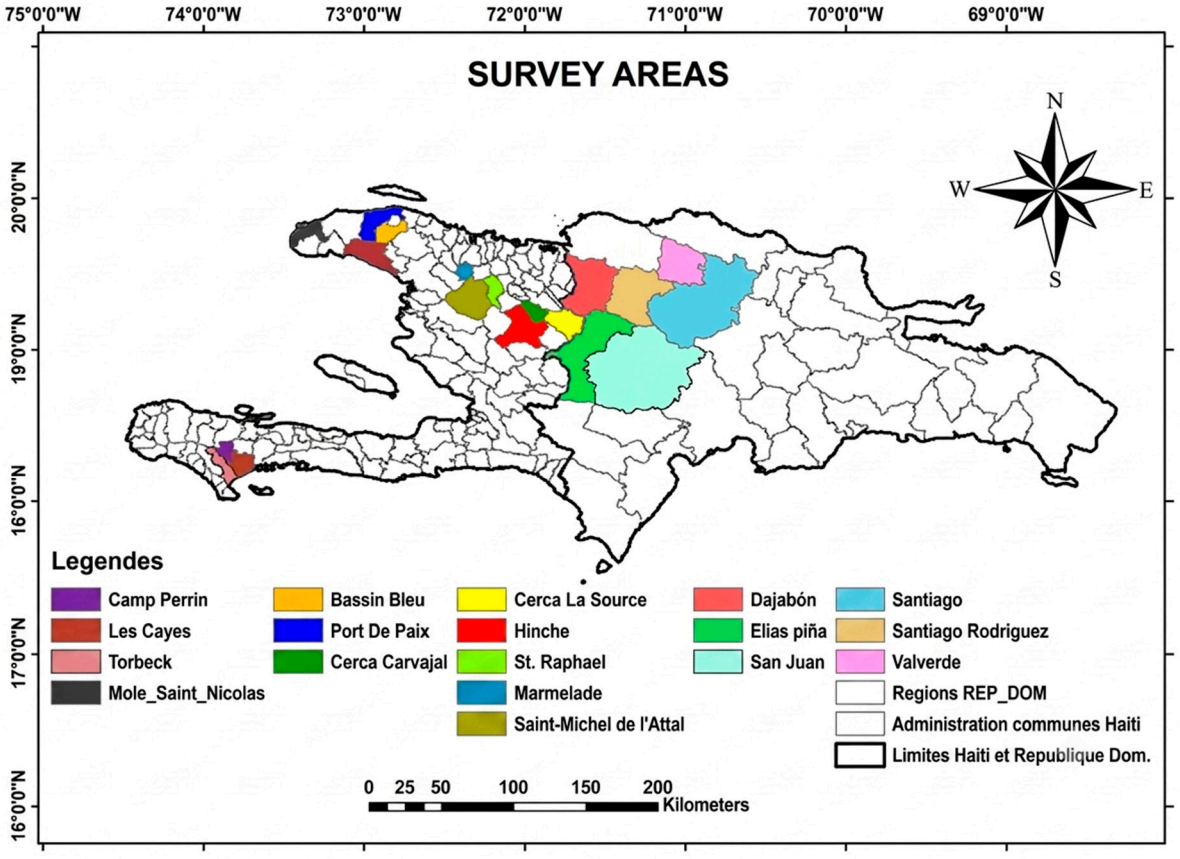


Figure 1. Field survey area; source: Duvil et al. [3].

The choice of Hispaniola is justified by the fact that Haiti and the Dominican Republic, which share the island, are increasingly affected by extreme weather events, making it the most vulnerable region in the Caribbean to climate change [23,24]. Given the island's vast size, we deemed it appropriate to limit the scope of our study to 18 shared zones/provinces (Table 1).

Table 1. Study area on Hispaniola Island.

Department	Municipalities	Population	Surface Area (km^2)	Altitude (m)	Survey	
					Frequency	%
Centre (Haiti)	Hinche	120,867	588.4	237	60	10.9
	Cerca–la-source	56,532	345	371	60	10.9
	Cerca-Carvajal	23,254	156.9	459	30	5.45
Nord-Ouest (Haïti)	Port-de-paix	185,707	351.75	36	30	5.45
	Bassin bleu	57,697	214.83	198	30	5.45
	Môle saint Nicolas	30,975	227.07	36	40	7.27
Artibonite en Haïti	Saint Michel de l'Attalaye	136,876	613.74	420	30	5.45
	Marmelade	34,609	108.94	759	30	5.45
Nord (Haïti)	Saint Raphaël	53,755	183	373	30	5.45
Sud (Haïti)	Aux cayes	151,696	191.11	70	30	5.45
	Camp Perrin	40,962	151.42	424	30	5.45
	Tobeck	78,603	201.86	40	30	5.45
Elias piñas (RD)	Hondo valle	10,647	128.53	890	20	3.63
Santiago (RD)	Santiago de los caballeros	283,651	236.51	199	20	3.63
Dajabón (RD)	Dajabón	25,983	253.4	35	20	3.63
Valverde (RD)	Santa cruz de Mao	49,475	409.66	85	20	3.63
Santiago Rodriguez (RD)	Monción	11,753	101.61	372	20	3.63
San Juan	Las matas de Farfán	70,586	636.64	415	20	3.63

Sources: Duvil et al. [2].

The 18 selected areas highlight the island's diverse agro-ecological characteristics, ranging from dry plains to humid mountains, and are particularly affected by the impacts of climate variability on agriculture [3,24].

2.2. Survey Data Collection

Data were collected between 23 June and 28 November 2023. Due to their geographic dispersion across Hispaniola, a panel of N = 60 experts in climatology and agriculture was selected using snowball sampling [25,26]. To ensure a sufficient level of operational and regional expertise, the final sample was rigorously validated against four fundamental professional and academic criteria (Table 2).

This selection was necessary to ensure that the interviewed experts possessed sufficient experience in a field related to climate change and agriculture on the island of Hispaniola.

Simultaneously, a survey was conducted among 550 farming households (430 in Haiti and 120 in the Dominican Republic) spread across 18 municipalities and provinces on the island. To correct the sample size asymmetry, a two-stage statistical weighting procedure was applied to ensure balanced and representative comparative analyses. First, simple weighting by country was performed by assigning each farming household a weight inversely proportional to the size of its source group (1/430 for Haiti and 1/120 for the Dominican Republic), adjusted through normalization so that the sum of the weights equals one. Second, a cross-weighting process incorporated key institutional factors (e.g., access to credit) while calibrating the total sum of weights to the overall sample (N = 550). This dual adjustment not only neutralizes the representativeness bias associated with subgroup overrepresentation but also accurately models the complex dynamics and interactions of

vulnerability between the two countries, while adhering to the normalization requirements of the statistical models used.

Table 2. Socioprofessional and academic characteristics of institutional experts (N = 60).

Selection Criteria	Categories	Count (n)	Percentage (%)
Field of Expertise	Agriculture and Agroecology	35	58.3%
	Climatology, Meteorology, and Hydrology	10	16.7%
	Environmental Sciences and Economics	7	11.7%
	Agricultural Economics	5	8.3%
	Humanities and Social Sciences	3	5.0%
Education Level	Master's Degree	46	76.7%
	PhD Candidates	7	11.7%
	PhD Holders	6	10.0%
	Habilitation (HDR)	1	1.6%
Professional Experience	5 to 15 years	5	8.3%
	16 to 30 years	34	56.7%
	31 to 42 years	14	23.3%
	More than 42 years	7	11.7%
Primary Activity	Professors and Researchers	33	55.0%
	NGO and Private Sector Representatives	15	25.0%
	Public Sector Executives	12	20.0%

The survey instrument included an instructions and informed consent section that stated: "Do you agree to participate in this survey? We would be very grateful. You are not required to answer all questions, as some are optional, but we would appreciate your response to every item. This questionnaire takes approximately one hour to complete, and the collected data will be used exclusively for this research project. Thank you in advance." All contacted farming households and experts agreed to participate in the study.

To ensure a reliable historical perspective on hydroclimatic dynamics, strict inclusion criteria focused on heads of farming households aged 35 to 80 with more than 15 years of continuous experience. Individuals outside this age range were excluded to avoid insufficient historical perspective (<35 years) or potential memory recall bias (>80 years).

Stratified sampling was employed across the target spatial units: in Haiti, the sample comprised 30 households per municipality (increased to 40 in Hinche and Cerca-la-Source to account for higher local population density), whereas in the Dominican Republic, a uniform sample size of 20 households per province was applied. This approach demonstrates robustness by drawing on empirical models of agroclimatic vulnerability and standardized regional protocols [3]. Primary data collection relied on a structured questionnaire containing 33 items, including 24 symmetric variables common to both farming households and experts (Table 3, Appendix A). Surveys were conducted face-to-face in Creole and Spanish by 15 trained enumerators to minimize lexical bias. Finally, data was digitized using Open Data Kit (ODK) Collect v2023.1 and centralized in KoboToolbox v2.023.04 following a strict quality assurance procedure.

Table 3. Description of the 24 questions asked identically to households and experts.

No	FQ	Questions/Variables	Modalities/ Measures	Sign Was Waiting	
				Perception of Farm Households	Experts' Opinions
1	FQ1	Do you think climate change is caused by a lack of respect for deities?	0 = No; 1 = Yes	1	0
2	FQ2	Do you think climate change is caused by a failure to respect social standards?	0 = No; 1 = Yes	1	0
3	FQ3	Have you seen any early warning signs of the rainy season's imminent arrival?	0 = No; 1 = Yes	1	0
4	FQ4	Have you observed any meteorological, biological or astrological indicators of a good rainy season in the past?	0 = No; 1 = Yes	1	0
5	FQ5	In your opinion, is there an ideal time to plant crops (cereals, legumes and vegetables) according to the lunar cycle?	0 = No; 1 = Yes	1	0
6	FQ6	In your opinion, are the agricultural seasons unfolding in the same way as before, compared to 2000?	0 = No; 1 = Yes	1	1
7	FQ7	In your opinion, is it important to sow according to the lunar calendar?	0 = No; 1 = Yes	1	0
8	FQ8	In your opinion, are high winds more frequent than in 2000?	0 = No; 1 = Yes	1	1
9	FQ9	In your opinion, is the rain increasingly abortive compared to 2000?	0 = No; 1 = Yes	1	0
10	FQ10	Do you think the rain is getting heavier now than it was in 2000?	0 = No; 1 = Yes	0	0
11	FQ11	In your opinion, was there an early cessation of rain compared with 2000?	0 = No; 1 = Yes	1	0
12	FQ12	Do you think the climate changes naturally?	0 = No; 1 = Yes	0	1
13	FQ13	In your opinion, is climate change due to the human impact of energy production?	0 = No; 1 = Yes	0	1
14	FQ14	In your opinion, is climate change due to the impact of man's industrial activities?	0 = No; 1 = Yes	0	1
15	FQ15	Have you ever heard about climate change in the media?	0 = No; 1 = Yes	1	1
16	FQ16	Do you think climate change is due to human impact through deforestation?	0 = No; 1 = Yes	1	1
17	FQ17	Do you think the rain has become more irregular than in 2000?	0 = No; 1 = Yes	1	0
18	FQ18	In your opinion, is there less rain than in 2000?	0 = No; 1 = Yes	1	1
19	FQ19	Do you think it's getting hotter in the dry season than in 2000?	0 = No; 1 = Yes	1	1
20	FQ20	Do you think the nights are warmer than in 2000?	0 = No; 1 = Yes	1	1
21	FQ21	Are the days warmer than in 2000?	0 = No; 1 = Yes	1	1
22	FQ22	Do you think winter has become shorter than in 2000?	0 = No; 1 = Yes	1	1
23	FQ23	In your opinion, is climate change due to the human impact of agricultural activities?	0 = No; 1 = Yes	0	1
24	FQ24	Do you think the rainy season is starting later than in 2000?	0 = No; 1 = Yes	1	1

FQ is the question symbol, and all FQ columns were binary (Yes or No). Source: Computed from HH survey 2023.

Questions related to meteorological parameters (precipitation, wind, and temperature) were selected because of their direct influence on agricultural productivity and the way in which farming households cognitively perceive climate dynamics [27]. Similarly, environmental indicators such as animal behavior, plant phenology, cloud formations, and celestial observations were included to account for the local ecological knowledge used by rural communities to predict weather [22,28–30] (Table 4). Conventional information channels (radio, television, and the internet), as well as consultations with traditional forecasters, were also taken into account, as they significantly influence risk perception [30]. Finally, demographic variables such as age and agricultural experience were included, given that long-term environmental exposure determines an individual's ability to assess climate risks and anticipate adaptation strategies [31]. Table 3 details the operationalized variables used to explain the perceptual discrepancy relative to expert opinions.

Table 4. Description of variables explaining the difference between the opinions of experts and farm households.

No	Variables	Type of Variables	Description
1	Age	Qualitative	Number of years
2	Experience	Qualitative	Number of years
4	Education level	Qualitative	0 = No education; 1 = Primary; 2 = Secondary; 3 = University; 4 = Higher education; 5 = Master; 6 = PhD
5	Country	Qualitative	0 = Haiti; 1= Dominican Republic
6	Environmental indicator	Qualitative	0 = Call or appearance of migratory birds; 1 = Noise of cicadas and ants; 2 = Cry of frogs; 3 = Appearance of rainbows; 4 = Sector rain; 5 = Sunny rain
7	Social networks for information on climate and agriculture	Qualitative	0 = Access; 1 = Media; 2 = Internet
8	Sources of climate and weather information	Qualitative	0 = Sign and change in the landscape; 1 = Mutual help between farmers; 2 = Scientific documents;
9	Vulnerability	Qualitative	0 = Very vulnerable; 1 = Vulnerable; 2 = Less vulnerable

Source: Computed from HH survey 2023.

2.3. Calculating the Quantification of the Gap Between Local Household Perceptions and Expert Opinions on Climate Change

The objective of this study is to quantify the perception gap between farming households and experts in Haiti and the Dominican Republic based on 24 identical binary questions, using the experts' responses as an objective benchmark. The average discrepancy for each household relative to this benchmark was calculated in three steps: (1) binary coding (Yes = 1; No = 0) of the selected variables; (2) calculation of the average response per farming household ("average FQ"); (3) calculation of the benchmark "average FQ" based on the panel of 60 experts.

$$AverageFQexperts = 1/m + \sum_{k=1}^{24} FQk,\ experts \quad (1)$$

where:

m = 60 is the number of experts;

k represents the 24 questions (or FQ columns);
FQk,experts is the average answer to question k given by the experts.

The fourth step was to calculate the perception gaps. The perception gaps correspond to the absolute values of the differences between the average FQ for each farm household and the overall average of the experts:

The fourth step was to calculate the perception gaps, defined as the absolute values of the differences between each farming household's average FQ score and the experts' overall average:

$$\text{Gap Perception}j = |\text{AverageFQexperts} - \text{AverageFQagrij}| \quad (2)$$

where:

j represents farm households.

The fifth step was to discretize the absolute differences into two groups based on the first quartile (Q1 = 0.0347): a difference less than or equal to Q1 was classified as "Identical" (close to expert opinions), whereas a difference greater than Q1 was classified as "Different" (notable divergence). We used the chi-square (χ^2) test to compare individual responses (FQ) and observed proportions between farming households and experts. When sample sizes were small, Fisher's exact test was applied to ensure a more robust estimate, allowing for a more reliable analysis of the associations between climate change perceptions and country of origin.

2.4. Statistical Determinants of the Perceptual Discrepancy

To identify the factors underlying the perception discrepancy between farming households and experts, five key covariates were selected based on established theoretical frameworks [3,30,31]: country of origin, educational level, age of the head of household, access to social networks, and socioeconomic vulnerability.

The vulnerability profile of the 550 households was modeled using multiple correspondence analysis (MCA) based on three standard dimensions (adaptive capacity, sensitivity, and exposure). The composite scores were then used to stratify households into three ordinal levels (highly vulnerable, vulnerable, and less vulnerable) via ordinal logistic regression based on percentile distributions. This classification, consistent with protocols for assessing farming household vulnerability in Hispaniola [3], was used to test the hypothesis that structural vulnerability exacerbates cognitive detachment from scientific evidence.

Finally, multiplicative interaction terms were incorporated into the final binary logistic regression model to account for the nonlinear synergistic effects of interdependent socio-ecological constraints on local risk perceptions.

2.5. Statistical Modeling

The relationships between the perception gap and potential determinants were estimated using a binary logistic regression model. This model is applied when the dependent variable is binary, as is the case here.

3. Results

3.1. Characteristics of Farming Households and HR and DR Experts

3.1.1. Agro–Socio–Economic Characteristics of Farm Households

The sample comprised 550 farming households, the majority of which were headed by men (70.36%) compared to women (29.64%). Participant ages ranged from 35 to 80 years, with 75% being over 40 years old, while agricultural experience ranged from 15 to 45 years. Average household size was 6 in Haiti (up to 14) and 5 in the Dominican Republic (up to 9).

The main crops cultivated include cereals, pulses, and vegetables (tomato, cabbage, chili, and eggplant), and over 68% of farmers spend at least 6 h per day working in their plots.

3.1.2. Expert Profile

The expert panel consisted of 81.66% males and 18.33% females, all holding post-graduate degrees, with a mean age of 46.41 years (ranging from 33 to 78 years). On average, experts possessed 17.43 years of professional experience. Over half of the experts (51.66%) were professor-researchers, 3.34% were dedicated researchers, 25% worked in public organizations, and 20% were employed in private organizations.

3.2. Perception of Climate Change

3.2.1. Start of the Rainy Season

All interviewed farming households and experts agreed that rainy seasons are now significantly more erratic than in the past, to the extent that in some years, they cannot even determine when the seasons begin. These disruptions have a direct impact on planting schedules, preventing the cultivation of first- and second-season crops according to traditional practices. Farming household No. 25 illustrated this situation, stating: "Climate change has profoundly disrupted rainfall patterns. We've been feeling the effects for some time now, and it's now difficult to predict when the rainy seasons will begin. We've had to give up certain crops. In the past, we grew coffee, sorghum, taro, etc., but today, these crops have disappeared." Quantitatively, survey data confirm this seasonal shift. According to respondents (49.1% of households and 90.9% of experts in Haiti, compared with 49.1% of households and 100% of experts in the Dominican Republic), the rainy season historically began in March during the 2000s (Figure 2).

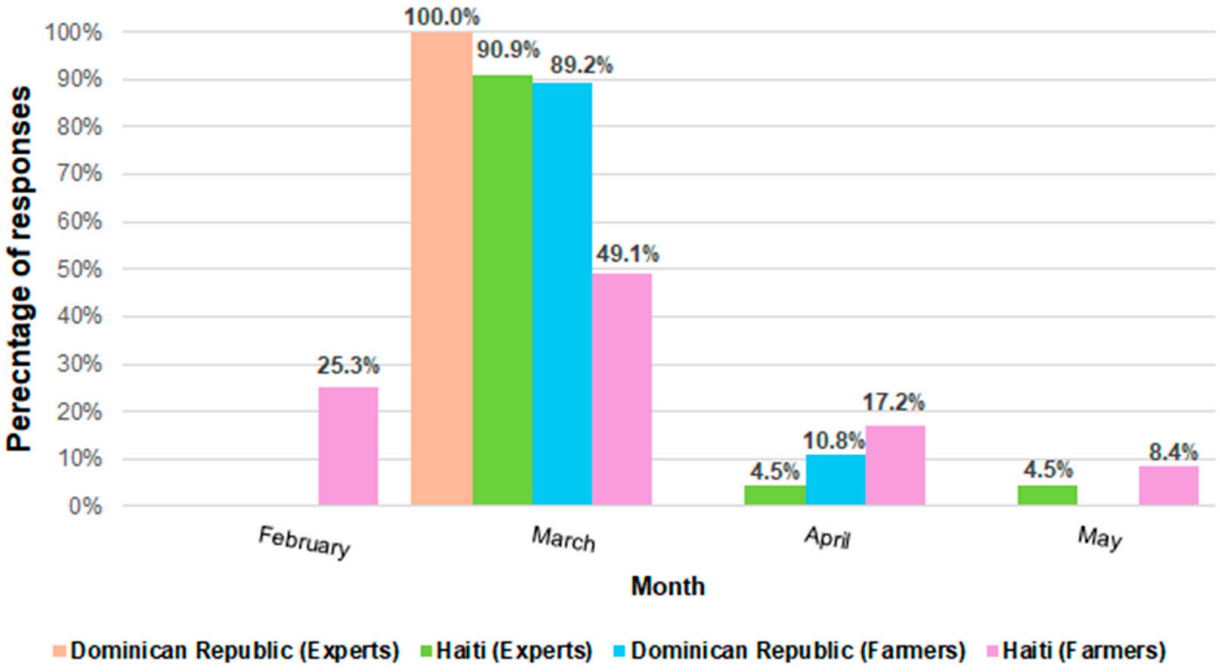


Figure 2. Starting month of the main rainy season in the 2000s.

Currently, the majority of experts (79.5%) and farming households (59.1%) in Haiti, as well as farming households (62.4%) and experts (87.5%) in the Dominican Republic, report that the rainy season now begins in May (Figure 3).

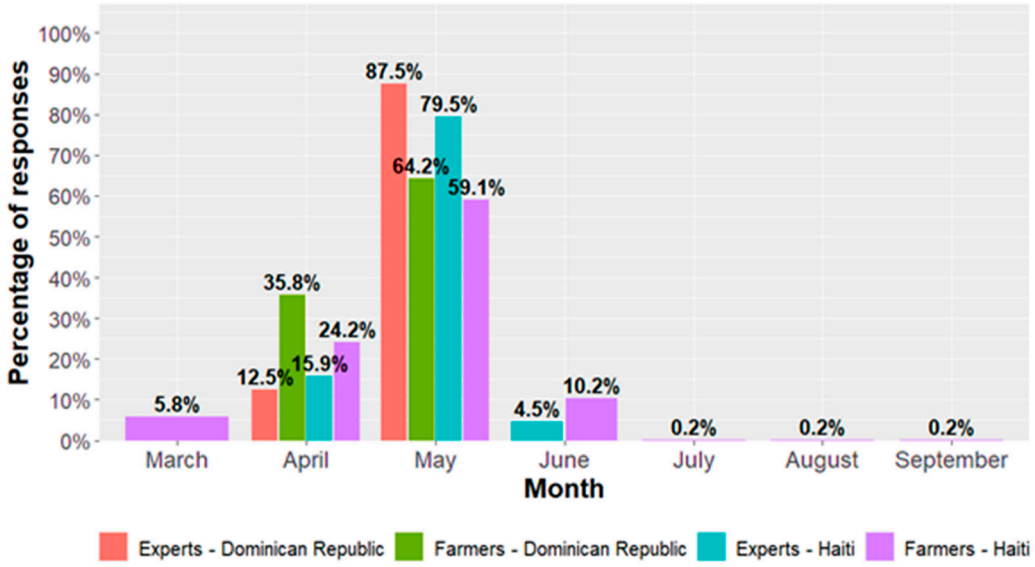


Figure 3. Current start month of the main rainy season.

3.2.2. Sources and Level of Local and Scientific Knowledge

The survey data highlight a structural divergence between the cognitive frameworks of institutional experts and those of farming households regarding weather and climate risk assessment. While the former utilize standardized modeling tools, local farmers base their forecasts on traditional ecological knowledge (TEK) and empirical monitoring of biophysical variables within their micro-environment. This framework is frequently rooted in a stance of cognitive autonomy vis-à-vis conventional science, coupled with a theocentric perception of climate dynamics. In this regard, the perspective of respondent No. 44—who asserts that scientific expertise is ineffective in the face of rainfall and temperature changes perceived as governed exclusively by natural and divine forces illustrates the prevalence of these local rationalities.

Observing Changes in Animal Behavior

Farming households across the island predict weather conditions by observing changes in animal behavior, such as the calls of certain birds (58.9%) including the nightingale (*Luscinia megarhynchos*), common wood pigeon (*Columba palumbus*), carrion crow (*Corvus corone*), and gray kingbird (*Tyrannus dominicensis*), as well as frog vocalizations (57%) and the sound of cicadas and winged ants (54.5%). A minority of households (4.00%) noted that some of these traditional indicators are no longer valid. In contrast, none of the island's experts were aware of these environmental indicators used to signal the approaching rainy season (Figure 4).

Observation of Cloud Formations and Atmospheric Phenomena

Farming households across the island also observe changes in atmospheric phenomena, cloud configurations, and celestial movements. These include changes in cloud color (61.7%), the appearance of rainbows (58.5%), the intensity of sunlight (51.2%), and star configurations (41.9%) to gain insights into upcoming weather conditions and guide crop establishment.

Wind Observation

Farming households across the island anticipate variations in wind patterns. Since time immemorial, traditional societies have used changes in wind behavior as indicators of climate dynamics. Farmers monitor wind direction, strength, and duration relative to the

season. Over half of the surveyed households (51.81%) noted that winds have become less frequent during the primary rainy season and shift direction differently compared to the year 2000.

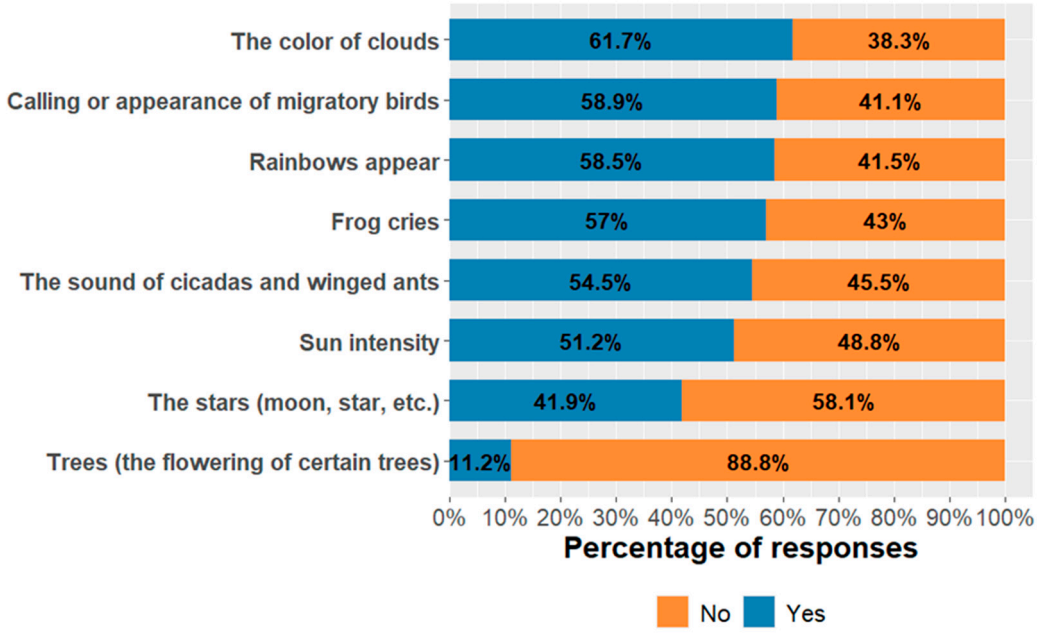


Figure 4. Environmental indicators of the approaching rainy season.

Observation of Variation in Plant Phenology

Nearly half of the island's farming households (11.2%) reported observing shifts in plant phenology, notably the budding and flowering of grasses, crops, and trees such as cassava (*Manihot esculenta*), mango (*Mangifera indica* L.), yam (*Dioscorea* spp.), and Bermuda grass (*Cynodon dactylon*).

3.2.3. Conventional Sources of Weather and Climate Forecasts

A small proportion of farming households on the island rely on conventional sources such as mass media and the internet (19.1% and 33% in Haiti; 46.7% and 21.7% in the Dominican Republic, respectively) to obtain information on agricultural practices and climate change impacts. In Haiti, 47.9% of households have no access to conventional information sources (Figure 5).

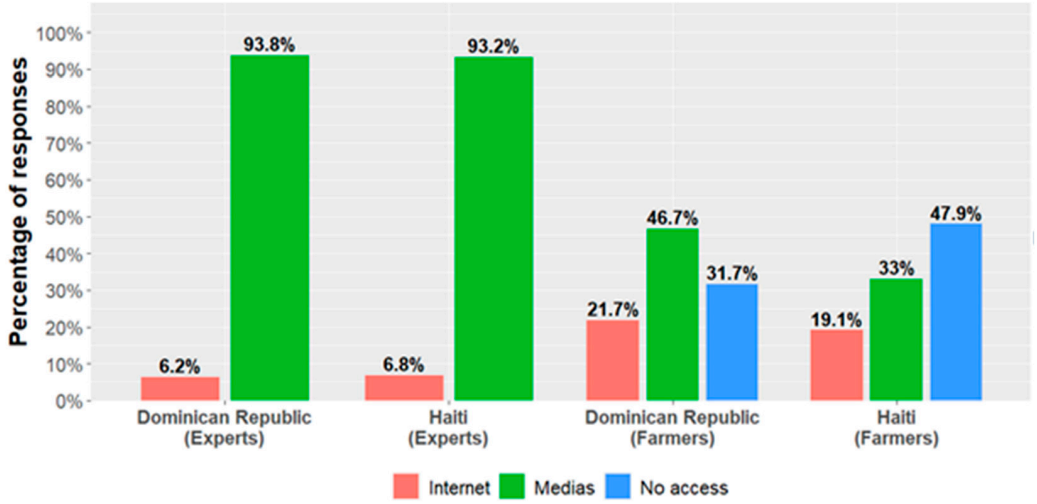


Figure 5. Access to social networks for climate and agriculture information.

The predominance of local information sources in Haiti is linked to a lack of access to electricity, which deprives farming communities of televisions and electronic devices; only 12.00% listen to traditional media (radio) for weather forecasts. By contrast, in the Dominican Republic, 75.00% of households do not rely on local traditional sources, preferring television (65.00%), official weather services (55.00%), and mobile phones (35.00%) for weather and climate information.

In Haiti, 57.90% of farming households find the terminology used in conventional weather forecasts too complex and difficult to understand. They also highlight the absence of local meteorologists to guide them in climate change adaptation and agricultural planning. Furthermore, 66.97% feel that scientific weather information is occasionally inaccurate, fails to correspond to observed local realities, and is communicated irregularly.

3.3. Gap Between What Experts Say and Farm Households' Local Perception

The results indicate that the majority of farming households in Haiti (70%) and a substantial minority in the Dominican Republic (47.50%) hold perceptions of climate change that differ from those of the experts (Table 5).

Table 5. Classification of farm households according to the two ranges of their distance from expert perceptions of climate change.

Country	Ecart Level	Number Farmers Households	Percentage of HHs (%)
Haiti	Identical	129	30
	Different	301	70
Total		430	100
Dominican Republic	Identical	63	52.5
	Different	57	47.5
Total		120	100

Source: Computed survey of 2023.

In the Dominican Republic, 52.50% of farming households hold climate change perceptions similar to those of the experts, compared to only 30.00% in Haiti. This divergence reflects the stronger influence of ancestral traditions on the perceptions of Haitian households, pointing to a distinct cross-country disparity in climate change perception. Figure 6 compares the perception levels of farming households in each country with those of the experts.

The results across the 24 items reveal variability in farming household responses compared to expert opinions, with discrepancy levels varying depending on the specific parameter evaluated. This variability highlights a clear divergence between local household perceptions and expert opinions across several indicators. The distribution of response variations is illustrated in Figure 7.

Specifically, the results of the chi-square (X^2) and Fisher's exact tests reveal significant differences between experts and farming households across the majority of items. However, no statistically significant differences were observed for items FQ_6, FQ_10, FQ_19, FQ_20, FQ_21, and FQ_23 (Tables 5 and 6).

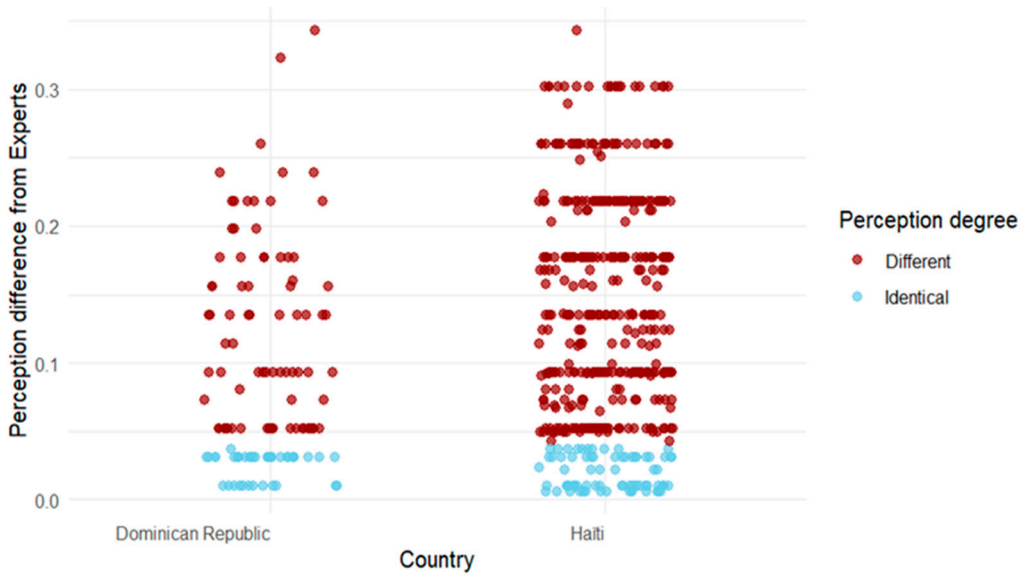


Figure 6. Level of perception of farm households by country.

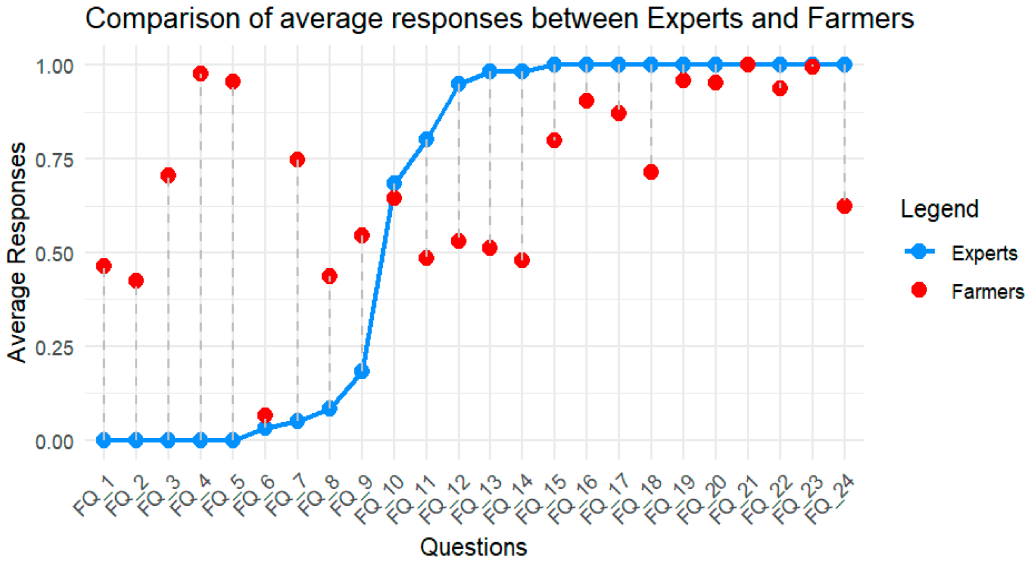


Figure 7. Gap between farm household perceptions and expert opinion.

Table 6. Result of Fisher's and Chi-square (X^2) test showing differences in proportions of 1 or 0 responses between households and experts, for each question.

No	Question	Test	*p* Value
FQ_1	Do you think climate change is caused by a lack of respect for deities?	Fisher	$p < 0.001$
FQ_2	Do you think climate change is caused by a failure to respect social standards?	Fisher	$p < 0.001$
FQ_3	Have you seen any early warning signs of the rainy season's imminent arrival?	Fisher	$p < 0.001$
FQ_4	Have you observed any meteorological, biological or astrological indicators of a good rainy season in the past?	Fisher	$p < 0.001$
FQ_5	In your opinion, is there an ideal time to plant crops (cereals, legumes and vegetables) according to the lunar cycle?	Fisher	$p < 0.001$
FQ_6	In your opinion, are the agricultural seasons unfolding in the same way as before, compared to 2000?	Fisher	$p > 0.05$
FQ_7	In your opinion, is it important to sow according to the lunar calendar?	Fisher	$p < 0.001$

Table 6. *Cont.*

No	Question	Test	*p* Value
FQ_8	In your opinion, are high winds more frequent than in 2000?	(X^2)	$p < 0.001$
FQ_9	In your opinion, is the rain increasingly abortive compared to 2000?	(X^2)	$p < 0.001$
FQ_10	Do you think the rain is getting heavier now than it was in 2000?	(X^2)	$p > 0.05$
FQ_11	In your opinion, was there an early cessation of rain compared with 2000?	(X^2)	$p < 0.001$
FQ_12	Do you think the climate changes naturally?	Fisher	$p < 0.001$
FQ_13	In your opinion, is climate change due to the human impact of energy production?	Fisher	$p < 0.001$
FQ_14	In your opinion, is climate change due to the impact of man's industrial activities?	Fisher	$p < 0.001$
FQ_15	Have you ever heard about climate change in the media?	Fisher	$p < 0.001$
FQ_16	Do you think climate change is due to human impact through deforestation?	Fisher	$p < 0.01$
FQ_17	Do you think the rain has become more irregular than in 2000?	Fisher	$p < 0.001$
FQ_18	In your opinion, is there less rain than in 2000?	Fisher	$p < 0.001$
FQ_19	Do you think it's getting hotter in the dry season than in 2000?	Fisher	$p > 0.05$
FQ_20	Do you think the nights are warmer than in 2000?	Fisher	$p > 0.05$
FQ_21	Are the days warmer than in 2000?	(X^2)	$p > 0.05$
FQ_22	Do you think winter has become shorter than in 2000?	Fisher	$p < 0.05$
FQ_23	In your opinion, is climate change due to the human impact of agricultural activities?	Fisher	$p > 0.05$
FQ_24	Do you think the rainy season is starting later than in 2000?	Fisher	$p < 0.001$

Source: Computed survey of 2023.

3.4. Factors Influencing the Gap Between Farm Households According to Expert Opinion

Country of origin emerged as the primary determinant of the perception gap (Table 7). An odds ratio (OR = 7.97, $p < 0.001$) indicates that, holding all other variables constant, farming households in Haiti were nearly eight times as likely to hold perceptions differing from experts compared to those in the Dominican Republic. Furthermore, the interaction terms between the country (Haiti) and vulnerability level—specifically for the vulnerable (OR = 12.94, $p < 0.05$) and highly vulnerable (OR = 4.18, $p < 0.001$)—demonstrate a statistically significant amplification of the climate change perception gap. These findings indicate that higher socioeconomic vulnerability in Haiti substantially increases the perception gap relative to the Dominican Republic.

Table 7. Results of a binomial logistic model of factors influencing local perception of farm households.

	Odds Ratios	Std. Error	IC_Lower	IC_Upper	*p*_Value
Factors influencing the perception of farm households					
Country					
Dominican Republic	Ref.	Ref.	Ref.	Ref.	Ref.
Haiti	7.97	0.43	3.59	19.39	$p < 0.001$
Vulnerability					
Less vulnerable	Ref.	Ref.	Ref.	Ref.	Ref.
Very vulnerable	4.18	0.72	1.02	17.36	$p < 0.05$
Vulnerable	12.94	0.64	4.09	53.34	$p < 0.001$

Table 7. *Cont.*

	Odds Ratios	Std. Error	IC_Lower	IC_Upper	*p*_Value
Education					
University	Ref.	Ref.	Ref.	Ref.	Ref.
Primary and illiteracy	0.1	0.051	0.04	0.27	$p < 0.001$
Secondary	0.89	0.32	0.47	1.67	$p > 0.05$
Age					
45 ≤ 60 (Middle-aged adults)	Ref.	Ref.	Ref.	Ref.	Ref.
35 ≤ 44 (Young adults)	0.3	0.34	0.15	0.58	$p < 0.001$
61 ≤ 80 (Older adults)	1.51	0.33	0.79	2.92	$p > 0.05$
Network Access					
Internet	Ref.	Ref.	Ref.	Ref.	Ref.
Media	0.75	0.15	0.49	1.11	$p > 0.05$
No access	0.94	0.2	0.62	1.43	$p > 0.05$
Country: Vulnerability					
Dominican Republic: Less vulnerable	Ref.	Ref.	Ref.	Ref.	Ref.
Haiti: Very Vulnerable	0.05	0.52	0.02	0.13	$p < 0.001$
Haiti: Vulnerable	0.25	0.47	0.09	0.6	$p < 0.05$
Pays: Education					
République Dominicaine: University	Ref.	Ref.	Ref.	Ref.	Ref.
Haïti: Primary and illiteracy	1.04	0.59	0.33	3.34	$p > 0.05$
Haïti: Education Secondary	1.46	0.57	0.48	4.56	$p > 0.05$
Education: Level Vulnerability					
Universitaire: moins vulnérable	Ref.	Ref.	Ref.	Ref.	Ref.
Primary and illiteracy: Very vulnerable	22.67	0.64	6.59	81.08	$p < 0.001$
Primary and illiteracy: Vulnerable	1.45	0.69	0.34	5.25	$p > 0.05$
Secondary: Very vulnerable	0.81	0.69	0.2	3.1.	$p > 0.05$
Secondary: Vulnerable	0.12	0.68	0.03	0.41	$p < 0.05$
Age: Education					
45 ≤ 60 (Middle-aged adults)	Ref.	Ref.	Ref.	Ref.	Ref.
≥60 (Older adults): Primary and illiteracy	0.55	0.45	0.23	1.32	$p > 0.05$
≥60 (Older adults): Secondary	0.7	0.44	0.3	1.63	$p > 0.05$
35 ≤ 44 (Young adults): Primary and illiteracy	3.38	0.51	1.26	9.36	$p < 0.05$
35 ≤ 44 (Young adults): Secondary	2.28	0.44	0.96	5.49	$p > 0.05$

Source: Computed from HH survey 2023.

The results indicate that vulnerable (OR = 12.94, $p < 0.05$) and highly vulnerable (OR = 4.18, $p < 0.001$) farming households are significantly more likely to hold perceptions differing from experts compared to less vulnerable households. This demonstrates a direct relationship: greater household vulnerability is associated with a wider perception gap relative to climate change experts.

The age of the household head also significantly influences climate change perceptions. Regression analysis reveals that younger household heads are 70% less likely to hold a perception differing from experts compared to older adults (OR = 0.30, $p < 0.001$). Furthermore, the interaction between a younger household head and a low level of education (illiteracy or primary education) significantly widens the perception gap (OR = 3.38,

$p < 0.05$). Conversely, for older household heads, the interaction with education level (illiterate: OR = 0.55; secondary: OR = 0.70) showed no statistically significant effect ($p > 0.05$). Overall, younger household heads hold perceptions of climate change that align more closely with expert views.

4. Discussion

In Haiti and the Dominican Republic, rural farming households and experts exhibit divergent perceptions of climate change. This gap is explained by the plurality of knowledge sources mobilized by local farming households, which are rooted in ancestral traditions and the empirical observation of biophysical environmental variables, contrasting with the scientific analyses of experts. Rather than simply opposing objective instrumental data to local representations, this study sought to precisely quantify this perceptual gap across the island of Hispaniola. Methodologically, our approach aimed to endogenize the subjective evaluations of both target groups by administering a strictly identical questionnaire. This standardized instrumentation choice was intended to ensure that the measured divergences did not stem from an asymmetry in question formulation, but rather reflected a local reinterpretation of concepts originating from expert epistemology through distinct sociocultural frameworks.

During data analysis, our analytical framework accounted for three major cognitive and structural biases likely to influence farming households' responses: (i) a linguistic bias, where vernacular lexicons (such as the Haitian Creole term tan) struggle to capture the rigor of scientific concepts, thereby confounding short-term weather with long-term climate; (ii) a causal attribution bias, where the experts' biophysical analytical framework sometimes contrasts with the spiritual or fatalistic interpretations of rural populations; (iii) a social desirability bias, wherein high socioeconomic vulnerability may prompt households to overestimate the severity of hazards during surveys in hopes of attracting potential development aid projects. Analyzing these self-reported statements provides a clearer understanding of the rationality underlying this insular gap.

Indeed, comparing farming households' perceptions with expert assessments reveals that the observed gap does not result from a simple "judgment error," but rather reflects a distinct rationality intimately tied to the immediate operational needs of rural farming households. This divergence by no means indicates an inability of farming households to perceive climate dynamics; rather, it is rooted in a profound asymmetry of spatial, temporal, and observational scales. On the one hand, at the macro-climatic scale, experts rely on models smoothed over long periods (typically 30 years) to measure global physical variations, such as average precipitation and temperature trends. On the other hand, at the micro-local scale, farming households' knowledge is forged at the plot level. Households prove particularly responsive to intra-seasonal variability such as a shift of a few weeks in the onset of the rainy season or the occurrence of short but intense dry spells which directly impacts cropping schedules and crop survival.

Furthermore, this divergence highlights deep structural constraints in scientific data production across Hispaniola, particularly in Haiti. Faced with the scarcity, obsolescence, or total absence of a dense ground-based synoptic meteorological network, experts are compelled to rely on interpolated satellite data, global and regional climate models, and IPCC reports. However, these macroscopic tools struggle to capture the high microclimatic heterogeneity created by the island's rugged topography, sometimes leaving expert evidence "blind" to the climate shocks actually experienced by farmers. To mitigate this instrumental uncertainty, our findings confirm that households anticipate weather variations through fine-grained tracking of plant phenological indicators such as the budding of cassava (*Manihot esculenta*) or yam (*Dioscorea* spp.) and animal behaviors, notably the vocal-

izations of the nightingale (Luscinia megarhynchos), the wood pigeon (*Columba palumbus*), and the hooded crow (*Corvus corone*). This approach fits squarely within the conceptual framework of "environmental prediction," according to which flora and fauna adjust their reproductive cycles to climate fluctuations [28,29,32]. This finding aligns with the work of Ankrah et al. [16,33], Balasha et al. [30], Pfeiffer et al. [34], and who demonstrate how rural societies mobilize local knowledge to anticipate weather disruptions.

In summary, unlike conventional approaches that merely oppose empirical knowledge and instrumental data, our study demonstrates that this gap is structural in nature. While experts model a statistical distribution of atmospheric variables over a given space and time step, farming households manage climate through the lens of their daily lived experience and the concept of "ideal rainfall" essential for successful harvests. From this perspective, climate change perception among households develops relative to the perceived water deficit against actual crop requirements rather than raw rainfall measured in millimeters, thereby creating a systemic disconnect between agricultural expectations and official forecasts [17,18].

Our research identifies socioeconomic vulnerability as a major predictor of the magnitude of this observed perception gap. In Haiti, a lack of digital climate literacy and severely limited access to infrastructure exacerbate this divergence. This observation corroborates recent research showing that, in low-income countries, reliance on traditional knowledge is a pragmatic necessity driven by the inaccessibility of scientific forecasts [4,11,27,30]. Conversely, in the Dominican Republic, greater access to digital media narrows this gap, confirming that the climate divide is as much technological as it is linguistic. This finding aligns with the work of Tume et al. [35] and Balasha et al. [30], who highlight the major difficulties farming households face in adopting technologies and comprehending climate information, particularly when delivered in foreign languages or overly technical jargon. In this context, Balehegn et al. [36], Hosen et al. [37], and Balasha et al. [30] affirm that traditional weather and climate forecasts remain crucial for farming households in low-income regions lacking access to modern forecasting systems. Concurrently, we observe a systemic erosion of traditional ecological knowledge (TEK), accelerated by demographic shifts, which poses a major threat to local adaptation strategies. This loss of empirical memory, combined with the decline in bioindicator biodiversity, directly compromises the self-resilience capacity of rural communities.

These perceptual divergences have profound implications for the governance of climate transitions across Hispaniola. Public adaptation policies, often designed top-down based exclusively on expert data, risk encountering a lack of local buy-in. Indeed, if government interventions or non-governmental organization (NGO) projects—such as the introduction of new seed varieties or the installation of irrigation infrastructure—target a phenomenon that farming households do not perceive as their primary vulnerability, the adoption of these measures will fail. To be effective, public transition policies must imperatively integrate the lived reality of populations; otherwise, they risk proposing climate solutions disconnected from local agronomic and socioeconomic urgencies.

Current literature on knowledge integration suggests that inclusion efforts frequently fail when they remain purely symbolic or directive. To address this limitation, our study proposes shifting from a unilateral transmission model to a "knowledge co-production" strategy grounded in the hybridization of evidence (hybrid evidence). Improving the accuracy of climate knowledge at the island scale requires moving beyond sole reliance on macroregional biophysical indicators. We recommend establishing participatory climate observatories where instrumental data are systematically cross-referenced with farmers' empirical monitoring (e.g., phenological indicators, soil moisture status). This bidirectional approach would allow meteorological institutions—such as the Hydrometeorological

Unit of Haiti (UHM)—to locally calibrate and validate satellite and expert models while translating weather forecasts into directly actionable agronomic recommendations for farming households.

However, a critical approach requires recognizing that the intrinsic value of ancestral knowledge extends beyond its mere compatibility with modern analytical tools. Marginalizing or attempting to forcibly alter these traditional systems proves counterproductive and directly compromises the cultural sustainability of rural communities. Any hybridization effort must respect the autonomy and agency of local populations: any evolution of knowledge structures must be driven by the households themselves, who remain the legitimate guardians and custodians of this cognitive heritage. Ultimately, this study demonstrates that the perception gap is primarily a symptom of asymmetrical access to information and development resources. Bridging this gap does not require "correcting" the representations of farming households, but rather strengthening the bridges between different information systems to foster a shared adaptation culture. The resilience of rural households relies not on strict adherence to expert models, but on their ability to navigate between these different knowledge systems to transform climate risks into robust adaptation strategies across the entire island of Hispaniola.

5. Conclusions

This study quantified the perception gap regarding climate change between farming households and experts on the island of Hispaniola. It contrasts the ancestral knowledge of households—grounded in meteorological, biological, and celestial indicators—with the scientific frameworks of institutional experts. To this end, 24 identical items were administered to both groups, with expert responses serving as the baseline reference. The mean distance of each household from these references was subsequently quantified. Chi-square (χ^2) and Fisher's exact tests were used to measure response discrepancies and rank households according to their degree of deviation from expert consensus. A binary logistic regression model was then applied to identify the primary determinants influencing this gap. To categorize the gap, a quantile classification method was applied, dividing absolute gaps into two groups based on the first quartile (Q1). Households with a gap less than or equal to Q1 were classified as holding perceptions similar to experts, whereas those above Q1 were categorized as holding differing perceptions. This methodological framework enabled a robust cross-country comparison between farming households and experts.

The results revealed that 70.00% of households in Haiti and 47.50% in the Dominican Republic hold perceptions differing from experts (OR = 7.97, $p < 0.001$), highlighting a significant cross-country disparity. Although a subset of survey items demonstrated similarities, the majority revealed significant divergence. This indicates that while farming households and experts face identical climate risks, their cognitive frameworks remain distinct. Furthermore, this gap is strongly tied to socioeconomic vulnerability: households classified as vulnerable (OR = 12.94, $p < 0.001$) and highly vulnerable (OR = 4.18, $p < 0.05$) exhibit significantly larger perception gaps. In this context, knowledge co-production—fostering synergy between scientific expertise and traditional knowledge—is critical for a comprehensive understanding of local climate dynamics. By bridging local and scientific insights, a reciprocal dialogue can emerge to drive inclusive and adaptive solutions. In Haiti, integrating local knowledge into national adaptation strategies and expanding educational programs will be crucial to narrowing this divide. Finally, policy interventions must be tailored to observed vulnerability levels while promoting regional collaboration with the Dominican Republic to optimize climate risk management across Hispaniola and support the Sustainable Development Goals (SDGs).

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Institutional Review Board Statement: This study was exempt from ethical review and approval. In accordance with French regulations (notably the Jardé Law on research involving human subjects), non-interventional research conducted in the fields of the humanities and social sciences, based strictly on anonymous and voluntary surveys, does not require mandatory institutional ethical approval. Furthermore, the ethics committee of the University and University Hospital (CHU) of Caen (the corresponding author's institution) was established in March 2024, by which time this research and the field surveys had already begun. Furthermore, in the local study areas (Haiti and the Dominican Republic), no national regulatory framework or local ethics committee (IRB) requires formal authorization for non-medical socioeconomic and environmental studies falling within the social sciences. Since ethics approvals cannot be granted retroactively for fieldwork that has already been completed, no additional institutional certificate can be provided.

Informed Consent Statement: Verbal informed consent was obtained from the participants. The rationale for utilizing verbal consent is privacy.

Data Availability Statement: The datasets generated and analyzed during the current study are not publicly available as they form an integral component of the corresponding author's ongoing doctoral dissertation. This doctoral research is conducted within the "Homme, Sociétés, Risques, Territoire" Doctoral School at Normandie Univ, UNICAEN, CNRS, UMR IDEES (14000 Caen, France), under an international co-supervision agreement with the Climate Change Research Team (ERC2), affiliated with LMI CARIBACT (Natural Hazards, Climate Variability, and Impacts in the Northern Caribbean), Quisqueya University, Haiti. Requests for dataset access should be directed to the corresponding author.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Grid for the quantification of local perception and expert opinions on climate change.

No	FQ	Questions/Variables	Modalities/ Measures	Expected Signs: Farming Household Perception	Expected Signs: Expert Opinion
1	FQ1	In your opinion, is climate change caused by a lack of respect for deities?	0 = No; 1 = Yes	1	0
2	FQ2	In your opinion, is climate change caused by a lack of respect for social norms?	0 = No; 1 = Yes	1	0
3	FQ3	In the past, have you observed warning indicators of the imminent arrival of the rainy season?	0 = No; 1 = Yes	1	0

Table A1. *Cont.*

No	FQ	Questions/Variables	Modalities/ Measures	Expected Signs: Farming Household Perception	Expected Signs: Expert Opinion
4	FQ4	In the past, have you observed meteorological, biological, or astrological indicators of a good rainy season?	0 = No; 1 = Yes	1	0
5	FQ5	In your opinion, is there an ideal time for planting crops (cereals, legumes, and vegetables) according to the lunar cycle?	0 = No; 1 = Yes	1	0
6	FQ6	In your opinion, are agricultural seasons unfolding the same way as before, compared to the year 2000?	0 = No; 1 = Yes	1	1
7	FQ7	In your opinion, is it important to sow according to the lunar calendar?	0 = No; 1 = Yes	1	0
8	FQ8	In your opinion, are strong winds more frequent than in 2000?	0 = No; 1 = Yes	1	1
9	FQ9	In your opinion, has rainfall become increasingly irregular compared to the year 2000?	0 = No; 1 = Yes	1	0
10	FQ10	In your opinion, is rainfall currently becoming increasingly intense compared to the year 2000?	0 = No; 1 = Yes	0	0
11	FQ11	In your opinion, has there been an early cessation of rain compared to the year 2000?	0 = No; 1 = Yes	1	0
12	FQ12	In your opinion, is the climate changing naturally?	0 = No; 1 = Yes	0	1
13	FQ13	In your opinion, is climate change due to human impact related to energy production?	0 = No; 1 = Yes	0	1
14	FQ14	In your opinion, is climate change due to human impact related to industrial activities?	0 = No; 1 = Yes	0	1
15	FQ15	Have you ever heard about climate change in the media?	0 = No; 1 = Yes	1	1
16	FQ16	In your opinion, is climate change due to human impact related to deforestation?	0 = No; 1 = Yes	1	1
17	FQ17	In your opinion, has rainfall become increasingly irregular compared to the year 2000?	0 = No; 1 = Yes	1	0
18	FQ18	In your opinion, is there a decrease in rainfall compared to the year 2000?	0 = No; 1 = Yes	1	1
19	FQ19	In your opinion, is it getting hotter during the dry season compared to the year 2000?	0 = No; 1 = Yes	1	1
20	FQ20	In your opinion, are nights warmer than in the year 2000?	0 = No; 1 = Yes	1	1
21	FQ21	In your opinion, are days warmer than in the year 2000?	0 = No; 1 = Yes	1	1
22	FQ22	Do you think the winter period has become shorter compared to the year 2000?	0 = No; 1 = Yes	1	1
23	FQ23	In your opinion, is climate change due to human impact related to agricultural activities?	0 = No; 1 = Yes	0	1
24	FQ24	In your opinion, is there currently a late onset of the rainy season compared to the year 2000?	0 = No; 1 = Yes	1	1

Note: FQ is the question symbol/code and all FQ columns are binary (0 = No; 1 = Yes).

References

1. Blanfort, V.; Hrabanski, M.; Demenois, J. *Climate Impacts and Challenges in Agriculture, Forests and Food Systems: Perspectives on the Global South*; Springer: Cham, Switzerland, 2026. [CrossRef]
2. Abdulmujeeb, B.H.; Otolorin, G.T.; Adegbite, A.A. Impacts du changement climatique et de la dégradation de l'environnement sur la sécurité alimentaire. In *Tirer Parti des Technologies Microbiennes pour la Sécurité Alimentaire*; CRC Press: Boca Raton, FL, USA, 2026; pp. 34–60.
3. Duvil, J.; Feuillet, T.; Emmanuel, E.; Paul, B. Assessing the Vulnerability of Farming Households on the Caribbean Island of Hispaniola to Climate Change. *Climate* **2024**, *12*, 138. [CrossRef]
4. Masara, A.N.; Ndunda, E.; Nyamira, E.N. Perception of Climate Change among Smallholder Dairy Farmers in Njoro Sub County, Nakuru County, Kenya. *Asian J. Geogr. Res.* **2026**, *9*, 122–133. [CrossRef]
5. Duvil, J. Farmers' Perceptions and Adaptation Strategies to the Impacts of Climate Change in the Caribbean Region: The Case of Haiti and the Dominican Republic. Master's Thesis, Université Paris-Saclay, Paris, France, 2021.
6. Bernard, D.; Chery, R.; Biabiany, E.; Cécé, R. Precipitation Regimes in Haiti: A Clustering Analysis Using CHIRPSv2 Data (Period 1981–2020). *Prepr. HAL* **2025**, hal-05360857. [CrossRef]
7. Valera, K.; Sharifi, A. Index-based mapping and assessment of flood vulnerability for climate adaptation at the neighborhood level: A case study of Santo Domingo, the Dominican Republic. *Int. J. Disaster Risk Reduct.* **2025**, *120*, 105362. [CrossRef]
8. Leal Filho, W.; Lütz, J.M.; Totin, E. Obstacles to implementing indigenous knowledge in climate change adaptation in Africa. *J. Environ. Manag.* **2025**, *373*, 123678. [CrossRef] [PubMed]
9. Cisse, M.N.; Fall, M. Endogenous Knowledge and Farmers' Strategies for Adapting to Climate Change in the Groundnut Basin of Senegal: Between Ecological Memory, Local Innovation and Dialogue with Science. *SciFrontiers J. Sci. Innov.* **2026**, *1*, 49–62. Available online: https://novalexpress.com/SFJSI/index.php/sfjsi/article/view/4 (accessed on 22 June 2026).
10. Martiarena, M.L.; Temudo, M.P. Endogenous learning and innovation in African smallholder agriculture: Lessons from Guinea-Bissau. *J. Agric. Educ. Ext.* **2024**, *30*, 161–179. [CrossRef]
11. Carmona, R.; Reed, G.; Thorsell, S.; Dorough, D.S.; MacDonald, J.P.; Rai, T.B.; Sanago, G.A. Analysing engagement with Indigenous Peoples in the Intergovernmental Panel on Climate Change's Sixth Assessment Report. *npj Clim. Action* **2023**, *2*, 29. [CrossRef]
12. Tham-Agyekum, E.K.; Ndimbo, G.K.; Boineelo, P.L. Indigenous agricultural communication systems as pathways for knowledge transfer and adoption of sustainable farming practices in rural Ghana. *Front. Sustain. Food Syst.* **2026**, *10*, 1846686. [CrossRef]
13. Petzold, J.; Andrews, N.; Ford, J.D. Indigenous knowledge on climate change adaptation: A global evidence map of academic literature. *Environ. Res. Lett.* **2020**, *15*, 113007. [CrossRef]
14. Ayanlade, A.; Radeny, M.; Morton, J.F. Comparing smallholder farmers' perception of climate change with meteorological data: A case study from southwestern Nigeria. *Weather Clim. Extrem.* **2017**, *15*, 24–33. [CrossRef]
15. Silva-Ávila, P.; Rojas Hernández, J.; Barra, R.O. Knowledge Alliances for Global Change Adaptation: A Relational Approach Based on Traditional Ecological Knowledge, Territorial Management, and Community Practices in the Chilean Context. *Sustainability* **2025**, *17*, 3653. [CrossRef]
16. Ankrah, D.A.; Mensah, J.; Anaglo, J.N.; Boateng, S.D. Climate variability indicators-scientific data versus farmers perception; evidence from southern Ghana. *Cogent Food Agric.* **2023**, *9*, 2148323. [CrossRef]
17. Kosmowski, F.; Lalou, R.; Sultan, B.; Ndiaye, O.; Muller, B.; Galle, S.; Séguis, L. Observations et perceptions des changements climatiques: Analyse comparée dans trois pays d'Afrique de l'Ouest. In *Les Sociétés Rurales Face aux Changements Climatiques et Environnementaux en Afrique de l'Ouest*; Sultan, B., Lalou, R., Amadou Sanni, M., Oumarou, A., Soumaré, M.A., Eds.; IRD: Marseille, France, 2015; pp. 89–110, ISBN 978-2-7099-2146-6.
18. Meze-Hausken, E. Contrasting climate variability and meteorological drought with perceived drought and climate change in northern Ethiopia. *Clim. Res.* **2004**, *27*, 19–31. [CrossRef]
19. Osbahr, H.; Dorward, P.; Stern, R.; Cooper, S. Supporting agricultural innovation in Uganda to respond to climate risk: Linking climate change and variability with farmer perceptions. *Exp. Agric.* **2011**, *47*, 293–316. [CrossRef]
20. Botzen, W.J.W.; Thepaut, L.D.; Banerjee, S. Kahneman's insights for climate risks: Lessons from bounded rationality, heuristics and biases. *Environ. Resour. Econ.* **2025**, *88*, 2663–2688. [CrossRef] [PubMed]
21. Magaya, S.; Fitchett, J.M. Acknowledging a Global South phenological science: The use of phenological and meteorological indicators in indigenous knowledge systems in Rural South Africa. *Int. J. Biometeorol.* **2026**, *70*, 128. [CrossRef] [PubMed]
22. Munyaka, J.-C.B.; Hlal, M.; Lolemtum, J.T. Integrating Indigenous and scientific early warning systems for climate resilience in the Karamoja Cluster of Kenya and Uganda. *Discov. Sustain.* **2026**, *7*, 42. [CrossRef]
23. Zapata, L. Drivers of Climate Vulnerability to Tropical Storms: A Comparative Analysis of Adaptive Capacities in Haiti and Dominican Republic. *Estud. Desarr. Soc. Cuba Am. Lat.* **2023**, *11*, 112–130. Available online: https://revistas.uh.cu/revflacso/article/view/7816 (accessed on 22 June 2026).

24. Herrera, D.A.; Mendez-Tejeda, R.; Centella-Artola, A.; Martínez-Castro, D.; Ault, T.; Delanoy, R. Projected hydroclimate changes on Hispaniola Island through the 21st century in CMIP6 Models. *Atmosphere* **2020**, *12*, 6. [CrossRef]
25. PNACC-RD. *Plan Nacional de Adaptación para el Cambio Climático en la República Dominicana 2015–2030: Un país Resiliente Frente al Cambio Climático*; Ministerio de Medio Ambiente y Recursos Naturales: Santo Domingo, Dominican Republic; CNCCMDL: Santo Domingo, Dominican Republic; GEF: Santo Domingo, Dominican Republic; PNUD: Washington, DC, USA, 2016.
26. Samuel, A.; Merkebu, J. Exploring sampling strategies to maximize qualitative research studies in adult education. *Adult Learn.* **2026**, *37*, 89–99. [CrossRef]
27. Mohammadi, E.; König, T.; Zimmermann, B. Multi-layered sampling strategy for qualitative interviews: Methodical reflections on sampling interviews with the European Research Council review experts. *Int. J. Soc. Res. Methodol.* **2026**, *29*, 1–13. [CrossRef]
28. Duvil, J.; Durone, J.-B.; Paul, B. Innovations agricoles en réponse au changement climatique. In *Innovations Agricoles et Agroalimentaires en Haïti*; Presses Universitaires des Antilles: Pointe-à-Pitre, France, 2023; pp. 131–165.
29. Yetişgin, S.O.; Canan, S. Traditional Ecological Knowledge and Pastoral Decision-Making: Sustaining Mobile Livestock Systems in Turkey. *Prepr. Res. Sq.* **2025**. [CrossRef] [PubMed]
30. Mwanga, S.S.; Mbekenga, M.J.; Mahoo, H.F.; Yonah, I.B. Utilization of Indigenous Knowledge (IK) Indicators in Weather Forecasting and Livelihood Planning in Coastal Regions of Tanzania. *Am. J. Clim. Chang.* **2025**, *14*, 393–412. [CrossRef]
31. Balasha, A.M.; Munyahali, W.; Kulumbu, J.T.; Okwe, A.N.; Fyama, J.N.M.; Lenge, E.K.; Tambwe, A.N. Understanding farmers' perception of climate change and adaptation practices in the marshlands of South Kivu, Democratic Republic of Congo. *Clim. Risk Manag.* **2023**, *39*, 100469. [CrossRef]
32. Dunn, P.O.; Winkler, D.W.; Whittingham, L.A.; Hannon, S.J.; Robertson, R.J. A test of the mismatch hypothesis: How is timing of reproduction related to food abundance in an aerial insectivore? *Ecology* **2011**, *92*, 450–461. [CrossRef] [PubMed]
33. Ankrah, D.A.; Kwapong, N.A.; Boateng, S.D. Indigenous knowledge and science-based predictors reliability and its implication for climate adaptation in Ghana. *Afr. J. Sci. Technol. Innov. Dev.* **2022**, *14*, 1007–1019. [CrossRef]
34. Pfeiffer, S.; Ekkirala, H.C.; Arlikatti, S. Participatory engagement and lived experiences of early warning and preparedness in two rural communities in Kerala, South India. *Int. J. Disaster Risk Reduct.* **2026**, *133*, 105986. [CrossRef]
35. Tume, S.; Jude, N.; Nji, F. Indigenous Knowledge and Farmer Perceptions of Climate and Ecological Changes in the Bamenda Highlands of Cameroon: Insights from the Bui Plateau. *Climate* **2019**, *7*, 138. [CrossRef]
36. Balehegn, M.; Balehey, S.; Fu, C.; Liang, W. Indigenous weather and climate forecasting knowledge among Afar pastoralists of north eastern Ethiopia: Role in adaptation to weather and climate variability. *Pastoralism* **2019**, *9*, 8. [CrossRef]
37. Hosen, N.; Nakamura, H.; Hamzah, A. Adaptation to climate change: Does traditional ecological knowledge hold the key? *Sustainability* **2020**, *12*, 676. [CrossRef]

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