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A Long Way toward Climate Smart Agriculture: The Importance of Addressing Gender Inequity in the Agricultural Sector of Guatemala

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Abstract: In the context of climate change's detrimental effects on agricultural production and food security, climate-smart agriculture (CSA) strategies constitute a promising approach to reduce vulnerability and boost adaptation capacity and resilience within farmers. However, CSA strategies should address gender dynamics to reach their full potential. This study analyzed the barriers and opportunities for the implementation of gender-sensitive CSA strategies in rural Guatemala, a low-latitude country with a high gender gap index, through the perceptions of agricultural extensionists. For this purpose, we conducted an online survey among Guatemalan agricultural extensionists who attended a series of Climate Services for Agriculture workshops between May and July 2021 and analyzed the results using a qualitative approach. Results suggest that women in rural Guatemala are frequently excluded from climate information access, agricultural training, and decision-making spaces in which agricultural resource management strategies are defined. We argue that this exclusion represents a barrier to the improvement in adaptation capacity and resilience and that gender inequity should be addressed to implement successful gender-sensitive CSA approaches. Generating gender-sensitive indicators and training extensionists against gender bias could be a starting point, but further research is necessary to understand gender dynamics in rural Guatemala.

Keywords: climate change; Central America; women farmers; food security

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1. Introduction

Food security is understood as the "physical and economic access to sufficient, safe, and nutritious food that meets dietary needs and food preferences for an active and healthy life" [1,2]. Climate change threatens food security due to its adverse effects on marine, coastal, and terrestrial ecosystems, which in turn have detrimental effects on livelihoods that depend on these ecosystems, leading to income loss [3,4]. Uncertainty regarding future water availability and water quality due to changes in different water balance components, changes in the frequency and intensity of extreme events, and changes in temperature patterns pose direct detrimental effects on agricultural production. Additionally, indirect effects of climate change, such as pests and invasive species proliferation, can significantly affect agricultural production [5].

The negative impacts of climate change on agriculture occur globally but have disproportionate effects on vulnerable populations and countries. In particular, it is expected that low-latitude countries will experience adverse and consistent effects on crop production in the near future, especially for crops such as maize, wheat, and rice [6]. In this context, climate-smart agriculture (CSA) emerged as an approach to transform agricultural systems with the aim of supporting sustainable food production, food security, and sustainable development [7,8]. Even when there is no universally accepted definition of sustainable

development or sustainability, there is a general agreement regarding the three pillars or dimensions of sustainability: economy (human welfare), ecology (environmental integrity), and society (human relationships, equity, and social justice) [9]. By focusing on food security, climate change adaptation, and ecosystem management, the concept of CSA addresses the three dimensions of sustainable development and aims to maintain a balance between them while enhancing agricultural productivity [7,9].

CSA is defined here as a group of strategies that aim to tackle the different challenges posed by the detrimental effects of climate change on agriculture by diminishing vulnerability, increasing agricultural production, and enhancing adaptive capacity and resilience [4,9,10]. In this context, vulnerability is defined as the product of the interaction between exposure, sensitivity, and responsive capacity to climate change effects. Adaptive capacity, or adaptation, refers to the means or resources that are used or could be used to reduce vulnerability. Finally, resilience is the capacity to recover from climate change's detrimental effects and return to the original state [4].

CSA strategies could be applied at different scales, from smallholders to transnational entities. Operatively, CSA strategies often focus on greenhouse gases (GHGs) reduction, agriculture's adaptation to climate change, resilience enhancement to weather extreme events [4], and ensuring food security [11]. Overall, CSA strategies aim to meet agricultural-related communities' needs (food, fiber, and other primary production materials), increase efficiency, and support sustainable development, poverty relief, and food security through science-based actions capable of responding to climate change challenges [4,12].

Since climate change affects multiple dimensions of food security (availability, access, utilization, and stability [5]), CSA strategies should exceed technical and economic aspects of agriculture and involve socio-cultural dimensions. One of these dimensions is gender [3]. In many rural areas, agricultural roles and labor are usually divided by gender, leading to differences in mitigation, adaptation, and resilience capacity among men and women [4,13,14]. Different studies on gender-specific responses to climate change conducted in rural areas of Africa, Asia, and Latin America revealed that women were comparatively more vulnerable to the effects of climate change than men. This increased vulnerability was attributed to asymmetries regarding access to education, health, land, natural resources, and decision-making spaces between men and women [3,15–19]. In rural settings, women's workloads are found to be higher than those for men when non-remunerated work is considered [20]. In addition, women's workload related to subsistence crops and other rural activities tends to increase dramatically in rural areas that experience climate change-induced migration by men, which signifies greater climate change impacts on women [15,16].

Gender inequity in terms of control and access to natural resources represents an obstacle to sustainable development in agriculture and has economic and efficiency implications [3]. Gender equity refers to the fairness of treatment and opportunity that men and women receive according to their needs. It is important to highlight that the concept of gender equity recognizes that men's and women's needs might differ even in the same socioeconomic context [21,22]. However, gender equality refers to strict egalitarianism between men and women [23] and does not necessarily acknowledge historical disadvantages that influence women's and men's present opportunities. In this way, while equality is considered an empiric concept, equity has an ethical connotation and is related to social justice and human rights [24]. Under these conceptions, equality without equity could lead to unfair treatment of men and women [25]. This is the reason why the terms equity and inequity are used in the context of the present study and preferred over equality/inequality.

Gender inequity in rural sectors restricts women's access to climate risk information, influencing their perceptions and willingness to adopt CSA practices [26]. These barriers have a detrimental effect on women's access to and adoption of CSA technologies [14] affecting food security. In addition, it is important to highlight that CSA interventions are not gender neutral per se; labor requirements, economic costs, and social empowerment dynamics play a significant role in CSA approaches and may impact household members

differently, depending on their gender. A narrow CSA approach that focuses solely on agricultural innovations and production increases without considering gender dynamics, may have unintended and detrimental effects on livelihoods [3,27]. However, when CSA strategies are applied with an integrated approach and a transformative intention [27], these can have multiple benefits for communities, not only regarding food security but also regarding poverty and gender inequity reduction. For these reasons, it is essential to address gender inequity in rural sectors when designing CSA strategies and to consider context-specific aspects [27]. From a global perspective, the implementation of comprehensive CSA approaches contributes to the achievement of several Sustainable Development Goals (SDG) from the United Nation's 2030 Agenda for sustainable development [28], such as Zero Hunger (SDG 2), No Poverty (SDG 1), Gender Equality (SDG 5), and Climate Action (SDG 13). In fact, CSA approaches are frequently promoted as a climate-action strategy [29–31].

CSA approaches that consider gender dynamics are more likely to reach their full potential and generate a positive effect on livelihoods than CSA approaches that are gender blind [32]. A pilot study conducted between 2016 and 2017 in Indonesia, the Philippines, and Lao's Peoples Democratic Republic related to implementing sustainable rice production practices supports this idea. Since agriculture in Asia is changing from labor-intensive to mechanized operations, smallholders must increase their productivity to improve their livelihoods, and using a drum seeder can be of great help [33]. Drum seeders can potentially increase labor productivity and income, apart from reducing work burden and time. However, since another critical change in this area is the feminization of agriculture, communication and education efforts must be put in place to target women farmers and, in that way, promote the adoption of this technology within them. FAO [33] recommended promoting the participation of women in field demonstrations and training sessions with the aim of amplifying the benefits related to seed drum use. Another study on the adoption of CSA approaches conducted in Somalia in 2019 revealed that women largely performed key crop production practices and, therefore, identified this group as key players in implementing CSA practices and adaptation actions [34]. Since access to climate services (climate information based on scientific data that is useful to assist decision-makers) is a fundamental component of CSA approaches [35], and it is generally limited to rural women [8], it is another important factor that should be considered when designing CSA strategies.

Guatemala is a low-latitude country highly exposed to natural hazards and among the most vulnerable of the tropical region to climate change [36]. According to the last National Survey on Life Conditions (ENCOVI 2014), 50.5% of Guatemala's population lived in rural areas, equivalent to 8 million people. Out of this percentage, 48.4% corresponded to Indigenous peoples. A total of 76.1% of rural households live in poverty conditions, which correlates with a high stunting index in children. [37]. Guatemala also presents the highest gender inequality index in the region [36]. Some official efforts have been developed to address this last reality in the agricultural sector. The Ministry of Agriculture, Cattle, and Food (MAGA), for example, designed an institutional policy to promote the active participation of women in the rural sector as well as their "economic, social, and political empowerment" and the development of their productive, organizational, and commercial capacities. Guaranteeing women's food security, strengthening women's leadership capacity, and increasing women's participation in decision-making are among the stated specific objectives of this policy [38]. These objectives are expected to be translated into actions and applied in official rural extension approaches in Guatemala. This policy was developed for the period 2014–2023, so it is still early to evaluate its effectiveness.

In this context, the Market Access for Smallholders program (MAS) implemented a comprehensive technical assistance package to provide training, local capacity building, and export market access to individual farmers and producer associations in the Western Highlands of Guatemala. This was achieved through partnerships between Colorado State University (CSU), the Agricultural and Microenterprise Development Association (ADAM), the Association for the Comprehensive and Sustainable Development of Agriculture in

Guatemala (ADISAGUA), and the financial support of Walmart and Mercy Corps. This program aims to increase farmers' resilience to climate change by applying CSA approaches and boosting food security. One of these CSA approaches implied conducting training workshops for agricultural extensionists on the provision of climate services for farmers. These workshops were held between May and July 2021. The training was based on the Participatory Integrated Climate Services for Agriculture (PICSA) manual [39]. The methodology proposed in the PICSA manual is (as indicated by its name) participatory. It allows the integration of farmers' traditional ecological knowledge [40] and scientific information, intending to facilitate informed decision-making and farming planning in the context of climate change. This methodology also allows the identification of gender dynamics and labor division in rural households. After the workshops, attendees were invited to complete an online survey that included questions on gender dynamics in the rural sector of Guatemala.

This study aims to explore and identify the barriers and opportunities that Guatemala's rural sector presents for implementing of gender-sensitive CSA strategies. For this purpose, we analyzed the perceptions of a group of agricultural extensionists on the topic through their responses to a climate services for agriculture post-workshop survey. These perceptions were contrasted with statistical information and the most recent literature on the topic and were used to answer the following research questions: (1) What are the most prevalent barriers for gender equity in the rural sector of the Western Highlands of Guatemala? (2) Is gendered division of labor a reality in the area and a component of gender inequity? (3) Are agricultural extensionists aware of current statistics related to gender dynamics in the rural sector? (4) What are the opportunities to surpass the barriers for gender equity in the area?

2. Materials and Methods

2.1. Case Study Description

The Western Highlands of Guatemala are known for their marginal soils, which are susceptible to erosion, and the frequent occurrence of climate-related hazards, such as floods, droughts, and landslides. In addition, this region concentrates most of Guatemala's subsistence agriculture and indigenous population, which frequently live under extreme poverty conditions [29]. For these reasons, and the fact that the described biophysical and socioeconomic conditions exacerbate the negative impacts of climate change in this region, the Western Highlands of Guatemala were chosen as the target area of the MAS project and the present study. The Western Highlands of Guatemala have also been a target for the promotion of CSA approaches in the past (starting in the 1980s), which, overall, had deficient results due to a technology-based focus and a lack of awareness of other intervening factors [29].

Extensionists and extensionists' coordinators from the Western Highlands of Guatemala were identified and invited to participate in the climate services for agriculture workshops by Mercy Corps and MAGA. The locations and dates of the three workshops were intentionally chosen to provide different attendance opportunities to extensionists distributed across the Western Highlands of Guatemala (the target of the MAS project). The chosen locations were the city of Quetzaltenango (better known as Xela, located in the department of Quetzaltenango), the city of Sololá (department of Sololá), and the city of Cobán, department of Alta Verapaz (Figure 1).

Every workshop lasted between 3 and 2 days. Due to Guatemala's 2021 COVID-19 pandemic contingency, attendance was limited to a maximum of 26 participants per workshop. However, the presential workshop organized in Cobán had to be canceled for the mentioned contingency and was conducted online, which allowed for the attendance of a higher number of participants (66). A total of 109 extensionists and extensionists' coordinators participated in these workshops.

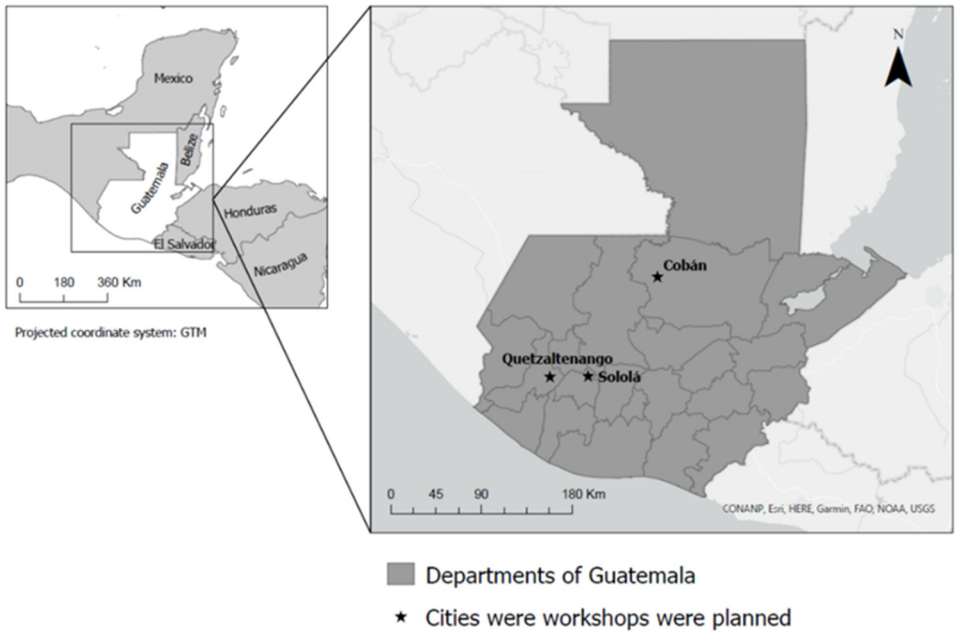

Figure 1. Cities of Guatemala where climate services for agriculture workshops were planned. GIS layers source: UN Office for the Coordination of Humanitarian Affairs—Field Information Services.

2.2. Data Collection

We conducted a survey among the attendees of three climate services for agriculture workshops that occurred between May and July 2021. The 109 participants were sent an email invitation to participate in the online post-workshop survey analyzed in the present study. This survey aimed to assess the following aspects: (1) participants' perceptions of the access and use of climate data/information; and (2) participants' perceptions of the challenges and opportunities that gender dynamics pose for the adoption of climate change adaptation and mitigation strategies in the rural sector of Guatemala's Western Highlands. The survey questionnaire was structured in two distinctive sections that addressed the mentioned aspects: "Access and use of climate information" and "Gender and climate change". The second section included questions that assessed extensionists' knowledge of census data on gender demographics in Guatemala's rural sector and questions based on extensionists' experiences in the field (see supplementary). The present study focuses on participants' responses to the second section of the questionnaire.

The focus population of this study was the rural extensionists and extensionists' coordinators that participated in the climate services for agriculture workshops organized by the MAS project in Guatemala, since they regularly worked with farmers in the Western Highlands of Guatemala. Therefore, participants' expertise in the geographical area of interest for this study was guaranteed. A total of 13 out of 22 Guatemalan departments were named within respondents' geographical areas of professional influence: Alta Verapaz, Baja Verapaz, Chimaltenango, Huehuetenango, Jalapa, Quetzaltenango, Quiché, Retalhuleu, Sacatepéquez, San Marcos, Sololá, Suchitepéquez, and Totonicapán (Figure 2). The PICSA methodology discussed in the workshops includes activities that trigger the identification of gendered division of labor in rural communities advised by extensionists. It was expected that these activities would elicit reflection regarding gender dynamics in the rural sector and provide some context to answer the questionnaire.

The questionnaire was distributed via email using Survey Monkey Survey Software (www.surveymonkey.com, accessed on 17 May 2021). The survey was conducted in July 2021. Reminders were sent over email every three days. The data collection process lasted two weeks. Of the 109 extensionists contacted via email, 56 answered the survey, and 44 answered the questions related to gender dynamics (response rate of 40%). Of the 44 participants who responded to gender-related questions, 37 stated their gender identity:

27 identified as men and 10 as women. These last 44 responses are the ones analyzed in the following section (Figure 3).

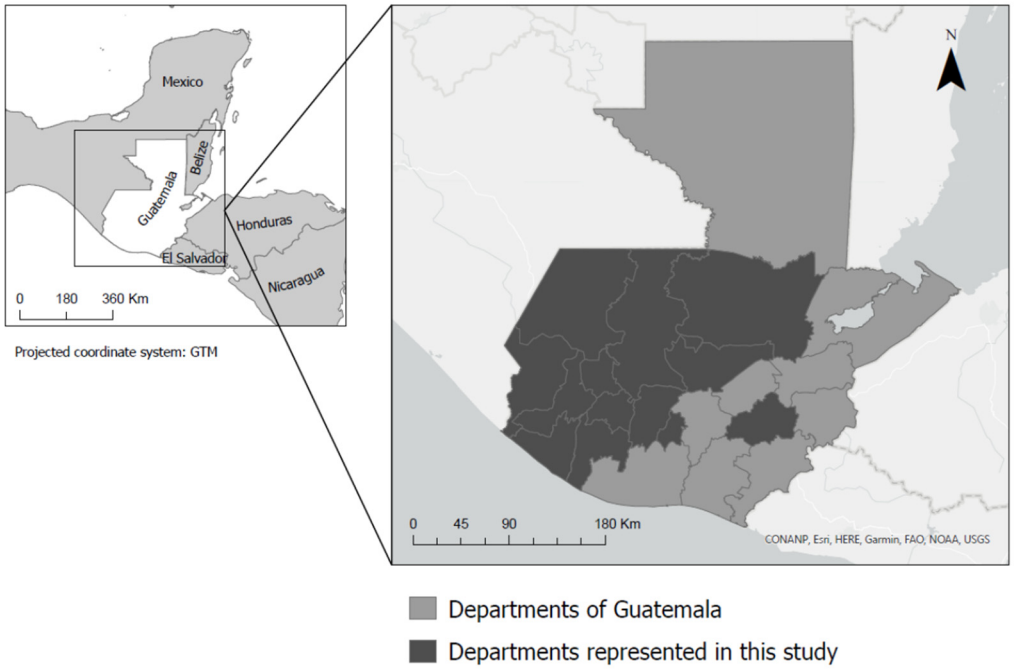

Figure 2. Guatemalan departments included within respondents' geographical areas of professional influence. GIS layers source: UN Office for the Coordination of Humanitarian Affairs—Field Information Services.

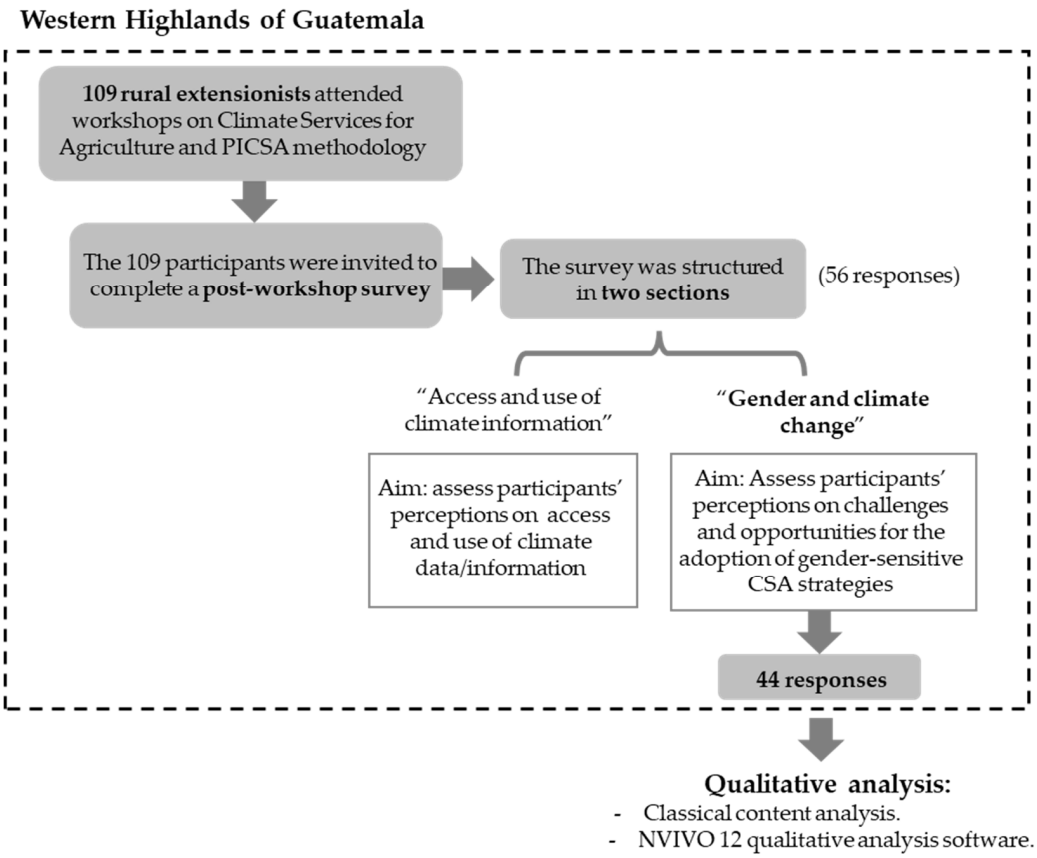

Figure 3. Summary of the methodological approach.

2.3. Data Analysis

We performed a qualitative analysis of the questionnaire responses using NVivo 12 qualitative analysis software [41]. NVivo, developed by QSR International, aids the organization and analysis of qualitative data, which can be stored in different formats [42,43]. In this case, the results of the survey were stored in an Excel spreadsheet that was uploaded to NVivo 12. For closed-ended responses, we obtained descriptive statistics, such as frequency and central tendency measures. A classical content analysis approach [44] was applied for open-ended responses. Classical content analysis (or just "content analysis") has been defined as "the quantitative description of the manifest content of communication" [45]. In this technique, text (in this case, open-ended responses) is divided into segments, and segments are given an associated descriptor or "code". Codes can be deductively or inductively produced. Then, the frequency of each code within the dataset is obtained, which can be used to derive descriptive statistics [44]. This technique is suitable for exploratory research, such as the present study, since it allows the identification of predominant topics or themes [44,46] that can be studied further in future studies. In NVivo, codes are equivalent to "nodes", which are used to place certain meaning to different text sections [46]. NVivo simplifies the coding processes and the reorganization of codes, since text can be highlighted and moved into (or out from) a node [43,47].

A total of 34 main nodes were defined, covering the open-ended questions in the questionnaire. From these, 15 nodes were related to gender aspects in the agricultural sector. This last portion of the data is the one analyzed in this paper. Following a framework analysis [48], different aspects (nodes) were grouped under general themes representing challenges and opportunities for the inclusion of a gender approach in the agricultural sector of Guatemala. Qualitative results should not be generalized outside the population described above. The design and implementation of this study was evaluated and qualified as "exempt" by the IRB office at Colorado State University (IRB Study #2463).

3. Results

3.1. Barriers for Women in the Rural Sector

The results of this subsection are illustrated in Figure 4. A total of 72.3% of the respondents considered that there were differences in the ability to access climate information between rural men and women. From this group, 94% of the respondents stated that women in rural Guatemala had less access to climate information due to social norms and cultural patterns, including *machismo* (30.3%), lower levels of education compared to men (24.2%), and lack of or exclusion from training activities (18.2%). Half of the respondents based their answers on their personal experience, while the other half named official statistics as their source of information.

A total of 85.4% of the respondents expressed that there were differences in the level of participation in decision-making processes among rural men and women. From this group, 94.1% of the respondents stated that rural women are excluded from decision-making processes due to social norms and cultural patterns that determine different roles among genders: "men make decisions, women do housework".

Less than half of the respondents (47%) considered that there were differences in vulnerability to climate change effects between rural Guatemalan men and women. From this, 56.3% stated that women are more vulnerable to climate change effects than men.

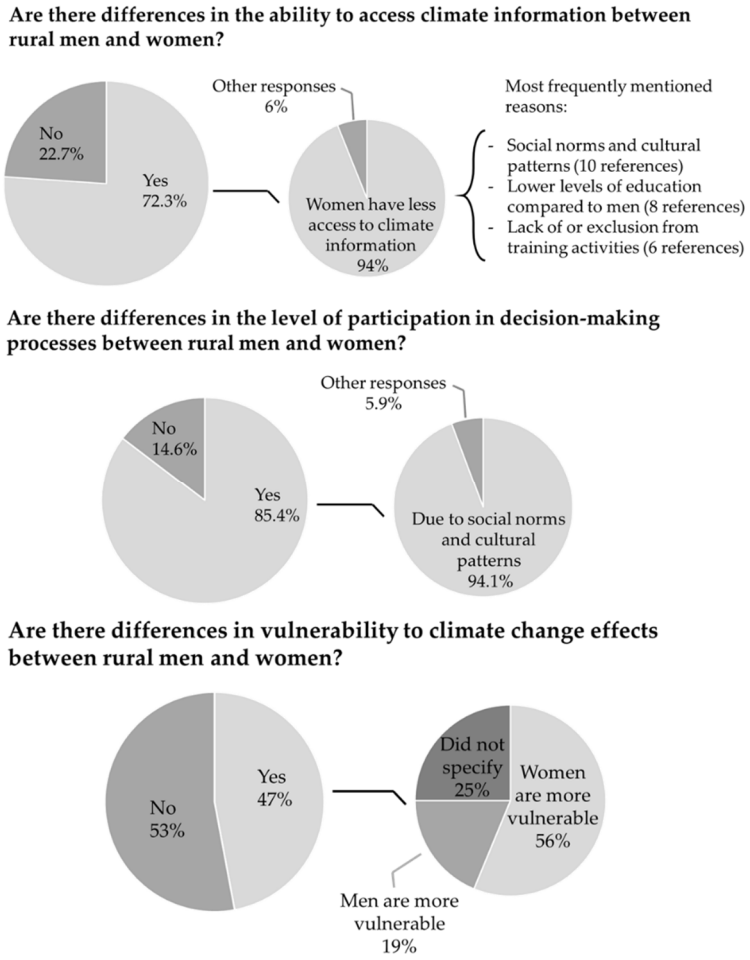

Figure 4. Survey results: aspects that were identified as barriers for women in the rural Highlands of Guatemala.

3.2. Is Gender Division of Rural Labor Real?

Participants were asked to rank the agricultural resources that women most frequently managed in rural Guatemala from 1 to 4, number 1 being the resource most frequently managed by this gender. Participants were asked to do the same for men in the following question. For women, the most frequently mentioned resources for positions 1 to 3 in the ranking were (in each case) maize and beans, followed by vegetables. For position 4, vegetables followed by fruits were the most frequently mentioned resources. In the case of men, the most prominent resources for positions 1 and 2 were maize, beans, and vegetables. For position 3, the most frequently mentioned resources were vegetables, followed by fruits, and for position 4, vegetables followed by livestock. Some of the resources mentioned as frequently managed by men but not by women were agrochemicals, agricultural machinery, and cacao. Medicinal and ornamental plants were only included in women's ranking. Even though these questions referred to agricultural resources management, housework, childcare, and religious activities were included within women's ranking.

3.3. Knowledge of Statistical Data Related to Gender Dynamics in the Rural Sector

The results of this subsection are illustrated in Figure 5. A total of 54.5% of the respondents stated that they could estimate the proportion of women farmers in Guatemala based on their knowledge of census data. However, when asked to state this proportion, values greatly varied among respondents, from 11% to 100%. A total of 56% of the respondents stated that the proportion of women farmers in Guatemala is equal to or greater than 40%. Similarly, 53.5% of the respondents stated that they could estimate the proportion of indigenous women among women farmers in Guatemala based on their knowledge of

census data. These estimations varied between 10% and 93%, with 54.2% of the respondents stating that at least 50% of the women farmers in Guatemala are part of indigenous communities. Only 38% of the respondents stated that they could estimate the proportion of women farmers that own their land based on their knowledge of census data. However, the stated percentages varied from 5 to 77% without a clear tendency.

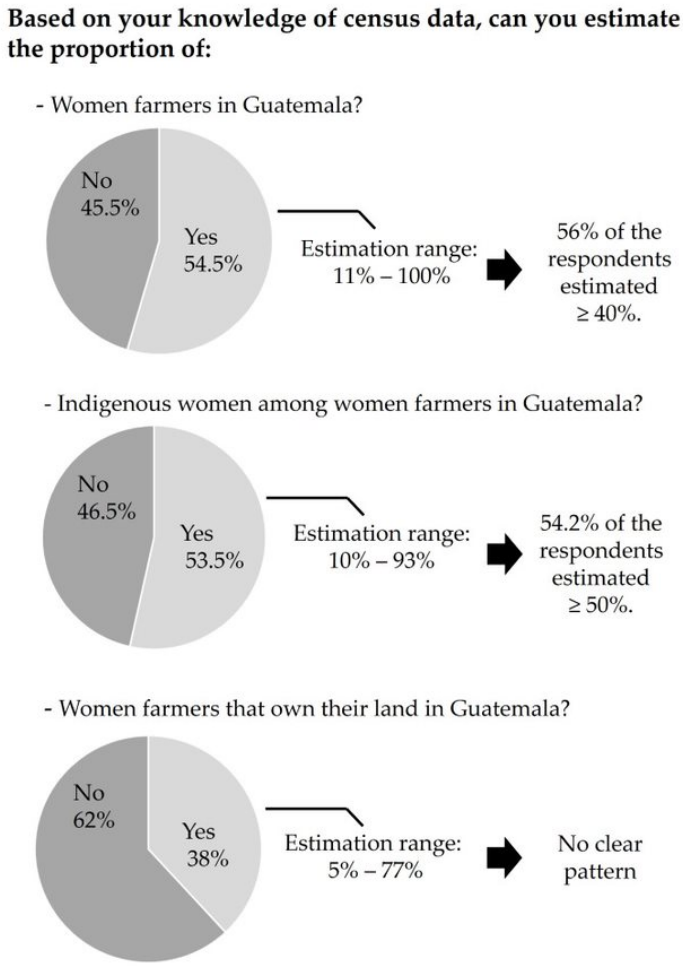

Figure 5. Survey results: estimation of gender-related indicators based on extensionists' knowledge of census data.

When participants were asked to state the sources of this information, almost half of them expressed that their responses were based on personal experience. In contrast, the other half named some official source, such as the National Agricultural Survey, MAGA official documents, the National Institute of Statistics, or the Learning Centers for Agricultural Development (CADER).

3.4. Opportunities to Surpass the Barriers

A total of 54.3% of the agricultural extensionists who responded to this survey stated that at least 51% of the farmers they advised were women. A total of 70.6% of the respondents estimated that at least 51% of the women they advised belonged to indigenous communities. When asked about strategies to promote women's participation in decision-making processes in the rural sector of Guatemala, extensionists pointed not only toward training activities for both men and women on gender perspectives (36.8%) but also toward more inclusive agricultural training in general (36.8%). According to respondents, these strategies would facilitate women's participation in decision-making spaces (31.5%). A summary of the identified gender equity barriers and opportunities to surpass them are presented in Table 1.

Table 1. Summary of participants' perceptions of barriers and opportunities for the adoption of gender-sensitive strategies in the Westerns Highlands of Guatemala.

Adoption of Gender-Sensitive CSA Strategies in the Western Highlands of Guatemala	
Barriers	**Opportunities**
Women are frequently excluded from: • Access to climate information • Agricultural training • Decision-making spaces Social norms and cultural patterns were identified as the causes of this exclusion	Already existing extension resources could be redirected towards: • Training on gender perspectives for both men and women farmers • Inclusive agricultural training for farmers • Facilitation of women's participation in decision-making spaces

4. Discussion

Through the opinions of agricultural extensionists that were exposed to PICSA's gender-responsive approach, this study identified aspects of gender inequity among farmers in the Western Highlands of Guatemala that should be addressed to enable the development and implementation of effective CSA strategies in the area. Results suggested that women in the Western Highlands of Guatemala are frequently excluded from climate information access, agricultural training, and decision-making spaces in which agricultural resource management strategies are defined. In the context of climate change and its exacerbated negative effects on low-latitude countries' agriculture and food security, women's exclusion from these resources represents a barrier that may severely impair mitigation and adaptation capacity [49–51]. This impairment could be even more severe when considering that, due to current male migration patterns in rural Guatemala, women are frequently required to take the lead in agricultural production in rural households [52]. However, since women seem to have less access to information and technological resources than men, they may not be able to effectively achieve this requirement [15]. In addition, even when the results of this study did not suggest significant differences in the agricultural resources that men and women manage in their farms in the Western Highlands of Guatemala, it was suggested that women often carry most of the burden of housework. The gendered division of labor would then manifest through this last aspect: apart from sharing the management of agricultural resources with men, women are often exclusively in charge of housework, which requires an additional investment of women's time [53].

The aforementioned aspects of gender inequity in the Western Highlands of rural Guatemala could translate into a higher vulnerability of women to the effects of climate change on agriculture and food security than men. It is then important to take into account these aspects when designing CSA strategies, or the implementation of these might fail or exacerbate vicious gender dynamics and gender inequity [3,54]. For example, the gendered division of labor could trigger differences in the willingness to implement CSA approaches between men and women. Since rural women tend to spend more time working than men when housework is included into the equation [53,55], women could resist incorporating CSA practices that require more time than they usually invest in agricultural-related chores [54]. Similarly, the lack of women's access to climate information, agricultural training, and decision-making processes could affect their perception of climate change impacts and their interest in CSA strategies [26,56]. CSA approaches require inclusive decision-making, since these enhance farmers' ownership and commitment to the chosen practices, improving climate change mitigation outcomes [27,57].

Apart from improving access to timely climate information and the adoption of innovative technological solutions for farmers, successful CSA approaches for rural Guatemala must consider current social values and the already described gender dynamics, recognizing that CSA strategies may have different impacts (positive and negative) on different genders [54]. By recognizing these differences and including context-specific values and social dynamics in the design phases of CSA strategies, it would be possible to target

vulnerable groups and to promote their empowerment. In this way, the potential of CSA approaches to boost mitigation and adaptation capacity in the context of climate change would increase, in turn increasing farmers' resilience [14,58].

On a small scale, agricultural extensionists, such as the ones that participated in this study, represent a valuable resource and an opportunity to implement gender-sensitive CSA approaches [53,54]. As presented in our results, most of these extensionists gave agricultural advice to women and men in rural sectors. Since extensionists work closely with farmers' communities, they are in an advantaged position to identify gender dynamics as well as the influence of intersectionality in farmers' social dynamics [59]. With the proper training and tools, extensionists could compile this information and use it to develop and implement more effective CSA strategies [60,61]. The PICSA methodology presented to Guatemalan rural extensionists in the aforementioned Climate Service for Agriculture workshops, for example, could be used as a tool to assess gender dynamics while working closely with farmers and including these dynamics in planning and decision-making processes. Different studies have used the PICSA methodology either to assess different aspects of gender inequity in rural communities [62,63] or as a tool to empower women if inequity had already been assessed [64,65]. Other participatory approaches that could be implemented with a gender perspective to support CSA strategies include the crop-choice model [60], agro-climate information services [66], farmer field schools [61], focus groups, farmer-to-farmer learning exchanges, participatory rural-appraisal tools [64], and agent-based modeling for the integration of gender-specific spatial behavior and perceptions [32], among others. Extensionists must be trained to successfully implement these participatory methodologies within CSA strategies, which usually requires institutional and policy engagement [53,61].

One of the critical components of extensionists' training for incorporating a gender perspective into CSA strategies is educating against gender bias. Among rural extensionists, gender bias is commonly expressed through the naturalization of inequity between men and women in the rural sector [53]. Under this type of bias, for example, current patterns of the gendered division of labor could be considered inherent to the agricultural sector instead of a social construct that could be revised and challenged [27]. This represents a barrier to promoting gender equity through extension services [54] and, in turn, to implementing efficient CSA approaches. Presenting factual data regarding the manifestation of gender inequity at larger scales than the specific rural communities that extensionists work with could contribute to broaden their perspectives on this topic. This study showed considerable discrepancies in extensionists' estimations about Guatemala's proportion of women farmers, indigenous women farmers, and women farmers that are also landowners, even when extensionists were asked to base their responses on their knowledge of census data. This could be due to the fact that the extensionists that participated in this study either do not have guaranteed access to official data on this topic (almost half of the respondents stated that they based their answers on their personal experience instead), or that this statistical data, which could be useful to depict general gender dynamics at a national level, does not exist. Neither the last National Survey on Life Conditions (ENCOVI 2014), nor the last Agricultural Census, contain many gender-disaggregated indicators (beyond the ones related to alphabetization, educational levels, age, and rural vs. urban residents) that could contribute to a better depiction of gender dynamics in the rural sector of Guatemala [37,67]. In addition, the mentioned survey and census were conducted in 2014 and 2003, respectively. Therefore, even if gender-disaggregated indicators were obtained at those times, this information would be currently too old to be useful. According to the projections from Guatemala's National Institute of Statistics [68], by mid-2022 Guatemala's total population would have increased by 38.8% with respect to 2003's population (the year in which the last Agricultural Census was conducted), which might cause demographic changes in rural areas.

On a larger scale, generating gender-responsive indicators with the ability to capture changes in women's empowerment, access to information and training, and participa-

tion in decision-making processes over time [27] in the rural sector of Guatemala could contribute to the development of countrywide policies against gender inequity. In addition, this information could support the investment of resources (financial and human) in the implementation of practices that tend to bridge the gender gap in the rural sector, including gender-sensitive CSA approaches. In turn, gender-sensitive CSA approaches would contribute to improving adaptation capacity and resilience in the rural sector in the context of climate change. Without gender-responsive indicators, and without agricultural extensionists managing this data, it is difficult to even start delineating gender-sensitive CSA approaches. As demonstrated in the cited literature, gender inequity in rural sectors compromises the effectiveness of CSA approaches. It could then be concluded that effective CSA approaches are not possible in the context of gender inequity.

Since this study was conducted among a group of Western Highlands extensionists that received training on the PICSA methodology, their reported perceptions should not be considered the general perceptions of all Guatemalan extensionists. We are aware that this might be considered a limitation. Future studies could address this issue by targeting a less specific population of extensionists. However, the goal of this study was not to understand or summarize the perceptions of agricultural extensionists in Guatemala. Rather, this study's contribution lies in identifying context-specific gender dynamics that can condition the effectiveness of CSA approaches in the Western Highlands of Guatemala, which should be the subject of further exploration. The information collected in this study suggests that there are still unexplored aspects regarding gender inequity in the rural sector of Guatemala that need to be understood and addressed at different scales to make the implementation of effective CSA approaches possible. In this sense, beyond the generation of gender-responsive indicators, future research studies should focus on exploring gender dynamics within farmers' communities, directly targeting these populations, while immersed in their daily social–ecological context. The participatory methodologies described above could be a starting point for the design of local research studies on gender dynamics. These local research studies could contribute to completing the current knowledge gap on context-specific gender dynamics in rural communities of Guatemala's Western Highlands.

5. Conclusions

For CSA strategies to be sustainable and effective in the improvement of adaptation capacity and resilience at a local scale and to contribute to the achievement of SDGs at a global scale, they must consider context-specific gender dynamics and social values, while aiming to reduce existing gender inequity. This study advanced the exploration of gender dynamics in the rural sector of Guatemala through the perspectives of agricultural extensionists that received training in gender-sensitive methodologies (PICSA). Lack of access to information, training, and decision-making spaces among rural women were identified as general manifestations of gender inequity in the Western Highlands of Guatemala and, consequently, as barriers to effective CSA approaches. The scientific literature supports that these gender inequity manifestations in rural sectors impair food security, climate change adaptation, and, ultimately, sustainable development. However, further exploration is needed for a better understanding of the way in which these dynamics occur in the Western Highlands of Guatemala, as well as their interactions with other factors, such as the intersection of race, ethnicity, sexual orientation, and gender, in the rural sector. Understanding these dynamics would allow the development of effective CSA strategies that, in turn, could contribute to reducing gender inequity and increasing adaptive capacity and resilience in the context of climate change, both at local and global scales.

Given the results of this study and the state of the art of scientific and grey literature on the topic for the Western Highlands of Guatemala, we conclude that there are still many context-specific aspects in the intersection of gender inequity and climate change adaptation that need to be assessed for this area in order to inform the design of effective CSA strategies. In this sense, Guatemala has a long way to go to achieve CSA objectives. We propose two lines of action that could contribute to shedding some light on these aspects

at two different scales. At a national and/or regional level, the generation and inclusion of gender-responsive statistical indicators in future census/survey efforts would allow establishing a baseline that could be contrasted with newer data and used to evaluate progress or setbacks in gender equity in time. These indicators could also serve as a tool to support decision-making in the context of public policy implementation. At a local level, it is fundamental to train agricultural extensionists in identifying and interpreting gender dynamics and against gender bias, so they are prepared to design and implement effective gender-sensitive CSA approaches with the communities they advise.

The preliminary findings of this study could be taken as a point of start for the design of context-specific studies on gender dynamics within farmers' communities in the Western Highlands of Guatemala. These local studies would increase the understanding of context-specific gender dynamics, their causes, and consequences for climate change mitigation, hopefully contributing to identifying strategies capable of challenging gender dynamics that exacerbate inequity. In turn, this understanding of context-specific gender dynamics would inform the design of gender-sensitive CSA approaches.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/land11081268/s1, File S1: title Post-workshop survey—MAS Project.

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