

# ***Scaling-Up Climate-Smart Agriculture (CSA) Globally Through GACSA***

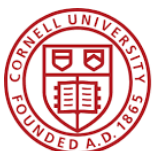


**Results and Recommendations from the  
Global Alliance for Climate Smart Agriculture  
Survey of Members 2019-2020**

**November 2020**



GLOBAL ALLIANCE FOR  
CLIMATE-SMART AGRICULTURE



Cornell University®

***Scaling-Up Climate-Smart Agriculture (CSA) Globally through GACSA.*** Results and Recommendations from the Global Alliance for Climate Smart Agriculture Survey of Members. © Global Alliance for Climate Smart Agriculture, November 2020

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**Photo on the Cover:**

FAO/L. Dematteis. Climate change has serious implications for agriculture and food security.

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# Executive Summary

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The Global Alliance for Climate Smart Agriculture (GACSA) is an inclusive, voluntary and action-oriented multi-stakeholder platform on Climate-Smart Agriculture (CSA). Its vision is to improve global food security, as well as enhance mitigation and resilience in the face of climate change. From December 2019 to March 2020, we conducted a survey to ensure our work is grounded in the needs of farmers globally facing climate change, and to offer GACSA members recommendations to address these needs. In this report, we present the survey responses from 165 GACSA participants from GACSA's global network.

Climate change is causing increased global average temperatures, increased frequency of extreme weather events (including both droughts and floods), changing weather patterns and growing seasons, increased soil erosion, and increased weed/disease/pest pressures. Overall, climate changes are rendering agricultural production increasingly difficult. These changes will only exacerbate existing issues of food insecurity and poverty, as farmers struggle under these evolving conditions to maintain crop yields and plant and animal health. Decreased yields will negatively impact both farmers' ability to profitably engage in the economic marketplace, as well as their ability to feed themselves and their families, contributing to undernourishment and food-related health issues worldwide.

According to the United Nations Food and Agriculture Organization's (UN FAO) definition from 2010, Climate-Smart Agriculture (CSA) is an approach to agriculture that helps to guide actions needed to transform and reorient agricultural systems to effectively support development, profitability, and ensure food security in a changing climate (UN FAO, 2013). CSA is based on three main pillars:

1. Sustainably increasing agricultural productivity and incomes;
2. Adapting and building resilience to climate change;
3. Reducing and/or removing greenhouse gases emissions, where possible.

GACSA calls for the development and use of technical practices, enabling policies and investments to achieve sustainable agricultural development for food security under a changing climate (UN FAO, 2013). Climate-Smart Agriculture (CSA) strategies can help farmers adapt to changing climatic conditions by helping them better manage existing resources. Despite growing awareness of climate change's impacts to agriculture, and the importance of using CSA to help increase sustainable agricultural production, adaptation and mitigation, there is still slow uptake of CSA nationally, regionally and locally with farmers. The GACSA member survey sought to illuminate climate concerns and barriers to implementation.

The findings of the survey are summarized below, along with accompanying analyses. There are several tools that can help farmers sustainably increase agricultural production while also adapting to and mitigating climate change. They include the increased sharing of knowledge about CSA, regional information/data sharing, increased access to climate and weather services, technological adaptations, and increased access to financing and economic strategies. Focuses on gender inclusion and youth engagement in CSA, and stronger emphasis on the diverse skills and capabilities of these groups, will help make measurable change in communities while also addressing persisting social inequalities.

### ***Knowledge Barriers to Scaling up CSA Globally***

Regionally specific information regarding climate change impacts, possible adaptations, and climate/weather predictions is lacking and remains a significant barrier inhibiting farmer's adaptation to climate impacts, especially to changing growing seasons, and changes in pest, disease, and weed pressures. While there is an abundance of existing information on CSA practices, the information is not reaching farmers. There is a need for stronger mechanisms to deliver and increase access to CSA information so that farmers understand how to adapt their practices.

Facilitating the continual and effective exchange of knowledge across different regions would allow farmers to prepare for pressures which are becoming locally relevant by learning from others' approaches to climate change adaptation, and mitigation. This is also important because adaptation practices (for example, pest management strategies) are most effective when implemented on a community-wide scale. Individual farms may implement management strategies, but if pests, diseases, and/or weeds are abundant in neighboring farms, then there will inevitably be crossover from those other farms. Sharing knowledge among community members is therefore key to the success of adapting to climate changes.

GACSA members specifically cited the need for more access to local climate and weather services and information. Climate and weather information is necessary for farmers to make decisions about planting dates, when irrigation is needed, when crops need more protection from heat, frost, hail, storms, etc., and heat stress safety for farm laborers and livestock. Without access to accurate weather and climate information, it is difficult for farmers to plan well, and production suffers. The climate and weather services that would increase farm's adaptation capacity include growing degree day calculators, fruit hardiness and freeze risk alerts, irrigation schedulers, seasonal and weekly forecasts, and other tools to increase farm resilience to climate change and sustainability.

Survey results stress the need to continue to pinpoint new knowledge demands in an ever changing climate system, which has also been noted in the literature (Sala et al., 2016). Additionally, even among well educated and connected GACSA members, only 25 percent of survey respondents were accessing GACSA information resources, meaning that even when knowledge is available, it is not being distributed effectively. The survey results highlight

mechanisms to foster knowledge sharing and dissemination, and the “Recommendations” section will expand on these suggestions made by respondents.

### ***Policy and Regional Barriers to Scaling up CSA Globally***

GACSA members indicated that the lack of funding is the most significant barrier to CSA implementation. They also reported that there are not strong enough national Extension services to reach out to farmers with new information. And finally, respondents note that global CSA policies have not been translated into national policies. Furthermore, national policies either do not support climate-smart agricultural practices, or are not being implemented or enforced locally.

Respondents who are affiliated with Climate-Smart Agriculture Regional Alliances (50% of respondents) stress the importance of GACSA’s role in capacity building and as a platform for external communication, linking policy objectives, and developing and disseminating information and case studies on CSA policies and their implementation. Regional CSA Alliances promote harmonization of CSA planning across different regions, the exchange of data and information, and advocate for policies to facilitate CSA implementation. Further analysis is needed to identify and assess the differential capabilities and needs of these alliances and the geographic areas where they work.

GACSA should bolster capacities of Action Groups and work with Regional Alliances to build farmers’ ability to implement climate-smart agricultural practices by expanding involvement in mechanisms such as the GACSA Global Annual Forum or other regional forums or workshops. This may further facilitate the sharing of case studies and exchange of knowledge that will build a base of solutions specific to farmers’ regions (GFFA, n.d.).

Lastly, while CSA can help farmers increase their resilience to climate change, this does not address the root causes of climate change. The vast majority of farmers globally are small-holder farmers in developing countries, who contribute very little to global greenhouse gas (GHG) emissions. Climate change will continue to occur and intensify until all countries and sectors adequately reduce their GHG emissions. A key focus should remain on helping countries increase their ambition to reduce GHG emissions in their Nationally Determined Contributions, as per the Paris Climate Agreement, and to ensure that there is adequate support for capacity building and financing of global climate change projects on CSA for developing countries.

### ***Financial Challenges to Scaling up CSA Globally***

Survey respondents identified a lack of financial resources as the top barrier to implementing CSA in their countries. Financial barriers are hard to overcome because while knowledge is freely available, funding for CSA initiatives is not. Financing is limited, so it is vital to identify areas and opportunities to prioritize funding needs. Most GACSA members

felt a lack of funding inhibited implementation of CSA. Part of this issue is due to the lack of financial literacy that prevents farmers, NGOs, or developing countries from pursuing avenues for grants, loans, and other forms of funding for CSA. Other members identified that financing institutions lacked especially in rural settings.

GACSA members identified several core institutional factors that limit the uptake of CSA. The most significant barrier in terms of expertise was in finance economics. Climate change will further exacerbate the issue of profitability of farms and agricultural enterprises without adequate adaptation to climate change. Considering that farm profitability was a major concern that GACSA members felt they needed more support in, GACSA should focus on sharing knowledge of finance economics and strategies with farmers, so that they can better manage their income and increase profitability. This may cushion farmers' businesses as they experience climate disasters and work to implement CSA strategies.

## ***A Special Emphasis on Gender and Youth***

### ***Gender***

GACSA members ranked initiatives to improve gender equity in agriculture low in priority. However, it is clear that gender issues remain a critical issue to address. In fact, in this survey, the percentage of women respondents was less than that of male respondents, indicating perhaps the lack of equity of women working in GACSA member organizations. There is a growing base of research that indicates that expanding women's access to resources and involvement in decision-making processes is positively correlated with increased implementation of CSA practices. Women's knowledge base, agricultural practices, and importance to food security (such as tending kitchen gardens and preparing food) are often discounted in traditional surveys. Women have valuable practical experience from working closely with natural resources that would contribute greatly to GACSA members' understanding of the context for CSA implementation. There should be an increased focus on disseminating information on climate change impacts and Climate-Smart Agriculture to women farmers as well as efforts to incorporate women's knowledge into the information base. Additional policies to facilitate implementation of CSA would increase women's access to productive resources and expand their capacity to participate in decision-making at the community level in order to increase ability to respond to climate change.

### ***Youth***

There was very low representation of youth voices in GACSA itself as well as in the responses to this survey, with only 2.3% of respondents from younger people ages 18 to 24. This lack of youth participation is also seen in the agricultural field as well. The average age of farmers and farm owners globally is 60 years old (Brand & Galdava, 2019). With the farmer population growing older and young people increasingly moving to cities to pursue business-related careers that they deem more profitable, the threat to food security is increasing. Young people often hold prejudices against agricultural careers, seeing them as

representative of low social and economic status. Agriculture is often seen as a field that young people could fall back on if they cannot become educated, and is therefore often not respected. Families may pressure youth to leave the family's subsistence farm to seek alternative career paths, but this has become synonymous with the idea that those who stay in farming are uneducated and unsuccessful. Agriculture careers globally for youth are also limited by land tenure issues and the lack of stable incomes. Solving the systemic and image problems with agricultural careers will be crucial to engaging youth. Youth engagement in climate-smart agriculture could be built by increasing education and program opportunities for youth in both urban and rural settings and reorienting the approach to agriculture with skills-based and technical expertise. Increasing youth's access to agricultural education as well as financial and land resources will limit the barriers limiting youth engagement.

Engaging youth in agriculture through new modern information and technologies may be a key tool (Brand & Galdava 2019) in increasing youth involvement in CSA. Technological tools can address numerous challenges to agriculture in a changing climate. Leveraging these tools will require a new set of technical expertise and youth are often eager to master new technologies as a way to solve challenges. New technologies can help farmers adapt to climate changes as well as demonstrate to youth how agriculture can be an engaging, viable, and profitable business opportunity, increasing their desirability of agriculture-related career paths (Brand & Galdava 2019).

# Introduction

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The Global Alliance for Climate Smart Agriculture (GACSA) is an inclusive, voluntary and action-oriented multi-stakeholder platform focused on Climate-Smart Agriculture (CSA). Its vision is to improve food security and enhance resilience in the face of climate change, by creating partnerships to encourage actions that reflect an integrated approach to the three pillars of CSA (GACSA, 2020).

According to the United Nations Food and Agriculture Organization's (UN FAO) definition from 2010, Climate-Smart Agriculture (CSA) is an approach to agriculture that helps to guide actions needed to transform and reorient agricultural systems to effectively support development, profitability, and ensure food security in a changing climate (UN FAO, 2013). CSA is based on three main pillars:

1. Sustainably increasing agricultural productivity and incomes;
2. Adapting and building resilience to climate change;
3. Reducing and/or removing greenhouse gases emissions, where possible.

CSA calls for the development and use of technical practices, enabling policies and investments to achieve sustainable agricultural development for food security under a changing climate (UN FAO, 2013). Climate-Smart Agriculture (CSA) strategies can help farmers adapt to changing climatic conditions by helping them better manage existing resources. Despite growing awareness of climate change's impacts to agriculture, and the importance of using CSA to help increase sustainable agricultural production, increase adaptation and mitigation, there is still slow uptake of CSA nationally, regionally and locally with farmers.

Agriculture around the globe faces a current and impending crisis because of the increasingly negative impacts of climate change to global production. It is imperative that countries, non-governmental organizations, businesses, and research institutions collaborate to share knowledge, develop CSA policies, and provide financing that will help farmers to adopt CSA practices.

Based on feedback from the GACSA Annual Forum in Bonn, Germany in June 2019, GACSA identified the need to survey its members to delineate further steps to be carried out by GACSA members in order to help implement CSA principles at a global scale, while considering national priorities.

The GACSA Member Survey was developed by Dr. Allison Chatrchyan and students from her Global Climate Change Science and Policy Class at Cornell University in the fall of 2019, with

input from GACSA staff and co-leaders of the GACSA Knowledge, Investment, and Enabling Environment Action Groups. Survey analysis was performed over the spring and summer by a team from Cornell and GACSA, and by the fall 2020 Global Climate Change Science and Policy Class at Cornell University.

The goal of the survey was to understand the barriers to information, policies, and investments and needs to enable increased farmer adoption of CSA practices globally. In addition, the survey was structured to gather input on how climate change is affecting farmers in each country, the key challenges and needs farmers have in order to adopt CSA practices, and priority actions for member organizations in the GACSA network to help focus their work to advance the three pillars of CSA.

## Survey Methods

The online survey was distributed using a convenience sampling method which would allow potential respondents from the GACSA membership (which included 350 organizations at the time of distribution) and GACSA members's wider networks to self-select into the sample. This approach was chosen in order to gain access to the widest number of participants from around the globe, while saving time and costs.<sup>1</sup> There were 165 respondents to the GACSA survey. Because of the convenience sampling method, it is not possible to calculate an overall response rate for the survey. However, if one considers that 165 individuals completed the survey, and there were 350 GACSA members in the organization, which represents approximately 47% of GACSA member organizations globally. Participation in the survey was voluntary, and survey participants were not required to complete all of the questions; therefore, certain questions may have a lower response rate. Survey respondents that did not complete at least 40% of the survey were eliminated from the analysis, leaving 144 responses that were analyzed.

The survey was distributed via the online Qualtrics Survey tool from 5 December 2019 through 25 March 2020, with an initial email request, and monthly email reminders that were sent out requesting members to complete the survey. The questionnaire was written in English, and had four main sections including (1) Climate Impacts and Priorities; (2) Farmer Preparedness, (3) GACSA participation; and (4) Demographics (see Appendix 1 below). The survey results were analyzed using Qualtrics, SPSS and Excel, and survey results are presented below.

### *Rank Analysis Methodology*

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<sup>1</sup> Any sample in which the probability of a sample member's inclusion in the sample cannot be computed is considered to be a convenience sample. Schonlau, Matthias, Ronald D. Fricker, and Marc N. Elliott, Conducting Research Surveys via E-mail and the Web. Santa Monica, CA: RAND Corporation, 2002. [https://www.rand.org/pubs/monograph\\_reports/MR1480.html](https://www.rand.org/pubs/monograph_reports/MR1480.html).

For a number of questions in the survey, respondents were asked to rank a limited number of top choices from a given list of options. Analysis of responses to these questions consisted of a scoring system which accounted both for an option's frequency of selection and its place in the respondent's ranked list. Open-ended responses ("other") typically made up less than 2% and never more than 5% of overall responses. These responses were assessed to determine whether they could be included in a different category; if not, similar "other" were excluded from the scoring system.

For each response, the highest-ranked option was assigned the greatest number of points (either 3 points or 5 points, depending on whether the question asked the respondent to rank their "Top 3" or their "Top 5"). Lower-ranking options were assigned descending numbers of points. If the option was not selected at all, the option received a score of 0. Scores were then tallied for each option (Score) and averaged (Avg. Score [Mean]). Options were sorted in descending order in a table to illustrate the highest priorities gleaned from all survey responses.

### *Limitations*

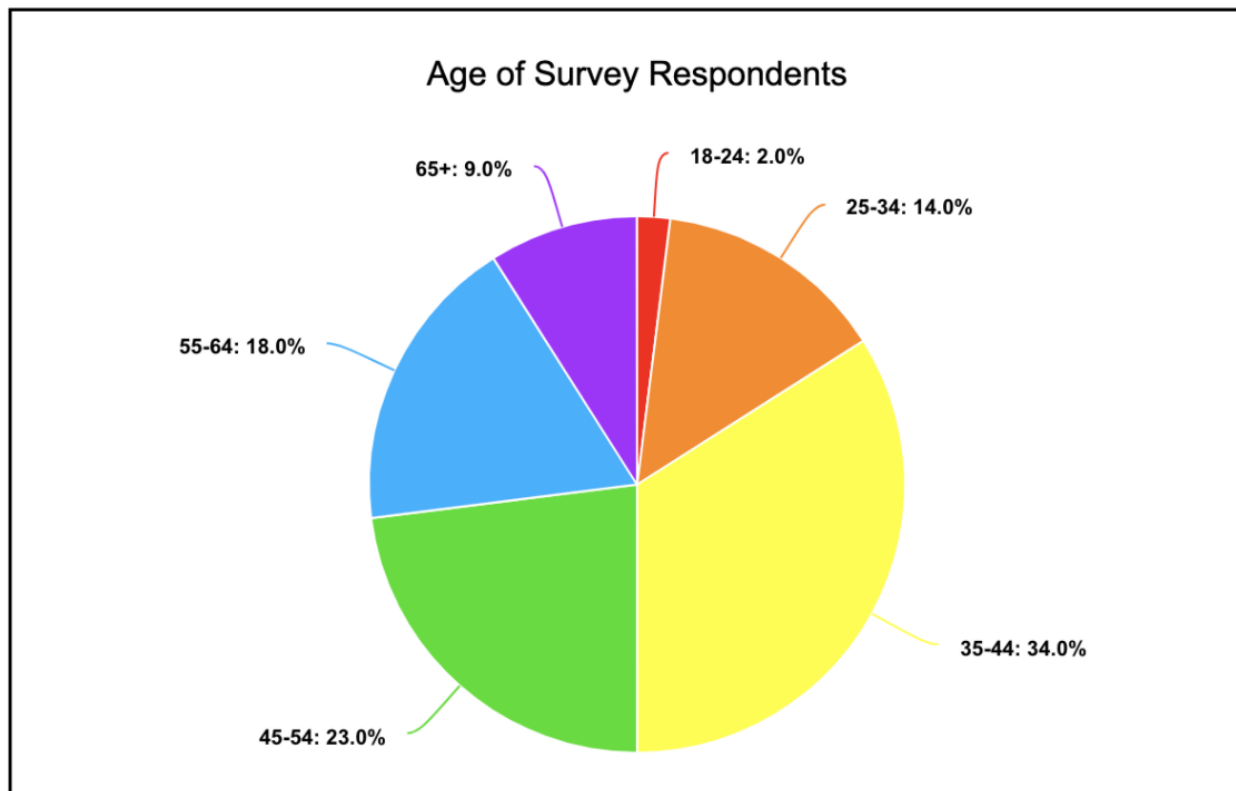
There were only 144 full responses to the survey, limiting ability to conduct statistical analysis and make regionally-specific recommendations. In order to fill this knowledge gap, we recommend conducting further surveys that incentivize greater participation. There were also less female respondents to the survey than men, and there were very few younger people under 24 years of age who completed the survey. As a result of the survey responses by gender and age, there may be some inherent biases in the survey results. This is likely due to the makeup of the membership organizations in GACSA that employ a higher number of middle aged men. While acknowledging these limitations, the survey results still provide relevant information that GACSA can take into account to expand CSA implementation among its members globally.

## Participant Demographics

### **Respondents Age**

There were 131 responses to this question. The survey was distributed only to adults above the age of 18. The majority of respondents (57%) were between 35 to 54 years old, with a median age of 45-54 years old. Approximately one quarter of respondents were 55 years and older. There was very little representation (2.3%) from younger people ages 18 to 24 in the survey responses. This is likely due to the makeup of the membership organizations in GACSA that employ more people in the age group following completion of a university

degree. However, GACSA should endeavor to increase participation from younger individuals in the network.



**Figure 1. Age of GACSA survey respondents (Q35a).**

### Gender Distribution

There were 91 survey responses (69.5%) from males, and 40 survey responses (30.5%) from females.

**Table 1. Gender distribution of survey respondents (Q35b, n=131).**

Participant Gender Identification	Percentage (n)
Female	30.5% (n=40)
Male	69.5% (n=91)

The unequal gender distribution may stem from the fact that GACSA members' organizational focal points are more often male than female. It may also be due to the fact that there may be a higher percentage of males that work in the fields of agricultural policy, research, or advisory services overall.

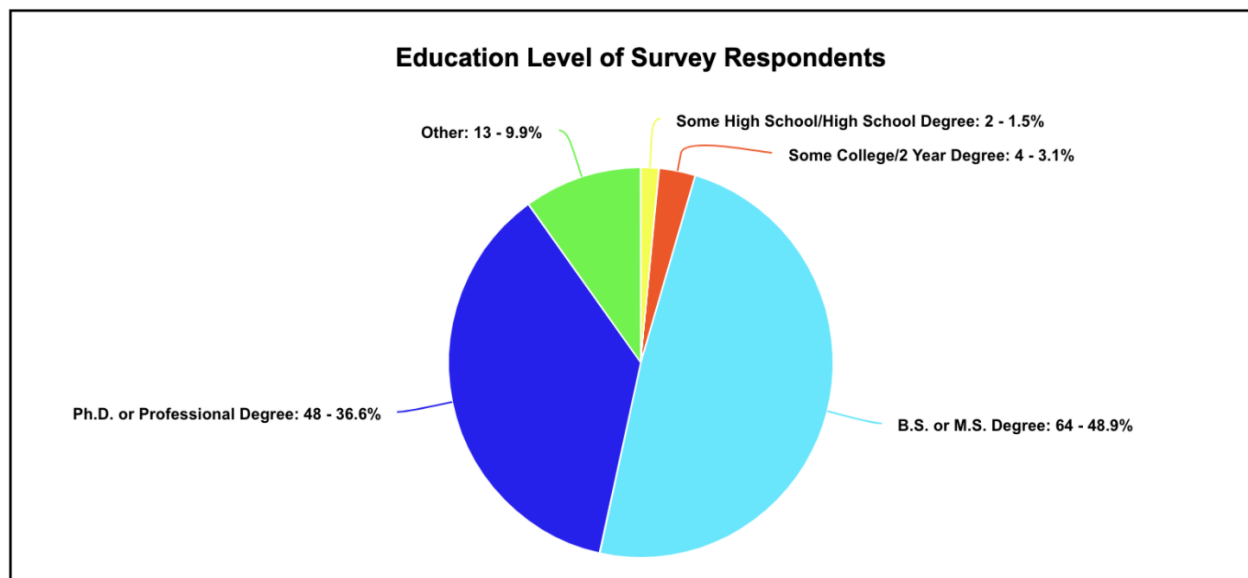
Increasing participation of female farmers and advocacy groups in feedback platforms such as GACSA's survey may increase the effectiveness of extension and advisory services and lead to the implementation of more equitable policies. Mechanisms to increase female representation in CSA will be further discussed at the end of the report. Given that over 43% of the agricultural labor force in developing countries is made up of women, with over 50% participation in Eastern and Sub-Saharan Africa and 20% participation in Latin America, incorporating gender concerns into CSA planning and dialogues is imperative to achieve equitable and productive results (Manfre et al. 2013). As a result of the survey responses by gender, there may be some inherent gender bias in the survey results.

## Level of Education

The respondents to the GACSA survey have very high levels of education. Only 4.6% of respondents have only some college courses or a high school degree, while 48% of respondents have a BS or MS university degree, and 37% hold a Ph.D. See Figure 2 below.

**Table 2. Education level of survey respondents (Q36, n=131).**

Level of Education	Percentage
Some Highschool/Highschool degree	1.6% (2)
Some college/2-year degree	3.0% (4)
BS./M.S. degree	48.9% (64)
Ph.D./Professional degree	36.7% (48)
Other	9.8% (13)



**Figure 2. Education level of respondents in GACSA Survey (Q36).**

## GACSA Membership

Participants were asked if they worked for an agency or organization that is a member of GACSA or not; and if not, if their organization or agency would be interested in joining GACSA (see Question 26). Out of 133 respondents, 62% were full members, and 6% were observer members. Fifteen respondents (11%) were not members of GACSA, and 20% were not sure if their organization was a member or not.

Of the respondents that were not members of GACSA, 36 (86%) indicated that they would be interested in joining the global alliance (see Question 27). Assessing entry barriers for different types of organizations (government, farmer's organizations, research organizations, universities, etc.) may help broaden membership within the network and diversify its knowledge base.

The majority of respondents are members of a research or academic institution, NGO, or government agency, with less representation of farmers' organizations or businesses (see Table 3).

**Table 3. Participants GACSA member organization Affiliation (Q28)**

Type of Member Organizations	No. Responses
Research or academic institutions	46
Non-governmental Organization (NGO)	32
Governments of a developed or developing country	29
Farmer's Organizations	21
Intergovernmental Organizations	13
Businesses	11
Other	4

It is imperative that GACSA'S farmers and farmer associations remain active in the network to ensure that their voices are being heard. Although NGOs had expressed concern after GACSA's development that the Alliance would be driven by corporate interests, there was, in fact, less representation from the business community in the survey's responses. It is actually imperative to build public-private partnerships, and participation with the business community could be encouraged.

## GACSA Action Group Participation by Members

Members were further asked to check all the GACSA Action Groups that they are involved with. Most participants are participating in the Knowledge Action Group, while many respondents are not yet participating in any Action Group (See Table 4).

**Table 4. GACSA Action Group Participation by Members (Q29, n=122)**

Action Group		Number of Responses
1	Knowledge Action Group	41
2	Enabling Environment Group	27
3	Investment Action Group	12
4	No Participation	25
5	Unsure	17

### Primary Expertise or Role in the Field of CSA

The survey asked respondents to identify their primary field of expertise. Most respondents indicated that their primary expertise was in farming or agricultural practices. Other respondents noted that they have primary expertise in community development/sustainable development, policy/legal fields, and extension work (see Table 5).

**Table 5. Identified Expertise of GACSA members ranked\* (Q3).**

Primary Expertise		Total Score	Avg. Score
1	Farming/agriculture practices	239	1.65
2	Community development/sustainable development	172	1.19
3	Policy/legal	95	0.66
4	Extension	61	0.42
5	Physical Science Research	51	0.35
6	Education	45	0.31
7	Consulting	33	0.23
8	Business	31	0.21
9	Social Science Research	30	0.21
10	Finance/Economics	21	0.14
11	Youth	16	0.11

### GACSA Participants by Countries and Regions

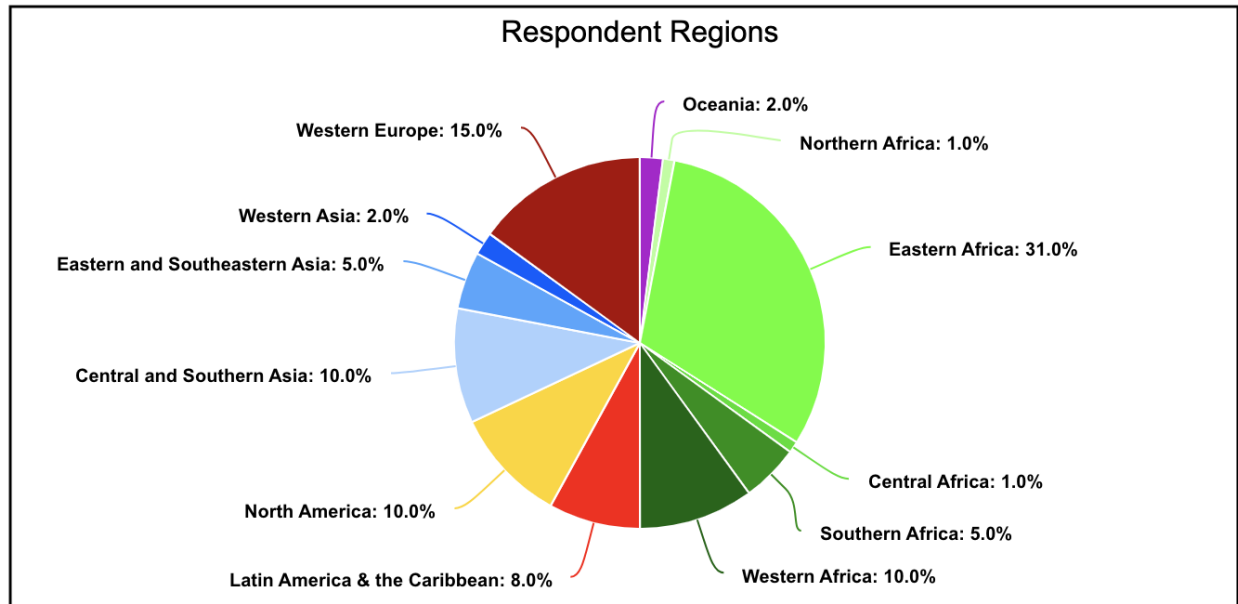
Respondents were asked to identify the country they live in, and/or work most closely with, on Climate Smart Agriculture (CSA) activities. Individuals from 58 countries responded to the survey. The top five countries represented in the survey were: the United States of America (14); Zimbabwe (13); Nigeria (10); Kenya (9); and India (8).

The countries were grouped into eleven regions, based on United Nations Standard country or area codes for statistical use (M49) methodology.<sup>2</sup> The regional participation in the survey is presented below in Figure 3. There were no participants from Eastern European

<sup>2</sup> UN Statistics Division: <https://unstats.un.org/unsd/methodology/m49/>.

\* See Appendix II for rank analysis methodology

countries, indicating a strong need for GACSA to reach out to organizations and countries in this region. Because the number of responses from each region were so small, statistical analysis of responses by region was not performed.



**Figure 3. Regional representation of respondents in the GACSA Survey (Q1).**

### Participation in the GACSA Annual Forum

Respondents indicated whether or not they had previously attended a GACSA Annual Forum (see Table 6). Nearly two-thirds of respondents were new attendees.

**Table 6. Participation at GACSA Annual Forums, from 2013-2019 (Q24, n=132).**

Participation Response	Number	Percent
Yes	50	37.9
No	82	62.1
Total	132	100

# Key Themes

## Climate Impacts

Respondents were asked to rank the climate-related impacts they thought would affect the farms in their region or country the most over the next five years. The impacts associated with climate change that respondents feel will most affect farms in their region include Drought, Extreme Rainfall Events/flooding, Changing Growing Seasons, Soil Erosion, and Increased Weed/Insect/Disease Pressure (see Table 7).

**Table 7. Ranking of Climate-Change related Impacts that will most affect Farms (Q4).**

Climate Change Related Impacts		Total Score	Avg. Score
1	Drought	497	3.43
2	Extreme Rainfall Events/Flooding	410	2.83
3	Changing Growing Seasons	251	1.73
4	Soil Erosion	192	1.32
5	Increased Weed/Insect/Disease Pressure	189	1.30
6	Heat Stress	176	1.21
7	Desertification	83	0.57
8	Increased Disease Pressure	72	0.50
9	Salinization of agricultural fields	39	0.27
10	Wildfires	34	0.23
11	Sea Level Rise	24	0.17
12	Wind Damage	18	0.12
13	Saturated Soils/Ponding	11	0.08
14	Hail Storms	11	0.08
15	Local Tornadoes	5	0.03
16	Freeze Risk	1	0.01

Drought and extreme rainfall were cited as the top two concerns for farmers, and it is worth noting that these are often two sides of the same coin, as climate change causes weather to swing between increasing extremes. In cases where soil is compacted and then parched from drought, water is not readily absorbed, and instead pools and flows, causing flooding (USDA, n.d.).

Drought conditions also alter the composition of soil organic matter, making it more difficult to retain moisture and nutrients, and less resilient to soil erosion (another top concern),

especially in the face of heavier rainfalls induced by climate change (Al-Kaisi 2017). Furthermore, since drought reduces a plant's ability to uptake nutrients and engage in normal processes, crops become more susceptible to diseases and pests (U.S EPA, 2017). Most plant-feeding insects and diseases tend to thrive under drought conditions due to high humidity levels (Faubert, 2017).

With changing growing seasons, seasonal weather patterns tend to shift. Changes in the seasonality of precipitation may result in excess water during odd seasons and limited water during critical crop growth periods (USDA, 2020). Impacts of growing seasons will vary according to crop, region, and rate of climate change. Earlier arrival of warm temperatures shifts blossom times earlier while frost periods last longer. Earlier spring thaws and later, longer first frosts could result in greater growth and productivity in some crops. However, for fruit crops, early spring dormancy breaks can be detrimental if early bud development increases exposure to late spring frosts (USDA, 2020). Unusually warm periods in late winter may act as a “false spring,” triggering new growth of plants to begin too early, and leaving them vulnerable to frosts and winter storms (Land Trust Alliance, 2020). The climate impacts that farmers are concerned about are heavily interconnected, as are changing growing seasons and increased insect pressure (which is discussed further below). A lengthening growing season, for example, would allow insects to spawn multiple generations a season, producing more generations per year (USDA, 2020).

Increasing global average temperatures puts stress on livestock and crops, as well as farmers and laborers. Over time, heat stress will increase vulnerability to disease by both plants and animals who will already be facing a climate-induced abundance of parasites and diseases (FAO, 2016). For livestock, the expected outcome of increased vulnerability and parasites/diseases is reduced fertility, meat and milk production (FAO, 2016). As for crops, plants have a reduced overall photosynthetic performance under heat stress, so growth and development is affected. As for agricultural laborers, heat stress poses threats to mental and physical health. Farmers and laborers may become fatigued, nauseated, or experience dizziness and headaches, causing them to lose focus on the task at hand, thereby decreasing productivity and quality of work. Individuals may become irritable as well, straining communication and morale in the workplace. Excessive exposure to heat can cause a range of dangerous illnesses such as skin rash, heat cramps, heat exhaustion, and heat stroke (Association of Farmworker Opportunity Programs, 2020).

Respondents were asked to identify the key agricultural commodities they thought would be at the greatest risk for climate impacts in their region. Globally, respondents indicated that the highest-risk commodities included grains, livestock, and field crops (see Table 8).

**Table 8. Agricultural commodities at greatest risk for climate impacts (Q5).**

Agricultural Commodities		Total Score	Avg. Score
1	Grains (e.g. including rice, wheat, corn, soybeans)	477	2.89
2	Livestock	327	1.98

3	Field Crops	238	1.44
4	Horticulture Crops	234	1.42
5	Vegetables	208	1.26
6	Perennial Crops	117	0.71
7	Forestry/Agroforestry	110	0.67
8	Fruit, Berries, and Grapes	76	0.46
9	Aquaculture	44	0.67
10	Cotton	27	0.16
11	Tobacco	12	0.07
12	Nuts	12	0.07

Grains are the commodity deemed to be at highest risk to climate impacts. This is alarming given that grains provide the vast majority of calories worldwide, especially in developing regions. Livestock, valued for their protein, services, and liquidity as an asset, are also at high risk. Some cultures also place significant social value on livestock ownership, which may be an additional reason for the high concern among those surveyed (FAO Commodities and Trade Division, 2002). Field crops, horticulture crops, and vegetable crops also rank high as a concern, likely because they make up a large percentage of farms' production, and their high demand for water (FAO, 1986).

## Climate and Weather Services

Respondents were asked which time scales for weather or climate information would best help farmers make informed decisions. These climate and weather services help farmers know when and what to plant; without reliable forecasting, farmers may plant too early or sow cultivars not well-suited to the season's prognostic. The consequences may range from slightly reduced yields to complete crop failure from frost or drought. Responses indicated that monthly or seasonal outlooks, along with current and immediate conditions, were most useful (see Table 9).

**Table 9. Most useful time scales for farmers (Q22, n = 144).**

Useful Time Scales for Information		Score	Avg. Score
1	Monthly or seasonal outlooks	188	1.30
2	1-7 day forecasts	151	1.04
3	Current weather conditions	106	0.73
4	Annual or Multi-year outlooks (combined)	86	0.59
5	8-14 day outlooks	78	0.54
6	Historical weather information	68	0.47
7	Weather Data from the past 12 months	59	0.41

8	Longer term/climate projections (10 to 30 years)	37	0.26
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When asked to list the weather or climate-related decision support tools and climate services for which farmers need more reinforcement, respondents indicated that forecasts for crop disease and weather, nutrient management, and IPM/disease tools needed the most support (see Table 10).

**Table 10. Most critical weather tools or climate-services (Q23).**

Decision Support Tools		Responses
1	Crop Disease Forecasts	100
2	Weather Forecasts	98
3	Nutrient Management Tools	96
4	IPM/Disease Tools	94
5	Drought Monitor/Outlooks	87
6	Seasonal Outlooks	83
7	Heat Stress Calculators	75
8	Water Deficit Calculators	68
9	Irrigation Schedulers	64
10	Evapotranspiration (ET) Indices	54
11	Annual Outlooks	46
12	Growing Degree Day Calculators	36
13	Multi-year Outlooks	34

Out of 144 respondents to the survey, 100 cited crop disease forecasts as an area where farmers would benefit from increased access. IPM and disease tools ranked closely with disease forecasts as well, indicating that pests and disease are a major concern. Similarly, the grouping of three weather-related tools in the top six responses suggests that reliable forecasting would be of great use to farmers.

## Farmer Preparedness and Needs

Participants were asked to rate how well prepared the farmers in their country or organization were to adapt to, mitigate, or sustainably intensify production in response to climate change. The majority of respondents indicated some degree of preparedness in all three areas, but are the least prepared for mitigation (see Table 11).

**Table 11. Farmer Preparedness to Adapt to Climate Change, Mitigate, and Sustainably Intensify in response to Climate Change (n=133) (Q15, Q17, Q19).**

Level of Preparedness	Prepared to Adapt (n)	Prepared to Mitigate (n)	Prepared to Sustainably Intensify (n)
Extremely Prepared	1.5% (2)	3.8% (5)	5.3% (7)
Very Prepared	17.3% (23)	9.8% (13)	16.5% (22)
Moderately Prepared	32.3% (43)	26.3% (35)	33.1% (44)
Slightly Prepared	33.8% (45)	33.8% (45)	30.8% (41)
Not at all prepared	12.8% (17)	24.1% (32)	12.8% (17)
I do not know	2.3% (3)	2.3% (3)	1.5% (2)

The majority of participants responded that they felt farmers in their country were only slightly or moderately prepared to adapt to climate change. Regarding mitigation, most respondents felt that farmers were only slightly prepared, followed by either moderately prepared or not at all prepared. With preparedness to intensify sustainably, most respondents felt farmers were in the moderately and slightly prepared categories.

The results indicate that most respondents feel farmers have only a small level of preparedness to adapt, mitigate, and sustainably intensify. The highest level of preparedness by respondents in the survey is in the category of sustainably intensifying, followed by adaptation, and then mitigation. Hence, there should be slightly greater emphasis placed on helping prepare farmers for mitigation. The overall goal, though, would be for GACSA members to help farmers prepare for all categories on all levels of preparedness.

Respondents were asked to rank farmers' knowledge gaps related to adaptation and mitigation practices. Globally, the largest adaptation gaps, where farmers need the greatest information about practices, have to do with soil health, agroecology, and efficient irrigation methods (see Table 12).

**Table 12. Information Needs Related to Adaptation Practices (Q16).**

Adaptation Gaps	Score	Avg. Score
1 Soil Health	253	1.74
2 Agroecology	173	1.19
3 Efficient Irrigation	144	1.00
4 Organic Fertilizer	140	0.97
5 Drought Tolerance	132	0.91
6 Integrated Pest Management	120	0.83
7 Agroforestry	112	0.77
8 Precision Ag	109	0.75
9 Diversified Crop Rotations	87	0.60
20 Cover Crops	86	0.59
11 Water Infrastructure	80	0.55

12	Reduced Tillage	77	0.53
13	Nutrient Management	64	0.44
14	Use New Varieties	52	0.36
15	No Till	45	0.31
16	Intercropping	41	0.28
17	Restored Wetlands	25	0.17
18	Rotational Grazing	18	0.12
19	Synthetic Fertilizer	14	0.10
20	System of Rice Intensification	12	0.08
21	Artificial Drainage	11	0.08
22	Windbreaks	8	0.06
23	Stream Management	7	0.05

The issue that respondents felt farmers need to learn the most about, by a significant margin, is soil health. This is an interesting finding because it seems to point to the fact that soil health is fundamental to improving the resiliency of agriculture to climate change. According to the US Natural Resources Conservation Service (NRCS), soil health is understood as an assessment of how soil performs on all of its functions, including physical, chemical, and biological properties (NRCS, 2020). Healthy soils can be seen as an outcome that can take quite a long time to improve, which would require investments in implementing a variety of the strategies in Table 12, including using agroecology, efficient irrigation, organic fertilizers, cover crops, etc.

It is critical to note that focusing on soil health would help farms address both adaptation, and mitigation co-benefits, because a healthy soil can withstand higher temperature, and extremes in drought and rainfall, but it also sequesters carbon (Al-Kaisi, 2017). Thus this is a critical practice that makes sense for GACSA members to focus on.

The largest gaps for mitigation efforts appear in installation of renewable energy and improving efficiency for irrigation and nitrogen fertilizers (see Table 13).

**Table 13. Information Needs Related to Mitigation Practices (Q18).**

	Mitigation Gaps	Score	Avg. Score
1	Install Renewable Energy on the Farm	244	1.68
2	Use Efficient Irrigation (use less energy)	217	1.50
3	Improve Nitrogen Fertilizer Efficiency	215	1.48
4	Plant Trees on the Farm	163	1.12
5	Reduce or Eliminate Tillage	158	1.09
6	Conduct a GHG Audit on the Farm	153	1.06
7	Use Biofuels	93	0.64
8	Conduct an Energy Audit on the Farm	87	0.60
9	Purchase Renewable Energy	85	0.59

10	Use Anaerobic Digestion	82	0.57
11	Use Fuel Efficient Vehicles or Tractors	73	0.50
12	Install Manure Storage Cover	71	0.49
13	Use Biogas Flares	52	0.36
14	Install Efficient Lighting in Buildings	17	0.12
15	Insulate Buildings	11	0.08

Respondents were asked to indicate farm management strategies that farmers are currently using as well as areas where more information is needed. Globally, farmers are most frequently employing the strategies of changing crops, using conservation practices, implementing new technologies, and getting an off farm job to respond to climate change (see Table 14).

**Table 14. Farm Management Strategies Farmers Currently Use (Q20).**

Strategies		Score	Avg. Score
1	Change Crops	318	2.19
2	Implement Conservation Practices	235	1.62
3	Use new technologies	224	1.54
4	Get an Off Farm Job	211	1.46
5	Diversify into Other Forms of Production	188	1.30
6	Develop a Climate Adaptation Plan	94	0.65
7	Exit the Industry/Stop Farming	88	0.61
8	Apply for Grants	68	0.47
9	Sell or Rent Property	61	0.42
10	Purchase/Adjust Crop Insurance	52	0.36
11	Scale Back Operations	51	0.35
12	Intensify or Expand Current Enterprises	48	0.33
13	Restructure Debt Flow	38	0.26

The farm management practices that are not being used as often to respond to climate change include restructuring debt flow, intensifying current enterprises, scaling back operations, purchasing crop insurance, selling or renting property, and applying for grants.

Respondents were asked to identify areas that farmers need the most support with related to farm management issues. Respondents felt that farmers needed the most support to address climate change, farm profitability, and extreme weather events (see Table 15).

**Table 15. Support Needs Related to Farm Management Issues (Q21).**

Farm Management Issues		Score	Avg. Score
1	Climate Change	292	2.01
2	Farm Profitability	248	1.71
3	Extreme Weather Events	231	1.59

4	Market Uncertainty	179	1.23
5	Production Costs	148	1.02
6	Land rights or tenure	129	0.89
7	Yields	98	0.68
8	Implementation of agricultural policies	90	0.62
9	Farm Transitions	70	0.48
10	Regulations	67	0.46
11	Labor Availability and Cost	59	0.41
12	Public Perceptions of Farming	53	0.37
13	Uncertain Planting Windows	53	0.37
14	Increased Energy and Fuel Costs	51	0.35
15	Improved gender roles/resource access	50	0.34
16	Animal Health	35	0.2414

Climate change was ranked as the foremost area where support is needed by survey respondents. But it should be acknowledged that the average respondent to this survey had a much higher level of education than the farmers they work with (Table 2). Presented with this same question, most farmers would likely prioritize farm profitability, extreme weather, and other more immediately tangible options over climate change. Indeed, these options also ranked high on the list of priorities. The next two highest issues, farm profitability and extreme weather events, are directly related to climate change. The following two issues, market uncertainty and production costs, will also be exacerbated by climate change.

## Survey Results by Theme

### Improving the Knowledge of CSA

Survey participants were asked to indicate the top barriers and needs related to knowledge about CSA. Respondents indicated that key knowledge barriers that hinder farmers' ability to adopt CSA practices include a lack of financing, lack of information on long-term benefits, inadequate knowledge of how to implement CSA practices efficiently, and the lack of knowledge of new practices themselves (see Table 16). These knowledge barriers seem straightforward and echo barriers seen in the literature and policy reports.

**Table 16. Knowledge Barriers to Farmers Adopting CSA (Q6).**

Knowledge Barriers		Score	Avg. Score
1	Lack of financing initiatives/opportunities	354	2.44
2	Lack of information on longer term (year on year) benefits of change	250	1.72

3	Not enough information on CSA practices implement them effectively	250	1.72
4	Lack of knowledge about new practices	186	1.28
5	Insufficient farm-specific information	166	1.14
6	Lack of interest or awareness	146	1.01
7	Takes too much time to switch practices	73	0.50
8	Difficult to understand and implement new technologies	63	0.43
9	New practices are not culturally accepted	51	0.35
10	Lack of digital technology / internet access	47	0.32
11	Hard to find information	44	0.30
12	New practices are difficult to use	36	0.25
13	Limited use of electronic devices	19	0.13
14	Guidance does not apply to farms in the area	18	0.12

Respondents were further asked to indicate which initiatives were most needed to help overcome these knowledge barriers. Most respondents felt that capacity building, peer information networks, national CSA projects, and strengthening national Extension programs would help foster knowledge sharing (see Table 17). These initiatives also seem straightforward and echo findings from the scientific literature and policy reports that have called for increased capacity building, knowledge sharing networks; demonstration projects and strengthening Extension programming (Sala et al., 2016). The challenge is finding the political will and innovative strategies to make these initiatives happen rapidly in every country.

**Table 17. Initiatives to Foster Knowledge Sharing (Q7).**

Knowledge Initiatives		Score	Avg. Score
1	Capacity Building Projects on CSA	176	1.21
2	Supporting farmer-farmer or peer to peer information networks	160	1.10
3	National Climate Smart Agriculture Projects	126	0.87
4	Strengthening of National Extension programs	121	0.83
5	Strengthening of CSA Research, Modeling or Outreach by Universities	95	0.66
6	Increasing NGO programs to share CSA information	51	0.35
7	Increasing research programs in countries or other regions	43	0.30
8	Supporting CSA Regional Networks	33	0.23
9	Global Networks to Share CSA resources and tools	10	0.07

It is important that GACSA work to eliminate the key barriers identified in this survey to overcome the challenges that inhibit effective implementation of climate-smart agricultural practices and farm profitability.

## Development and Use of CSA Informational Resources

Respondents were asked whether they had developed resources and/or tools to help farmers or policy with CSA that could be shared with GACSA, and whether they had used GACSA resources for these purposes. Over half of respondents indicated they had developed resources that can be shared with GACSA members (see Table 18).

**Table 18. Respondent resource development (Q33, n=131).**

Respondent Developed Resources	Number of Responses	Valid Percent
Yes	73	55.7%
No	58	44.3%
Total	131	100%

However, when asked if they had used GACSA resources, less than 25% of respondents answered yes (see Table 19).

**Table 19. Respondent resource use of GACSA resources (Q34, n=131).**

Respondent Used Resources	Number of Responses	Valid Percent
Yes	32	24.4%
No	99	75.6%
Total	131	100%

This is a very low number indicating low use of the resources GACSA has developed. The organization should follow up by asking members why less than a quarter of respondents have used GACSA resources, to determine if they are not aware of the resources, or did not find them relevant or useful. Instead of simply putting information out for consumption, the Alliance may need to evaluate the effectiveness of tools developed and used, and provide more innovative ways to access information, such as through social media, videos or webinars

## Improving the Enabling Environment for CSA

Survey participants were asked to indicate the top policy, legal, and capacity barriers and needs for CSA, to which respondents again cited a lack of funding. They also indicated inadequate extension services and the fact that global policies have not been translated into policies at the national level (see Table 20).

**Table 20. Policy Barriers to Farmers Adopting CSA (Q8).**

Enabling Environment Barriers		Score	Avg. Score
1	There is not enough funding	182	1.26

2	There is not enough Extension Services	162	1.12
3	Global Policies have not been translated into national policies	117	0.81
4	National Policies are not implemented locally	116	0.80
5	National Policies are not enforced	100	0.69
6	There is no local Buy In	46	0.32
7	Government agencies/extension are corrupted	41	0.28
8	Discrepancies between federal and sub-national policies	34	0.23

Respondents were asked to prioritize national-scale initiatives to foster the enabling environment for CSA in their country. Survey participants felt the highest priority for GACSA would be to help members incorporate climate change into existing national agricultural policies, assist with national CSA planning, and Nationally Determined Contributions (NDCs) under the Paris Agreement (see Table 21).

**Table 21. Priority Initiatives to Foster Enabling Environment (Q9).**

Enabling Environment Initiatives		Score	Avg. Score
1	Incorporating Climate Change in existing Ag Policies	209	1.44
2	National CSA Planning	189	1.30
3	NDCs under the Paris Agreement	125	0.86
4	National Adaptation Strategies	121	0.83
5	Sustainable Development Goals	89	0.61
6	National Mitigation Strategies	67	0.46
7	Gender Action Plans	14	0.10

These are critical important recommendations that speak to the need for GACSA to prioritize helping countries incorporate broad global CSA goals into the existing agricultural policies in each country, as well as by adapting national CSA plans and incorporating CSA into county NDCs. It is not enough to have a broad commitment to CSA on the global and national scales, but CSA has to be incorporated into actual agricultural policies. At an institutional level, GACSA has identified the need for public and private governance to be linked, and for Extension services in forestry, fisheries, environmental, and agricultural sectors to be aligned with newer goals related to CSA (Sala, 2016).

## Improving the Investment Environment for CSA

Survey participants were asked to indicate the top barriers and needs for Investment in CSA. Respondents indicated that they lacked access to rural financial services, that lending requirements were disconnected from CSA, and that they wanted support from government central finance and policy (see Table 22).

**Table 22. Barriers to Investments in CSA (Q10).**

Investment Barriers	Score	Avg. Score
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1	Lack of access to rural financial services	224	1.54
2	Lack of connection between lending requirements and CSA practices	168	1.16
3	Lack of government central finance and policy support	164	1.13
4	New private sector financing / loans difficult to find	94	0.65
5	Lack of land ownership/land rights	72	0.50
6	Corruption	58	0.40

Respondents identified a lack of access to financial services (such as loans, credit, savings, payments, insurance) as being the main constraint to their activities (see Table 22). Such issues – where traditional insurance structures, for example, benefit only rich farmers – are common in rural areas around the world (Abraham, 2018). Financial services and government programs should focus specifically on centering those at the margins to bolster the capacity of farmers in the poorest income quintile to reduce the paywall for sustainable agricultural practices. More inclusive financial policies should be designed alongside an investigation of rural farm household organization in order to best address how to fund CSA.

Respondents were asked to rank the top initiatives that could help foster investment in CSA. They again prioritized national-scale initiatives for investment, wanting national CSA planning with domestic budgeting as well as policies or projects from the Green Climate Fund (see Table 23).

**Table 23. Initiatives to Foster Investments (Q11).**

	<b>Investment Initiatives</b>	<b>Score</b>	<b>Avg. Score</b>
1	National CSA Plans and projects	172	1.19
2	Domestic budgetary funding for Climate Change or CSA	134	0.92
3	Green Climate Fund policies or projects	110	0.76
4	Public/Private Partnerships	99	0.68
5	NDCs under the Paris Agreement	79	0.54
6	Matchmaking Facilities (matching donors with projects)	77	0.53
7	Adaptation Fund policies and projects	66	0.46
8	Bilateral Government or NGO-funded Projects	46	0.32
9	Multilateral bank policies or projects	34	0.23

In addition to national funding initiatives, respondents indicated that the Green Climate Fund (GCF) would best foster investment in CSA (see Table 23). The GCF is an operating entity of the Financial Mechanism of the UNFCCC that invests in adaptation and mitigation. Supporting country ownership by working with developing countries' national action plans, the GCF engages both the public and private sectors to offer a wide range of financial products, including using funding to overcome market barriers for private finance (GCF). In this way, the GCF can provide direct and effective funding for specific projects in countries. GACSA can coordinate with member countries and Regional Alliances to work towards

investing in CSA as well as raise awareness of funding bodies and how organizations can apply for grants to support their CSA practices.

## Priorities for GACSA Focus

Members were asked to rank the Importance of the Three Pillars of CSA, in terms of how GACSA should prioritize its work. Sustainably increasing productivity was the main priority for members. Interestingly, mitigation was the lowest priority for respondents, despite most participants feeling like they were least prepared to implement mitigating agricultural practices (see Table 24).

**Table 24. Ranked Priority for GACSA to Address the Three Pillars of CSA (Q12).**

Rank	CSA Pillars	Avg. Rank
1	Sustainable improvements in productivity	1.69
2	Adaptation: Building resilience	1.86
3	Mitigation: Reducing & removing GHGs where possible	2.45

It is interesting to note that even though respondents felt farmers were least prepared to mitigate climate change, they felt this was the least important pillar for GACSA to focus on. They felt the strongest priority should be placed on productivity improvements followed by adaptation (see Table 24). This highlights the need to further assess stakeholder needs, aspirations, and capacities at all levels, particularly those of farmers and vulnerable communities, to illuminate equitable and inclusive CSA reforms. Linking the objectives of the agricultural and global change communities by first prioritizing adaptation and sustainable agricultural intensification, and then searching for opportunities to reduce emissions, has been identified as a strategic approach to CSA implementation (Vermeulen et al., 2015).

Respondents were asked to rank which activities and global initiatives they feel GACSA should become more involved with. The survey results indicate that GACSA should prioritize assessments of CSA to improve agricultural system outcomes, supporting increased funding or investment partnerships, and providing knowledge briefs for both policy and CSA practices (see Table 25). Desired agricultural system outcomes include increased household income, better soil health, and family nutrition (See Appendix, Q13).

**Table 25. Prioritized Activities that GACSA should Address (Q13).**

Priority for GACSA Activities	Score	Avg. Score
1 Assessment of CSA for improved agricultural system outcomes	374	2.58
2 Supporting increased funding/investment partnerships	294	2.03
3 Knowledge briefs/case studies of national policies or laws	268	1.85
4 Knowledge briefs/case studies of effective CSA practices	236	1.63

5	Assessment of linkages/differences between CSA and other approaches	205	1.41
6	Supporting CSA Communities of Practice	163	1.12
7	Providing Guidance documents/best practices	152	1.05
8	Supporting Country to Country technical exchanges	144	1.00
9	Providing Opportunities for networking and collaboration	132	0.91
10	Knowledge briefs/case studies of current or future priorities in CSA investments	122	0.84
11	Communication networks (to share information and knowledge)	111	0.77
12	CSA Implementation guidance documents	77	0.53
13	Strategies for improving gender equity	74	0.51
14	Recommendations on innovative/disruptive CSA technologies or practices	71	0.49
15	Implementation of SDG/NDCs via transformative CSA partnerships	71	0.49
16	Supporting Research papers	60	0.41
17	Further definition of the concept of CSA	55	0.38
18	Recommendations for the UNFCCC Koronivia Joint Work on Agriculture	29	0.20

The survey also asked respondents to provide feedback on the global initiatives that they felt GACSA should become involved with (see Table 26). Respondents felt that GACSA should prioritize participating in CSA science conferences, the Global Forum for Food and Agriculture, and Sustainable Development Conferences. The Global CSA Science Conference is a biannual forum for exchange of scientific knowledge to transform food systems under climate change and to catalyze the partnerships needed to do so by uniting scientists, farmers, policymakers, and investors (Global CSA Conference, n.d.). The Global Forum for Food and Agriculture (GFFA) is an international conference where politicians, industry members, scientists, and civil society discuss agri-food policy issues (GFFA, n.d.). GACSA members wanted to forge connections at the global scale by also partaking in Sustainable Development Conferences. It is interesting to note that respondents felt it was less of a priority to be involved with the UNFCCC COP conferences or Koronivia JWP under the UNFCCC process.

**Table 26. Global Initiatives for GACSA Involvement (Q14).**

Global Initiatives		Number of Responses
1	Global CSA Science Conferences	109
2	Global Forum for Food and Agriculture	107
3	Sustainable Development Conferences	101
4	World Food Summit	85
5	UNFCCC COP Conferences or SB Meetings	84

6	Koronivia Joint Work on Agriculture Meetings through the UNFCCC	74
7	Committee on World Food Security (CFS)	72
8	Climate Week NYC Events	48
9	Borlaug International Symposium and World Food Prize	37

## Regional CSA Alliances

### GACSA Member Regional CSA Alliance Participation

Survey participants were asked to indicate all of the Climate-Smart Agriculture Regional Alliances in which they participate, from a list of eight regional alliances (see Table 27). The top three listed regional affiliations were: 1) Africa CSA Alliance (ACSAA); 2) Southern Africa CSA Alliance (SACSAA); and 3) North America CSA Alliance (NACSAA). Over half of respondents are not affiliated with any regional alliances. This demonstrates that there is active input needed to increase representation of all regions within Regional Alliances affiliated with GACSA.

**Table 27. Regional Alliance Affiliation (Q31).**

GACSA Work with Regional Alliances		Percent
1	I am not affiliated with any CSA regional alliance	54.30%
2	ACSAA: Africa CSA Alliance	11.92%
3	SACSAA: Southern Africa CSA Alliance	7.28%
4	NACSAA: North America CSA Alliance	6.62%
5	Climate KIC: Regional Alliance in Europe	5.30%
6	Other	3.97%
7	ASEA-CRN: Association of Southeast Asian Nations	3.31%
8	EACSAP: Eastern Africa CSA Alliance	2.65%
9	WACSAA: West Africa CSA Alliance	2.65%
10	FAO/REU: Eastern Europe and Central Asia	1.99%

Of all responses, the greatest number were affiliated with the Africa CSA Alliance (ACSAA), which was established in 2015. ACSAA serves as a platform for information and technical support, peer exchange, communication, and advocacy. Enhancing social and environmental resilience is at the forefront of ACSAA/NEPAD-INGO's mission. In 2014, NEPAD declared its goal - backed by African state officials, NGOs, investors, and partner organizations - to introduce CSA to 25 million smallholder farmer households by 2025 (UN FAO Regional CSA Alliances and Platforms, n.d.). The second highest regional alliance affiliation was with the Southern Africa CSA Alliance (SACSAA), which covers 16 countries in Southern Africa. It was created to help facilitate the Pan-African Alliance's goal of introducing climate-smart practices to six million smallholder farmers by 2025 (Global Alliance for Climate-Smart

Agriculture, n.d.). The third highest regional alliance affiliation was with the North America CSA Alliance (NACSAA), which partners with organizations in the USA, Canada, and Mexico to engage and build capacity amongst agriculture and forestry sector leaders and stakeholders to ensure that CSA programs are governed by farmers, as well as to encourage collaborative research and knowledge sharing (UN FAO Regional CSA Alliances and Platforms, n.d.).

Survey participants were asked to provide the three most important functions that GACSA could provide to work with the regional alliances to help ensure that they function more effectively (see Table 28). Responses indicated that GACSA should prioritize training and capacity building for Regional Alliances and facilitate knowledge collation and dissemination to better educate and prepare members to implement climate smart agricultural practices.

**Table 28. GACSA Priorities for Working with Regional Alliances (Q32).**

<b>GACSA Work with Regional Alliances</b>		<b>Score</b>	<b>Avg. Score</b>
1	Training and Capacity Building	147	1.01
2	Knowledge collation and dissemination	132	0.91
3	Develop linkages	109	0.75
4	Facilitation of Membership	106	0.73
5	Engage in Co-Resource Mobilization	72	0.50
6	Coordinate Regular Check In Meetings	59	0.41
7	Share Policy Priorities	56	0.39
8	External Communication	55	0.38

Table 28 indicates that there is a strong desire amongst GACSA members who are affiliated with regional alliances for GACSA to strengthen mechanisms of collaboration and communication amongst partners – with training and capacity building, knowledge coalition and dissemination, facilitating membership, and developing linkages listed as their highest priorities. Agricultural Research for Development’s (AR4D) key principles for achieving positive, long-term impacts include enhancing research, engagement, and organizational capacities amongst stakeholders. These principles become increasingly important as farm and food systems face climate challenges (Vermeulen et al., 2015).

Based on the main findings of the survey noted above, key recommendations for GACSA were distilled out relating to the focus on knowledge sharing, improving the enabling environment for CSA, improving financing, and increasing the focus on gender and youth in CSA. These recommendations are outlined below.



# Recommendations

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## Knowledge Action Group

### *Spreading Knowledge of CSA Practices to address Climate Impacts*

The following sections highlight the CSA practices that farmers can adopt to increase their resilience to climate change, based on the issues that were found to be of greatest concern to GACSA members (see Table 7). GACSA members, Extension specialists and farmers can find more details on these CSA Practices in the *CSA Sourcebook* (UN FAO, 2013). GACSA members can help create materials, curriculums, or workshops to spread knowledge and adoption of these practices in their countries.

**Drought:** There are many methods of reducing vulnerability to drought. Increasing soil organic matter, reducing tillage, and cover cropping all improve soil's ability to retain water. Terracing helps to reduce runoff and improves water penetration into soil, while also reducing nutrient loss due to erosion. If they have access to capital or financing, farmers can invest in technologies which reduce the threat posed by drought: water efficient Irrigation equipment such as drip-tape ensures that water is used efficiently, and building catchments can help to collect water during rainy periods so that it is available later when water becomes scarce. Some common crops may also have cultivars which have been genetically engineered to improve drought resistance.

**Extreme rainfall/flooding:** In addition to helping combat drought, increasing soil organic matter also helps to reduce the risk of flooding by acting as a sponge, absorbing excess water and storing it away. Digging drainage ditches and using raised beds or mounds are also effective methods for reducing the risk of flooding. For farmers who can afford it, installing tile drainage is highly effective. If flooding has already occurred, quickly planting a cover crop once the water has receded will help to restore soil structure and microorganisms.

**Changing growing seasons:** Access to local weather and seasonal reports will be a crucial tool for adapting to changes in growing seasons. Reports help farmers to plan planting and harvesting schedules, as well as plan for frost and water availability. Other strategies to overcome changing growing seasons include: a frost protection plan (especially for fruit crops), using frost protection covers or hoop houses (heated or non-heated depending on the local climate), light-emitting diodes to lengthen growing times where growing seasons

are short, air circulation fans to reduce humidity in buildings (especially for livestock), misting and/or drip-tape irrigation systems, and site-specific selection. Large scale farm equipment may also help to cope with shrinking planting/harvesting windows by helping to cover more acreage faster.

**Soil erosion:** One way to reduce erosion is to improve the soil health over the long term. Water more readily infiltrates healthy soil, reducing the risk of erosion. For sloped land, one method that helps reduce erosion is to eliminate the slope through terracing. If terracing is not possible or practical, then cover cropping, tree planting, and hedgerows/grass breaks/stone walls can all help to hold soil in place and recapture soil lost from higher lands. Riparian buffers can help reduce erosion for fields along riverbanks.

**Increased Pest/Disease Pressure:** The use of integrated pest management (IPM) can help farmers identify and manage pests and disease early on. Farmers can help deter pests by intercropping fields with natural repellents such as marigold. The effectiveness of repellent crops can be maximized by planting field borders with trap crops, creating a “push-pull” system. Even simply increasing crop diversity reduces pest pressure by attracting greater animal biodiversity, which increases the presence of natural insect pest predators such as wasps, ants, and birds. Clearing leaf litter/detritus from fields and composting it elsewhere can help to thwart overwintering pests, eggs, and spores. If pest problems persist, farmers may have success with easy to make, organic pesticides such as onion or garlic brews.

**Heat stress:** Lightweight clothing and sunhats can help farm workers to stay cool, along with altering work hours to avoid the hottest times of the day. Shade from structures or trees and easy access to water helps farmers and livestock alike. For livestock, farmers may consider installing vents/fans in livestock enclosures, providing adequate cool water, and altering diets during high heat.

## *Knowledge Dissemination*

There is already a breadth of information on CSA practices and outcomes, yet it is important that the available knowledge be more readily accessible to stakeholders (Sala, 2016). The Knowledge Action Group’s “Map of Web-Based Knowledge Resources on CSA,” which can be found on the organization’s website, was crafted amidst GACSA’s growing awareness of the need to properly deliver information to its members. This compilation of online CSA resources targets policy makers, researchers and practitioners (Global Alliance for Climate-Smart Agriculture, n.d.).

Previously-published GACSA documents have identified knowledge gaps. There is a need for more site-specific information, particularly with regard to ways to enhance income diversification and assess organizational capabilities across various regions. There is also a need to identify new knowledge demands in an ever-changing climate system (Sala, 2016).

## *Preparing Farmers for Mitigation*

Respondents indicated that, of the Three Pillars of CSA, mitigation is their lowest concern (see Table 24). However, the survey also found that respondents felt that they were least prepared to implement practices to mitigate the effects of climate change (see Table 11). But countries are obligated to reduce GHG emissions from all sectors, including agriculture, to meet their commitments under the Paris Climate Agreement. It is therefore vital that GACSA concentrates support in sharing knowledge regarding mitigation methods. Grewer et al. (2018) emphasize the importance of “understanding the potential greenhouse gas impacts of agricultural development programs” in order to identify how to support smallholder farmers’ development without drastic increases in GHG emissions, in accordance with the Three Pillars of CSA.

Potential mitigation efforts coincide with the aforementioned suggestions. Respondents indicated installing renewable energy and energy-efficient irrigation systems as top mitigation information gaps (see Table 13). Smallholder farmers can also help to minimize environmental degradation by building soil health through strategies like increased organic matter, reducing reliance on inorganic fertilizers and pesticides, and minimizing or eliminating tillage. Less reliance on inorganic inputs, and more efficient application when use is necessary, would reduce runoff of nitrogen and harmful chemicals. Reduced tillage will positively impact soil health. Frequent tillage negatively impacts soil quality, including bulk density, pores and water-holding capacity, infiltration rates and overall tilth, and levels of organic matter and soil organisms, by disrupting soil structure (Iowa State, n.d.). Bolstering soil health would reciprocally reduce the need for additional inputs such as fertilizers, and, because soil acts as a significant carbon sink, such actions would enhance removal of carbon dioxide from the atmosphere through sequestration.

## *Extension Services*

Agricultural extension services help improve farmers' productivity and sustainability by working with them to grow CSA knowledge. This dynamic between extensionists and farmers should be highly collaborative. Shifting the focus of interventions from “transferring” knowledge, tools, and skills to “catalyzing and facilitating” collaborative CSA research, innovations, and dialogue amongst farmers is a GACSA ideal (Sala, 2016).

Farmer-to-farmer extensions (F2FE) may help supplement ongoing capacity building initiatives, as farmers are more receptive towards those with shared experiences. This approach fosters relationships between farmers that can be sustained and serve as sources of support long after the formal F2FE takes place. Implementing these alongside

governmental and external programs will in turn legitimize farmer-led training and assistance (Simpson, 2016).

There is also a need for rural advisors to contribute their unique ecological knowledge to strategy development and implementation, particularly from agricultural regions that have already been forced to adjust their practices due to changing conditions. The KAG recognizes that there is potential for local traditional knowledge to supplement current CSA strategies (Sala, 2016). The annual KAG report describes opportunities and challenges, scaling up potential, and stakeholder feedback associated with CSA extensions services in countries such as Tanzania and Senegal (Sala, 2016).

Extensionists should improve the accessibility and convenience of feedback services for women. Engagement could be facilitated through direct contact with officers and Citizen Report Cards (CRCs), for example, to identify ways where extension and advisory services can be improved (Manfre et al 2013, 23). The importance of increased representation and political power of female stakeholders and gender-advocacy groups to achieve equitable and effective CSA programs and policies will be discussed below (See “Special Focus on Gender and Youth”).

### *Climate and Weather Services*

The results of the survey make it clear that there is a strong need for improved weather and seasonal climate forecasts. GACSA should suggest to their members to get involved in Climate Smart Farming Decision Tools so that farmers can have access to growing degree day calculators, fruit hardiness and freeze risks, irrigation schedulers, seasonal and weekly forecasts, and other tools to increase farm resiliency and sustainability. Another suggestion would be supporting new decision tools such as field sensor technology and other data analytics that can assist farmer adaptation. Equitable farmer access to usable information and resources is key. For farmers with fewer technological resources, textual and step by step disaster risk management plans could be useful. In communities with fewer resources, GACSA should encourage community planning for “bad” years and threats to food security. GACSA should share climate-smart farming knowledge for these communities to incorporate into their plans.

As many respondents cited concern regarding increased disease and pest pressures, adaptation practices should be practiced, but in addition, there should be a push for enhanced pest and disease monitoring followed by regional data sharing of this information. GACSA should encourage neighboring regional alliances to frequently share pest and disease data so that farmers can anticipate threats and prepare for them. GACSA should encourage farmers to report disease and pest information to a data collection site where the information can then be available to other farmers in the same or nearby regions. This is important because pest management strategies are most effective when implemented on a community-wide scale.

## Enabling Environment Action Group

Respondents identified the main policy barriers to farmers in adopting CSA; these included a lack of funding, insufficient extension services, global policies not being translated into national policies, and national policies not being implemented at local levels or generally not being enforced, among others (see Table 20).

Policies to increase financing opportunities should be at the forefront of the Enabling Environment Group's action plan, particularly when it comes to expanding access to rural finance. Rural Advisory Services (RAS) present opportunities for greater engagement and innovation of rural sectors (Kamruzzaman et al., 2020). With their site-specific knowledge and access to community networks, rural advisory and extension systems have facilitated proper management of natural resources and provided technological support to farmers. These advisory systems and extensions enable traditional and farmer extension services, Information and Communication Technology transfers, the development of resource centers, and farmer field schools in rural sectors (Sala, 2016).

There is also a need for political and institutional support to strengthen RAS's organizational and financial capacities (Sala, 2016). Additionally, incorporating climate change into existing agricultural policies, national CSA planning, and national mitigation strategies were other high-priority policy recommendations for GACSA (see Table 21).

## Investment Action Group

Referencing Table 5, GACSA members reported the lowest level of expertise in finance economics and youth engagement. Farm profitability was a major concern that GACSA members felt they needed more support in. Climate change will further exacerbate the issue of profitability as, without proper adaptation, crop yields will decrease globally on average by 3 to 7 percent (Zhao et al., 2017). Therefore, GACSA's Investment Action Group should collaborate with the Knowledge Action Group in order to better focus on sharing knowledge of finance economics and strategies with farmers so that they can better manage their income and increase profitability.

In addition to financial literacy, respondents indicated that a significant barrier for them was a lack of financial services (see Table 22). Financial services include loans, credit, savings, and insurance. Loans help farmers afford land, equipment, seeds, and in other day-to-day operations. However, in rural areas, traditional insurance structures traditionally benefit only

rich farmers and financial institutions are not meeting the needs of farmers in lower income brackets (Abraham, 2018). Research on rural farm household organization should be conducted to determine how to better finance climate-smart agriculture. The Investment Action Group can partner with the Enabling Environment Group to help design more inclusive financial policy that will more adequately fund CSA practices.

Respondents mainly sought domestic support from their respective countries in the form of national financial plans and policies (see Table 23). Beyond public sector initiatives, the Investment Action Group can also act as a matchmaking entity that fosters linkages between GACSA members and external sources of funding. For example, respondents identified the Green Climate Fund (GCF) as a potential partner (see Table 23). GACSA can coordinate with member countries and Regional Alliances to work towards investing in CSA by facilitating such partnerships with funding bodies, and raise awareness of how organizations can apply for grants to support their CSA practices.

## **Regional CSA Alliances**

Regional alliances for CSA facilitate the exchange of knowledge and resources, the harmonization of the CSA agenda across national and sub-national levels, and policy support and advocacy. Stakeholders at sub-regional levels whose interests are represented and coordinated by an umbrella organization, as modeled by the NEPAD-INGO Alliance in Africa, have reached their targets more effectively and holistically. This organizational structure may help secure and manage resources across sub-regions (GACSA, 2016).

GACSA's leadership, including its Strategic Committee, Facilitation Unit, and action groups (KAG, EE, and IAG) are meant to provide Regional Alliances and other members with guidance to meet the three pillars of CSA (GACSA, 2016). GACSA's ability to create sustainable and productive agricultural systems through CSA programs is contingent upon guidance and support it receives from the FAO. Though the Regional Alliances' broader goals and desired outcomes overlap, GACSA's capabilities and degree of external reliance dictate the feasibility of their CSA goals and the pathways they take.

In many cases, the ability of a Regional Alliance to achieve sustainable and productive agricultural systems through CSA programs is contingent upon the guidance and support it receives from the FAO. Therefore, conducting a second survey report focusing on Regional Alliances has been identified as an important next step towards creating an action plan for GACSA. There is a need for a more comprehensive understanding of the alliances' capabilities and needs, with careful consideration to the varying ecological, economic, and sociocultural conditions of the regions they represent.

### ***GACSA Case Studies***

Regional Alliance members identified initiatives GACSA should prioritize to foster knowledge sharing, and amongst the activities that ranked the highest were evaluating and compiling case studies across different regions (see Table 25). The global network and Farming First supporters have already built a web page with documents and webinars of country case studies covering topics such as intercropping banana and coffee, weather data, drought tolerance, fertilizer use, and waste management (GACSA, n.d.). GACSA should therefore assess which case studies have been developed, and develop additional ones on country enabling policies or CSA practices to fill knowledge gaps.

## Special Focus on Gender and Youth

### Gender

Women play a vital role in food systems. There is significant evidence to suggest that a gender-centered approach to agricultural development is necessary in order to increase crop productivity as well as increase food security. While the FAO reports that women comprise only 43 percent of the agricultural labor force in developing countries, with as little as 15 percent of the labor in Latin America and the Caribbean, data may miss much of women's work (FAO, 2012). Kitchen gardens and homestead plots are not counted as agriculture, nor is tending livestock or poultry, despite playing an important role in providing dietary diversity (Doss et al., 2018). Women farmers are responsible not only for agricultural productivity, but also domestic labor that women are typically expected to perform, such as food preparation, cleaning, and childcare (Doss et al, 2018). Thus, it is unsurprising that on average, women-run farms produce 20 to 30 percent less than farms run by men (Duckett, 2019). This 'crop gap' is not due to lack of skill, but rather systemic obstacles. Across all regions, women have less access to assets, inputs, and services such as land, labor, education, technology, and financial resources (FAO, 2012; Paudyal et al., 2019).

Significantly, women have less access to critical climate and weather information. Such a disparity exacerbates women's vulnerability to climate change (Ampaire et al., 2020). It is vital to recognize the differential access to resources that women experience in order to better address climate change/poverty reduction/food security. If women had equal access to resources as men, they could see a 20 to 30 percent increase in yields (FAO, 2012). Such a boost would reduce the number of hungry people in the world by 12 to 17 percent, which would feed 150 million more people (FAO, 2012; Duckett, 2019). Moreover, it is critical to obtain better data on how gender factors into labor in agriculture and household production in order to design policies to promote sustainable agricultural techniques and food security (Doss et al, 2018). Policies to facilitate implementation of CSA would increase women's access to productive resources, expand their capacity to participate in decision-making at the community level, and extend the knowledge base a reciprocal manner to incorporate

women's knowledge while sharing the most relevant weather data in order to increase women's ability to respond to climate change.

## Youth

Global food security is increasingly threatened as the farming population grows older and young people increasingly turn away from agriculture and move to cities to seek out careers they believe to be more skillful and profitable (Brand & Galdava 2019). To ensure that there are enough farmers to feed the world, it is necessary to engage youth to retain them in the farming community. To do so, the image problem must be accounted for: the image problem refers to the common idea that agriculture is an undesirable way of living for the poor and uneducated. Solving the image problem lies in reorienting the approach to agriculture. Agriculture should be approached through a lens of learning the importance of knowing where our food comes from, technology, community engagement, and should recognize the extent of expertise and challenges related to farming. Developing educational outreach and programs to introduce students to these lenses of agriculture would be instrumental in this approach. One issue that adds to the image problem of agriculture is that the majority of rural youth who are employed as casual or seasonal subsistence farmers earn low wages, face unsafe and often exploitative working conditions, and have insufficient access to skills development and education (FAO, 2020). Increasing access to agricultural careers, education, and skills development and supporting better working conditions and wages for farm laborers will be helpful in solving the image issue.

Even if young people become interested in farming, they may still face barriers to accessing agricultural careers. Family and community pressures urge youth to seek out career paths that will take them away from the difficult, subsistence lifestyle of working on family or local farms (Brand & Galdava, 2019). Promoting skills development and agriculture as an educational, skills-based practice may fight these pressures. Access to land and finance are also significant barriers. In Sub-Saharan Africa, for example, land is a communal resource and is passed down generationally which makes it difficult for non-traditional farming youth to pursue careers in agriculture (Brand & Galdava, 2019). It is uncommon for youth to have the financial resources needed to rent, purchase, or begin a farm (Brand & Galdava, 2019). In addition, financial planning and community resources to access finance may be lacking for youth. Supporting ways for youth to acquire land and access financial resources will be instrumental in engaging them in farming careers.

Because agricultural knowledge is not taught to students and is instead passed down generationally or within communities, access to training, education, and information acts as a barrier to youth engagement. Youth demand new knowledge and access to improved technologies. Engaging youth in agriculture through information and communication technologies may be a key tool (Brand & Galdava, 2019). Technological tools can address numerous challenges to agriculture and leveraging these tools requires a full new set of technical expertise and youth are often eager to master new technologies as a way to solve

challenges (Brand & Galdava, 2019). New technologies can help farmers adapt to climate changes as well as demonstrate to youth how agriculture can be an engaging, viable, and profitable business opportunity, increasing their desirability of agriculture-related career paths (Brand & Galdava, 2019). In order to be effective and reach a diverse group of youth, educational materials for youth should be presented in several languages as well as versions catered to different age and skill levels. Young people are natural learners, but they will not engage well with material that is too simple or too complex; they need a level of difficulty that is “just right” in order to engage and retain information (this is known as the Goldilocks method). Many youth, and especially those with learning disabilities, may be more hands-on or visual learners. Hence, GACSA should support programs that get youth out into the environment to study agriculture through experiential learning. The best way to support the next generation of climate smart farmers is to get youth into meaningful settings where they personally invest in agricultural systems and foster a relationship with the natural world. GACSA could support this process by building up agricultural education and outreach programs in both rural and urban settings, which would allow a headstart for climate smart practices in future generations and help to engage youth in agriculture-related careers.

## COVID-19 Considerations

At the time of writing, much of the world is operating under strict limitations due to the global pandemic of SARS-CoV-2 (aka COVID-19). We recognize that GACSA member organizations are facing increased economic and budget challenges and unique working restrictions depending on region and level of risk, which may make some of these recommendations difficult or impossible to implement. In May 2020, the Southern Africa Climate Smart Agriculture Alliance (SACSAA) initiated virtual discussions on the impacts of the COVID-19 pandemic on food systems and potential ways to build resilience in collaboration with CGIAR, GACSA and other partners. The webinar recording is not yet available, but should be soon (SACSAA, 2020). Additional efforts like this can help GACSA and its member organizations plan for contingencies stemming from COVID-19.

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# Appendix: GACSA Survey Instrument

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## **GACSA Member Survey 2019**

Thank you for filling out our survey! The Global Alliance for Climate Smart Agriculture (GACSA) is an inclusive, voluntary and action-oriented multi-stakeholder platform on Climate-Smart Agriculture (CSA). Its vision is to improve food security, nutrition and resilience in the face of climate change. GACSA aims to catalyze and help create transformational partnerships to encourage actions that reflect an integrated approach to the three pillars of CSA namely, sustainable improvements in productivity, building resilience, and reducing and removing greenhouse gases where possible.

The purpose of this study is to better understand the needs for information, enabling policies, and investments to increase farmers' adoption of Climate Smart Agriculture (CSA) practices globally. You have been selected to receive this survey as a member or participant with the Global Alliance for Climate Smart Agriculture (GACSA) or as a key individual working in the sphere of CSA. GACSA would like to better understand how climate change is affecting farmers in your country, the key barriers to adoption of CSA practices and policies, and what the network can do to help advance the three pillars of CSA.

Agriculture around the globe faces a current and impending crisis because of the increasing impacts of climate change. It is imperative that all countries, organizations, businesses, research institutions, and farmers have the information needed to support adoption of CSA practices and policies. The results of this survey will inform GACSA on how to focus its work and better serve you and farmers globally. This survey was developed by Cornell University, the GACSA Knowledge, Investment, and Enabling Environment Action Groups, and the GACSA Facilitation unit.

To help understand and document your perspectives on CSA needs, it is critical that we receive input from as many individual representatives of both GACSA and non-GACSA organizations as possible. The survey is confidential, and your participation is voluntary. It should take no longer than 10 minutes to complete. If you have any questions on the survey, feel free to contact Dr. Allison Chatrchyan at Cornell University ([amc256@cornell.edu](mailto:amc256@cornell.edu)) or Dr. Federica Matteoli with the UN FAO ([federica.matteoli@fao.org](mailto:federica.matteoli@fao.org)).

Thank you very much!

## Survey Questions

**Q1** Please identify the country you live in, and/or work most closely with, on Climate Smart Agriculture (CSA) activities:

▼ Afghanistan (1) ... Zimbabwe (1357)

**Q2** What is the name of the GACSA member organization you work for or most closely with?

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What is your primary expertise or role in the field of CSA? (Pick up to 3, with the first being your top role). Drag and drop options into the box. You can rank and reorder options.

### Primary Role

- ☐ Policy/legal (1)
- ☐ Farming/agriculture practices (2)
- ☐ Social Science Research (3)
- ☐ Physical Science Research (4)
- ☐ Extension (5)
- ☐ Finance/Economics (6)
- ☐ Business (7)
- ☐ Community development/sustainable development (8)
- ☐ Education (9)
- ☐ Youth (10)
- ☐ Consulting (11)
- ☐ Other (please explain): (12)

*End of Block: Intro Block*

*Start of Block: Climate Impacts and Priorities*

**Q4** Which climate-change related impacts do you think will most affect the farms in your region or country over the next five years? (Choose the top 5 in order of importance)

### Most Effects

- ☐ Extreme Rainfall Events/flooding (1)
- ☐ Increased Disease Pressure (2)
- ☐ Drought (3)
- ☐ Increased Weed/Insect/Disease Pressure (4)
- ☐ Saturated Soils/Ponding (5)
- ☐ Freeze Risk (6)
- ☐ Soil Erosion (7)
- ☐ Wildfires (8)

- \_\_\_\_\_ Desertification (9)
- \_\_\_\_\_ Heat Stress (10)
- \_\_\_\_\_ Changing Growing Seasons (11)
- \_\_\_\_\_ Hail Storms (12)
- \_\_\_\_\_ Local Tornadoes (13)
- \_\_\_\_\_ Salinization of agricultural fields (14)
- \_\_\_\_\_ Sea Level Rise (15)
- \_\_\_\_\_ Wind Damage (16)
- \_\_\_\_\_ Other (please explain): (17)

**Q5** Which key agricultural commodities are at greatest risk for climate impacts in your region? (Choose up to 5 in order of importance)

Greatest Risk Commodities

- \_\_\_\_\_ Grains (e.g. including rice, wheat, corn, soybeans) (1)
- \_\_\_\_\_ Tobacco (2)
- \_\_\_\_\_ Cotton (3)
- \_\_\_\_\_ Field Crops (e.g. including hay and silage) (4)
- \_\_\_\_\_ Perennial Crops (5)
- \_\_\_\_\_ Forestry/Agroforestry products (6)
- \_\_\_\_\_ Livestock (e.g. including dairy, cattle, sheep, and poultry) (7)
- \_\_\_\_\_ Vegetables (8)
- \_\_\_\_\_ Fruit, Berries, and Grapes (9)
- \_\_\_\_\_ Nuts (10)
- \_\_\_\_\_ Horticultural crops (11)
- \_\_\_\_\_ Aquaculture (12)
- \_\_\_\_\_ Other: (please explain) (13)

**Q6** What are the main knowledge barriers that limit farmers' adoption of CSA in the countries you work with? (Choose up to 3 in order of importance)

Main Knowledge Barriers

- \_\_\_\_\_ Lack of interest or awareness (1)
- \_\_\_\_\_ Lack of information on longer term (year on year) benefits of change (2)
- \_\_\_\_\_ Lack of financing initiatives/opportunities (3)
- \_\_\_\_\_ Takes too much time to switch practices (4)
- \_\_\_\_\_ Hard to find information (5)
- \_\_\_\_\_ Not enough information on CSA practices to implement them effectively (6)
- \_\_\_\_\_ Insufficient farm-specific information (7)
- \_\_\_\_\_ Lack of knowledge about new practices (8)
- \_\_\_\_\_ Limited use of electronic devices (9)
- \_\_\_\_\_ New practices are difficult to use (10)
- \_\_\_\_\_ New practices are not culturally accepted (11)
- \_\_\_\_\_ Lack of digital technology / internet access (12)
- \_\_\_\_\_ Guidance does not apply to farms in the area (13)
- \_\_\_\_\_ Difficult to understand and implement new technologies (14)
- \_\_\_\_\_ Other (please explain): (15)

**Q7** Which of the following initiatives would best foster Knowledge Sharing needed for CSA in your country or in organizations you work with? (Choose up to 3 in order of importance)

Knowledge Sharing initiatives

- \_\_\_\_\_ Capacity Building Projects on CSA (1)
- \_\_\_\_\_ National Climate Smart Agriculture Projects (4)
- \_\_\_\_\_ Strengthening of National Extension programs (5)
- \_\_\_\_\_ Strengthening of CSA Research, Modeling or outreach by Agricultural Universities (6)
- \_\_\_\_\_ Increasing research programs in countries (e.g. CGIAR) or spreading to other regions (8)
- \_\_\_\_\_ Increasing NGO programs to share CSA information (9)
- \_\_\_\_\_ Supporting farmer-farmer or peer to peer information networks (10)
- \_\_\_\_\_ Supporting CSA Regional Networks (11)
- \_\_\_\_\_ Global Networks to Share CSA resources and tools (12)
- \_\_\_\_\_ Other: (please explain) (7)

**Q8** What are the main policy/legal/capacity barriers that limit farmers' adoption of CSA in the countries you work with? (Choose up to 3 in order of importance)

Main Policy/Legal/Capacity Barriers

- \_\_\_\_\_ Global Policies have not been translated into national policies (1)
- \_\_\_\_\_ National policies are not implemented locally (2)
- \_\_\_\_\_ National policies are not enforced (3)
- \_\_\_\_\_ Discrepancies between federal and sub-national policies (4)
- \_\_\_\_\_ There is no local buy in for national policies (5)
- \_\_\_\_\_ There is not enough funding to implement policies (6)
- \_\_\_\_\_ There is not enough extension services to support policies (7)
- \_\_\_\_\_ Government agencies/extension services are corrupted (8)
- \_\_\_\_\_ Other (please explain): (9)

**Q9** Which of the following initiatives would best foster the Enabling Environment (policies or laws) for CSA in your country or organizations you work with? (Choose up to 3 in order of importance)

Enabling Environment initiatives

- \_\_\_\_\_ Nationally Determined Contributions under the Paris Agreement (1)
- \_\_\_\_\_ National Adaptation Strategies (2)
- \_\_\_\_\_ National Mitigation Strategies (3)
- \_\_\_\_\_ National Climate Smart Agriculture Planning (4)
- \_\_\_\_\_ Incorporating Climate Change in existing Agriculture Policies (5)
- \_\_\_\_\_ Sustainable Development Goals (6)
- \_\_\_\_\_ Gender Action Plans (7)
- \_\_\_\_\_ Other (please explain): (8)

**Q10** What are the main investment barriers that limit farmers' adoption of CSA in the countries you work with? (Choose up to 3 in order of importance)

Main Investment Barriers

- \_\_\_\_\_ Lack of access to rural financial services (1)
- \_\_\_\_\_ Lack of government central finance and policy support (2)
- \_\_\_\_\_ New private sector financing / loans difficult to find (3)
- \_\_\_\_\_ Lack of land ownership/land rights (4)
- \_\_\_\_\_ Corruption (5)
- \_\_\_\_\_ Lack of connection between lending requirements and CSA practices (6)
- \_\_\_\_\_ Other (please explain): (7)

**Q11** Which of the following initiatives would best foster Investments or funding needed for CSA in your country or in organizations you work with? (Choose up to 3 in order of importance)

Investment initiatives

- \_\_\_\_\_ Nationally Determined Contributions under the Paris Agreement (1)
- \_\_\_\_\_ National Climate Smart Agriculture Plans and projects (4)
- \_\_\_\_\_ Green Climate Fund policies or projects (5)
- \_\_\_\_\_ Domestic budgetary funding for Climate Change or CSA (6)
- \_\_\_\_\_ Multilateral bank policies or projects (7)
- \_\_\_\_\_ Matchmaking Facilities (matching donors with projects) (12)
- \_\_\_\_\_ Public/Private Partnerships (10)
- \_\_\_\_\_ Bilateral Government or NGO-funded Projects (11)
- \_\_\_\_\_ Adaptation Fund policies and projects (13)
- \_\_\_\_\_ Other (please explain): (8)

**Q12** Please rank how the three pillars of CSA should be prioritized in GACSA's work (1: the most important, 3: the least important)

Priorities

- \_\_\_\_\_ Sustainable improvements in productivity (1)
- \_\_\_\_\_ Building resilience (2)
- \_\_\_\_\_ Reducing and removing greenhouse gases where possible (3)

**Q13** Please select activities that should be addressed by GACSA member organizations: (Choose up to 6 in order of importance)

Activities

- \_\_\_\_\_ Knowledge briefs/Case Studies of national policies or laws that enable CSA adoption by sector (1)
- \_\_\_\_\_ Knowledge briefs/Case studies of effective CSA practices, by sector and country (2)
- \_\_\_\_\_ Knowledge briefs/Case studies of current or future priorities in CSA investments by sector and country (3)
- \_\_\_\_\_ Assessment of CSA for improved agricultural system outcomes (e.g., household income, soil health, family nutrition) by country (4)
- \_\_\_\_\_ Assessment of the linkages/differences between CSA approaches and other approaches (agroecology, carbon sequestration, agroforestry), etc.) (5)
- \_\_\_\_\_ Supporting Research papers (6)
- \_\_\_\_\_ Providing Guidance documents/best practices (7)
- \_\_\_\_\_ Supporting CSA Communities of Practice (8)
- \_\_\_\_\_ Supporting Country to Country technical exchanges (9)
- \_\_\_\_\_ Further definition of the concept of CSA (20)
- \_\_\_\_\_ CSA Implementation guidance documents (11)
- \_\_\_\_\_ Strategies for improving gender equity (e.g., labor, income, decision, ownership) (12)
- \_\_\_\_\_ Supporting increased funding/investment partnerships (13)
- \_\_\_\_\_ Communication networks (to share information and knowledge) (14)
- \_\_\_\_\_ Providing Opportunities for networking and collaboration (15)
- \_\_\_\_\_ Recommendations on innovative/disruptive CSA technologies or practices (16)
- \_\_\_\_\_ Recommendations for the UNFCCC Koronivia Joint Work on Agriculture (17)
- \_\_\_\_\_ Implementation of SDG/NDCs via transformative CSA partnerships (18)
- \_\_\_\_\_ Other (please explain): (19)

**Q14** Which Global Initiatives should GACSA be involved with?

- ☐ Annual UNFCCC COP or SB Meetings (1)
- ☐ Koronivia Joint Work on Agriculture Meetings through the UNFCCC (2)
- ☐ Sustainable Development Conferences (3)
- ☐ Climate Week NYC Events (6)
- ☐ Global CSA Science Conferences (5)
- ☐ Global Forum for Food and Agriculture (4)
- ☐ Committee on World Food Security (CFS) (9)
- ☐ Norman E. Borlaug International Symposium (Borlaug Dialogue) and World Food Prize (10)
- ☐ World Food Summit (11)
- ☐ Other (please specify): (12) \_\_\_\_\_

*End of Block: Climate Impacts and Priorities*

*Start of Block: Farmer Preparedness*

**Q15** How prepared are farmers in the country or organization you work with to adapt to climate change?

- ☐ Extremely Prepared (1)
- ☐ Very Prepared (2)
- ☐ Moderately Prepared (3)
- ☐ Slightly Prepared (4)
- ☐ Not at all prepared (5)
- ☐ I do not know (6)

**Q16** With which of these adaptation practices is there a gap in information or adoption, that GACSA members could help to fill? (Choose up to 5 in order of importance)

Practices

- \_\_\_\_\_ Soil health improvements (1)
- \_\_\_\_\_ Agroforestry (2)
- \_\_\_\_\_ Agroecology practices (3)
- \_\_\_\_\_ Cover Crops (4)
- \_\_\_\_\_ Use of organic fertilizers (5)
- \_\_\_\_\_ Use of synthetic fertilizers (6)
- \_\_\_\_\_ No-till (7)
- \_\_\_\_\_ Reduced Tillage (8)
- \_\_\_\_\_ Diversified Crop Rotations (9)
- \_\_\_\_\_ Intercropping (10)
- \_\_\_\_\_ Efficient Irrigation (drip irrigation) (11)
- \_\_\_\_\_ Water Infrastructure (e.g. ponds) (12)
- \_\_\_\_\_ Artificial Drainage (e.g. tiling) (13)
- \_\_\_\_\_ Restored or Constructed Wetlands (14)
- \_\_\_\_\_ Stream/Floodplain Management (15)
- \_\_\_\_\_ Windbreaks or Shelterbelts (16)
- \_\_\_\_\_ Integrated Pest Management (IPM) (17)
- \_\_\_\_\_ System of Rice Intensification (SRI) (18)
- \_\_\_\_\_ Rotational Grazing (19)
- \_\_\_\_\_ Nutrient Management (20)
- \_\_\_\_\_ Use of Precision Agriculture (21)
- \_\_\_\_\_ Use of new varieties (22)
- \_\_\_\_\_ Use of drought tolerant species (23)
- \_\_\_\_\_ Other (please explain): (24)

**Q17** How prepared are farmers in the country or organization you work with to mitigate climate change, i.e. to reduce or remove greenhouse gases?

- ☐ Extremely Prepared (1)
- ☐ Very Prepared (2)
- ☐ Moderately Prepared (3)
- ☐ Slightly Prepared (4)
- ☐ Not at all prepared (5)
- ☐ I do not know (6)

**Q18** With which of these mitigation practices is there a gap in information or adoption, that GACSA members could help to fill? (Choose up to 5 in order of importance)

Practices

- ☐ Install Renewable Energy on the Farm (1)
- ☐ Purchase Renewable Energy for the Farm (2)
- ☐ Conduct an Energy Audit on the Farm (3)
- ☐ Use Biofuels (4)
- ☐ Use Fuel Efficient Vehicles or Tractors (5)
- ☐ Install Efficient Lighting in Buildings (6)
- ☐ Insulate Buildings (7)
- ☐ Use Anaerobic Digestion (8)
- ☐ Use Biogas Flares (9)
- ☐ Install Manure Storage Cover (10)
- ☐ Use Efficient Irrigation (uses less energy) (11)
- ☐ Plant Trees on the Farm (12)
- ☐ Reduce or Eliminate Tillage (13)
- ☐ Improve Nitrogen Fertilizer Efficiency (14)
- ☐ Conduct A Greenhouse Gas Audit on the Farm (15)
- ☐ Other (please explain): (16)

**Q19** How prepared are farmers in the country or organization you work with to sustainably intensify agricultural production in response to climate change?

- ☐ Extremely Prepared (1)
- ☐ Very Prepared (2)
- ☐ Moderately Prepared (3)
- ☐ Slightly Prepared (4)
- ☐ Not at all prepared (5)
- ☐ I do not know (6)

**Q20** Which of these strategies do farmers currently use on farms in your country (or do the farmers you work with utilize)? (Choose up to 5 in order of importance)

Farm Management Issues

- ☐ Change Crops, Varieties, or Livestock Breeds (1)
- ☐ Use New Technologies (2)
- ☐ Implement Conservation Practices (3)
- ☐ Sell or Rent Part of Property (4)
- ☐ Get an Off-Farm Job to Supplement Farm Income (5)
- ☐ Develop a Climate Adaptation Plan for the Farm (6)

- ☐ Restructure Cash Flow and Debt (7)
- ☐ Scale Back Operations (Take Land out of Production) (8)
- ☐ Exit the Industry/Stop Farming (9)
- ☐ Apply for Grants (10)
- ☐ Purchase/Adjust Crop Insurance (11)
- ☐ Intensify or Expand Current Enterprises (12)
- ☐ Diversify into Other Forms of Production/Services (13)
- ☐ Other (please explain): (14)

**Q21** With which of these farm management issues do farmers need the most support? (Choose up to 5 in order of importance)

Farm Management Issues

- ☐ Increased Energy and Fuel Costs (1)
- ☐ Regulations (2)
- ☐ Farm Transitions (3)
- ☐ Farm Profitability (4)
- ☐ Land rights or tenure (5)
- ☐ Production Costs (6)
- ☐ Climate Change (7)
- ☐ Labor Availability and Cost (8)
- ☐ Market Uncertainty (9)
- ☐ Public Perceptions of Farming (10)
- ☐ Uncertain Planting Windows (11)
- ☐ Extreme Weather Events (12)
- ☐ Yields (13)
- ☐ Improved gender roles and/or access to resources (14)
- ☐ Implementation of agricultural policies (15)
- ☐ Animal Health (16)
- ☐ Other (please explain): (17)

**Q22** What time scales for weather or climate-information are most important to help farmers make informed farming decisions? (Choose up to 3 in order of importance)

Time Scales

- ☐ Historical weather information (1)
- ☐ Weather data from the past 12 months (2)
- ☐ Current weather conditions (3)
- ☐ 1-7 day forecasts (4)
- ☐ 8-14 day outlooks (5)
- ☐ Monthly or seasonal outlooks (6)
- ☐ Annual or multi-year outlooks (7)
- ☐ Annual or multi-year outlooks (8)
- ☐ Longer term/climate projections (10 to 30 years) (9)

**Q23** In which of the following weather or climate-related decision support tools or climate services do farmers need support? (Check all that apply)

- ☐ Weather Forecasts (1)
- ☐ Growing Degree Day Calculators (2)
- ☐ Nutrient Management Tools (3)
- ☐ Evapotranspiration (ET) Indices (4)

- ☐ Irrigation Schedulers (5)
- ☐ Water Deficit Calculators (6)
- ☐ Multi-year Outlooks (7)
- ☐ Annual Outlooks (8)
- ☐ Seasonal Outlooks (9)
- ☐ Drought Monitor/Outlooks (10)
- ☐ Crop disease Forecasts (11)
- ☐ Heat Stress Calculators (12)
- ☐ Integrated Pest Management (IPM)/Disease Tools (13)
- ☐ Other (please explain): (14) \_\_\_\_\_

*End of Block: Farmer Preparedness*

*Start of Block: GACSA Participation*

**Q24** Have you participated at a GACSA Annual Forum?

- ☐ Yes: (please indicate which year) (1) \_\_\_\_\_
- ☐ No (2)

**Q25** Do you plan on participating at this year's GACSA Annual Forum?

- ☐ Yes (1)
- ☐ No (2)

Skip To: **Q26** If “Do you plan on participating at this year's GACSA Annual Forum?” = Yes

**Q25.1** Would you like information on how to attend this year's Annual Forum?

- ☐ Yes (please include your email information): (1) \_\_\_\_\_
- ☐ No (2)

**Q26** Is the organization or country you work with a member of GACSA?

- ☐ Yes, as a member organization (1)
- ☐ Yes, as an observer organization (2)
- ☐ No (please explain why not): (3) \_\_\_\_\_
- ☐ Unsure (4)

**Skip To: Q28** If “Is the organization or country you work with a member of GACSA?” = Yes, as a member organization

**Skip To: Q28** If “Is the organization or country you work with a member of GACSA?” = Yes, as an observer organization

**Q27** Would you like to join GACSA?

- ☐ Yes (1)
- ☐ No (2)

**Skip To: Q31** If “Would you like to join GACSA?” = Yes

**Skip To: Q31** If “Would you like to join GACSA?” = No

**Q28** Please indicate the type of GACSA member organization(s) you work most closely with: (Choose all that apply)

- ☐ Government of a developed or developing country (1)
- ☐ Research or academic institution (2)
- ☐ Farmer's Organization (3)
- ☐ Business (4)
- ☐ Non-governmental Organization (NGO) (5)
- ☐ Intergovernmental Organization (IGO) (6)
- ☐ Other (please specify): (7) \_\_\_\_\_

**Q29** Which GACSA Action Group(s) do you participate with? (Choose all that apply)

- ☐ Knowledge Action (1)
- ☐ Enabling Environment (2)
- ☐ Investment Action (3)
- ☐ I do not participate in an Action Group (4)
- ☐ Unsure (5)

**Skip To: Q31** If "Which GACSA Action Group(s) do you participate with? (Choose all that apply)" = Knowledge Action

**Skip To: Q31** If "Which GACSA Action Group(s) do you participate with? (Choose all that apply)" = Enabling Environment

**Skip To: Q31** If "Which GACSA Action Group(s) do you participate with? (Choose all that apply)" = Investment Action

**Q30** Please indicate which Action Group(s) you wish to join, if any:

- ☐ Knowledge Action (1)
- ☐ Enabling Environment (2)
- ☐ Investment Action (3)
- ☐ None for now (4)

**Q31** Which regional CSA Alliances are you connected with? (Choose all that apply)

- ☐ NACSAA: North America CSA Alliance (1)
- ☐ ACSAA: Africa CSA Alliance (2)
- ☐ EACSAP: Eastern Africa CSA Alliance (3)
- ☐ SACSAA: Southern Africa CSA Alliance (4)
- ☐ WACSAA: West Africa CSA Alliance (5)
- ☐ ASEAN-CRN: Association of Southeast Asian Nations (6)
- ☐ Climate KIC: Regional Alliance in Europe (7)
- ☐ FAO/REU: Eastern Europe and Central Asia (8)
- ☐ Other: (9) \_\_\_\_\_
- ☐ I am not affiliated with any CSA regional alliance (10)

**Q32** How can GACSA work with these regional alliances, or help ensure that they function more effectively? (Choose up to 3 in order of importance)

#### Strategies

- ☐ Coordinate regular check-in calls with the Alliances (1)
- ☐ Share policy priorities (2)
- ☐ Knowledge collation and dissemination (3)
- ☐ Facilitation of membership, partnerships and initiatives (4)
- ☐ Training and Capacity Building (5)
- ☐ External Communication (development and distribution of communication/advocacy products & organize engagement platforms) (6)
- ☐ Engage in co-resource mobilization efforts (7)
- ☐ Develop linkages between the regional alliances and GACSA action groups (8)
- ☐ Other (please explain): (9)

**Q33** Has your organization developed any resources and/or tools to help farmers or policy makers with CSA, that you can share with GACSA?

- ☐ Yes (Please describe and provide a link to the document if possible) (1)
- ☐ No (2)

**Q34** Has your organization used any GACSA resources and/or tools to help farmers or policy makers with CSA?

- ☐ Yes (Please describe and provide a link to the document if possible) (1)
- ☐ No (2)

*End of Block: GACSA Participation*

*Start of Block: Demographics*

**Q35** What is your age?

- ☐ Under 18 years old (1)
- ☐ 18-24 years old (2)
- ☐ 25-34 years old (3)
- ☐ 35-44 years old (4)
- ☐ 45-54 years old (5)
- ☐ 55-64 years old (6)
- ☐ 65-74 years old (7)
- ☐ 75 years or older (8)

**Q35** Which of the following best describes your gender?

- ☐ Female (1)
- ☐ Male (2)
- ☐ Other (3)

**Q36** What is your highest level of education? (please check one):

- ☐ Some high school (1)
- ☐ High school graduate (2)
- ☐ Some college (3)
- ☐ 2-year/technical degree (4)
- ☐ 4-year degree (5)
- ☐ Master's degree (6)

- ☐ Doctorate degree (7)
- ☐ Professional degree (e.g. Engineer, J.D., MBA, etc.) (8)
- ☐ Other: (9) \_\_\_\_\_

**Q37 Optional:** If you would like to receive further information about this survey or GACSA, please provide your contact information below.

- ☐ Name (1) \_\_\_\_\_
- ☐ Organization (2) \_\_\_\_\_
- ☐ Email Address (3) \_\_\_\_\_

End of Block: Demographics