

Public Consultation Report

SAN Climate Module: Criteria for Adaptation and Mitigation to Climate Change

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Summary

From July 2010 to October 2010 a public consultation process on the Sustainable Agriculture Climate Module was conducted according to the *ISEAL Alliance Code of Good Practice for Setting Social and Environmental Standards* (<http://www.isealalliance.org/>). The public consultation consisted of one 100-day round of on-line consultation, local workshops and trial audits. The consultation started on July 15th and ended in October 25th.

More than 164 organizations from 41 countries (Belgium, Bolivia, Botswana, Brazil, Cambodia, Canada, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Ethiopia, Germany, Ghana, Guatemala, Honduras, India, Indonesia, Italy, Kenya, Malaysia, Mexico, Netherlands, New Zealand, Nicaragua, Nigeria, Panama, Paraguay, Peru, Philippines, Portugal, Spain, Sri Lanka, Sweden, Switzerland, United Kingdom, United States, Uruguay and Venezuela) posted a total of 810 comments. The majority of the participating stakeholders came from the environmental interest group (82%), followed by economic (9%) and social (9%) sectors. A distinct categorization showed the following participation statistics: NGOs (45%), academic & research (24%), industry and commerce (11%), others (10%), producers (7%) and government (3%).

Local consultation workshops were held in seven countries: Brazil, Costa Rica, El Salvador, Ghana, Guatemala, Indonesia and Kenya with the participation of 172 stakeholders including producers and their organizations, representatives from universities and government agencies, as well as NGOs. 217 comments were received during these workshops. 15 field tests were conducted in cocoa, coffee and tea farms in Brazil, Costa Rica, El Salvador, Ghana, Guatemala, Indonesia, Kenya and Tanzania.

The SAN International Standards Committee composed of 12 international independent expert advisers met in November 2010 to write the final draft of the SAN Climate Module and approved the final version on December 2010. The SAN Climate Module will be published in February 2011 and a Guidance Document will provide more details for farms and auditors about how to implement the *SAN Climate Module's* criteria.

Introduction

The Sustainable Agriculture Network and Rainforest Alliance

The Sustainable Agriculture Network (SAN) is a coalition of independent non-profit conservation organizations that promote the social and environmental sustainability of agricultural activities by developing standards. Standard and policy development and review is coordinated by the SAN secretariat based in San José, Costa Rica. A Certification Body certifies farms or group administrators that comply with SAN's standards and policies. Certified farms or group administrators can apply for use of the *Rainforest Alliance Certified™* trademark for products grown on certified farms.



Since 1992, more than 700 certificates for more than 130,000 farms - including small family farms of cooperatives, as well as plantations - in 29 countries (Argentina, Brazil, Chile, Colombia, Costa Rica, Côte d'Ivoire, Dominican Republic, Ecuador, El Salvador, Ethiopia, Ghana, Guatemala, Honduras, India, Indonesia, Jamaica, Kenya, Malawi, Mexico, Nicaragua, Panama, Papua New Guinea, Peru, Philippines, Sri Lanka, Tanzania, United States, Vietnam and Zambia) have met the Sustainable Agriculture Standard on more than 700,000 ha for 30 crops: acaí palm, allspice and pepper, apple, avocado, banana, blueberry, cherry, chesnut, citrus, cocoa, coffee, cupuacu, flowers, foliage, grapes,

heart palm, jocote, kiwi, leek, macadamia, mango, mangosteen, pear, pineapple, plum, radicchio, sugarcane, sweet onion, tea and tomato.

SAN representatives and their operating countries are: Conservación y Desarrollo (C&D), Ecuador; Fundación Interamericana de Investigación Tropical (FIIT); Guatemala; Fundación Natura, Colombia; ICADE, Honduras; IMAFLORA, Brazil; Nature Conservation Foundation, India; Pronatura Sur Mexico; SalvaNatura, El Salvador and Rainforest Alliance.

The Sustainable Agriculture Network's Mission

The Sustainable Agriculture Network (SAN) promotes efficient agriculture, biodiversity conservation and sustainable community development by creating social and environmental standards. SAN fosters best management practices across agricultural value chains by encouraging farmers to comply with SAN standards and by motivating traders and consumers to support sustainability.

SAN pursues its mission by:

- Integrating sustainable production of crops and livestock into local and regional strategies that favor biodiversity conservation and safeguard social and environmental well-being.
- Raising awareness among farmers, traders, consumers and business leaders about the interdependencies among healthy ecosystems, sustainable agriculture and social responsibility.
- Impressing upon business leaders and consumers the importance of choosing products grown on environmentally sustainable and socially responsible farms.
- Stimulating dialog among environmental, social and economic groups, North and South, about the benefits of sustainable agriculture.

Background of the SAN Climate Module development process

With support from Efico (www.efico.org) – a green coffee and cocoa trading company - Efico Foundation (www.eficofoundation.org), and its partners: ANACAFE (Asociación Nacional del Café; www.anacafe.org) and Universidad del Valle in Guatemala, the Rainforest Alliance, the Fundación Interamericana de Investigación Tropical, and other members of the Sustainable Agriculture Network have worked to identify best management practices that farmers can employ to reduce their own climate impacts and adapt to the challenges brought by climate change. Using selected farms in Guatemala as a laboratory, the coalition implemented a project to measure carbon storage on typical farms, test assumptions regarding practices in the existing standard that reduce or offset greenhouse gas emissions and develop credible climate criteria that could be verified as part of routine farm-auditing procedures.

Financial support from the Rockefeller Foundation has enabled the Rainforest Alliance and Sustainable Agriculture Network to build on the pilot initiative in Guatemala and give the climate module a global focus. Rockefeller funding over a 17-month period (November 1, 2009 – March 31, 2010) allowed for testing, piloting and consultation of the module in new crops (tea & cacao) and geographic regions (primarily East Africa, West Africa, and Southeast Asia, with consultation work also conducted in Brazil). The Rockefeller Foundation has also provided active support of project activities, by providing guidance to public consultation activities in Kenya, contributing analyses to the draft module and suggesting outlets for awareness-raising around the module (i.e. the FAO's MICCA Database, where Rainforest Alliance is featured: <http://climate-l.iisd.org/news/fao-micca-project-produces-analysis-of-afolu-database/>). Key deliverables for this project include 1) analyses of the proposed climate-beneficial criteria for the SAN Standards with a particular focus on new crops and regions; 2) comparative research to assess climate benefits of the SAN Standards, 3) development and testing of the SAN Climate Module, 4) development of guidance and training materials; and 6) market leverage and outreach.

The Zurich Foundation covered related activities in Central America (Costa Rica and El Salvador), and there was close collaboration with the Sangana Public–Private Partnership (partners: GTZ, Sangana Commodities Ltd., 4C Association, World Bank and Tchibo GmbH in Kenya) that participated in the technical analysis of climate-friendly criteria, particularly on integration of adaptation issues, were closely involved in stakeholder consultation in Kenya as well facilitated field trials in some project sites and finally shared materials during the SAN Climate Module's development.

Process according to ISEAL Alliance Code

This public consultation process was coordinated by the Sustainable Agriculture Network's Secretariat of the Rainforest Alliance's Sustainable Agriculture Program. The SAN secretariat has strived at all times during the Module development-process to follow and implement contents of the ISEAL Alliance Code of Good Practice for Setting Social and Environmental Standards ISEAL Code of Good Practice. Even though the application of this Module is a voluntary verification, one comprised consultation period –of 100 days- was conducted instead of two.

Stakeholder outreach methods

The stakeholder outreach for the SAN Climate Module consultation process was based on the following activities:

1. An online consultation platform in English, Spanish and Portuguese at <http://clima.sanstandards.org>
2. Local Workshops with interested stakeholders were held in Brazil, Costa Rica, El Salvador, Ghana, Guatemala, Kenya and Indonesia.
3. Field Visits were conducted in coffee, tea and cocoa farms in Brazil, Costa Rica, El Salvador, Ghana, Guatemala, Indonesia, Kenya and Tanzania
4. Reaching out key stakeholders and monitoring participation and comments via the climate electronic mail account: clima@sanstandards.org.

I. Summary

Online stakeholder participation generated 810 additional comments from 125 stakeholders out of 221 stakeholders that were registered in the online platform. The public workshops generated 217 additional comments from 172 stakeholders. A total of 1,027 comments were received from 297 stakeholders. The following sections cite respective statistics for each public consultation activity conducted.

II. Online Consultation

A total of 196 stakeholders out of the 3,064 database stakeholders registered into the online platform, and additional 25 forms received via email were entered into the online system database. The participation corresponds to 7.2% of the total database population. Of these 221 stakeholders, 164 different organizations and 41 countries were represented (Figure 1). 810 online comments (differentiated from a simple “agree/disagree” response) were received from 125 stakeholders via the public consultation website.

- Number of countries recorded: **41**
- Number of organizations recorded: **164**
- Number of stakeholders recorded: **221**
- Number of stakeholders who have commented via website: **125**
- Number of comments via website: **810**

a. List of represented countries

- | | | |
|------------------------|-----------------|--------------------|
| 1. Belgium | 15. Germany | 29. Panama |
| 2. Bolivia | 16. Ghana | 30. Paraguay |
| 3. Botswana | 17. Guatemala | 31. Peru |
| 4. Brazil | 18. Honduras | 32. Philippines |
| 5. Cambodia | 19. India | 33. Portugal |
| 6. Canada | 20. Indonesia | 34. Spain |
| 7. Chile | 21. Italy | 35. Sri Lanka |
| 8. Colombia | 22. Kenya | 36. Sweden |
| 9. Costa Rica | 23. Malaysia | 37. Switzerland |
| 10. Cuba | 24. Mexico | 38. United Kingdom |
| 11. Dominican Republic | 25. Netherlands | 39. United States |
| 12. Ecuador | 26. New Zealand | 40. Uruguay |
| 13. El Salvador | 27. Nicaragua | 41. Venezuela |
| 14. Ethiopia | 28. Nigeria | |

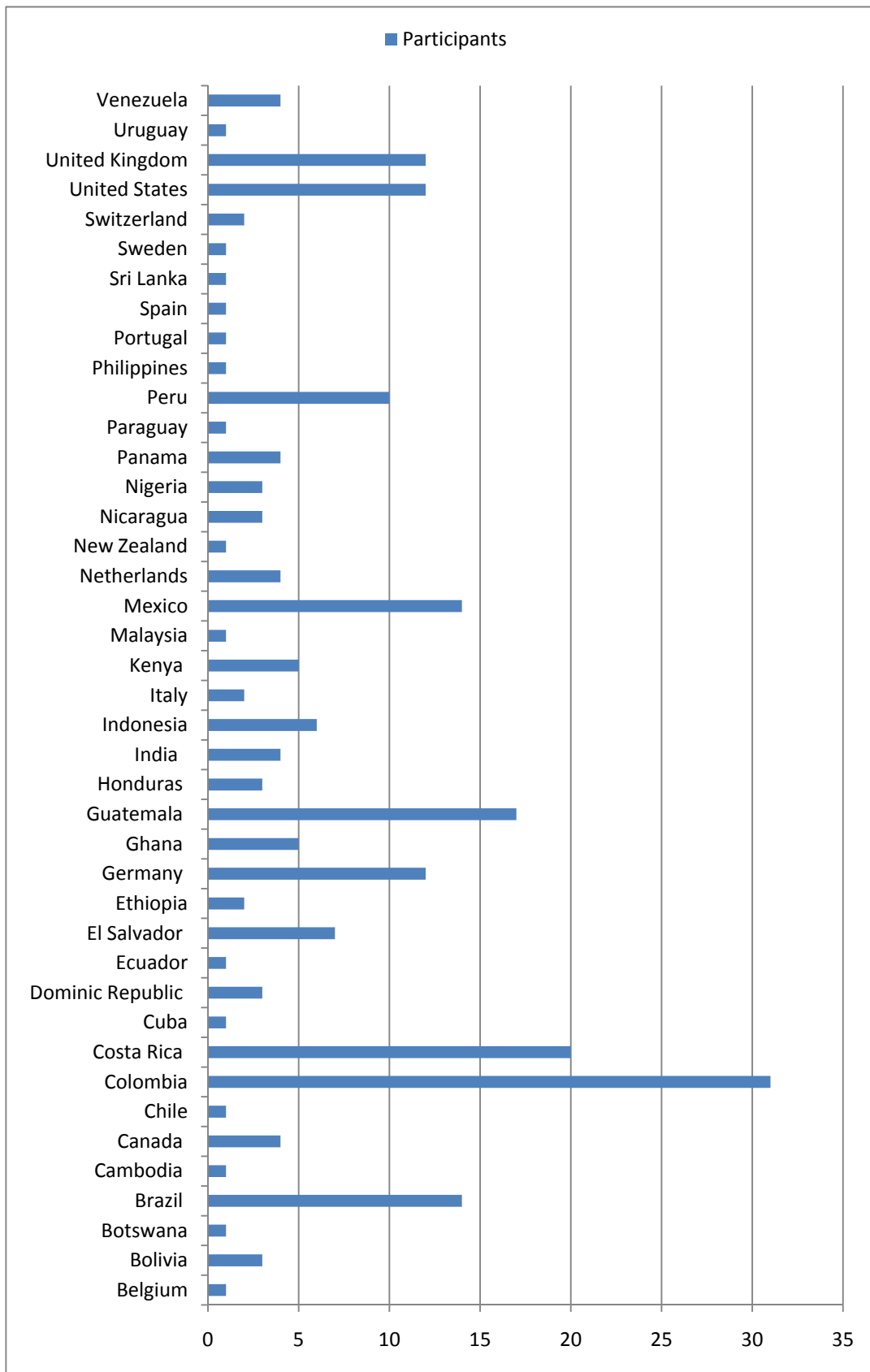


Figure 1. Number of registered stakeholders by country

b. List of participating producers

1. ANACAFE -Guatemala
2. C.I. BANACOL -Colombia
3. C.I. TROPICAL S.A. -Colombia
4. Coopedota -Costa Rica
5. Cooxupé -Brazil
6. Finca Bohemia -Guatemala
7. Finca Santa Cruz -Mexico
8. GRCHIA S.A -Colombia
9. KTDA -Kenya
10. Pequeños Productores de la Sierra occidental -Mexico
11. Praguna Management Consultants (Pvt) Limited -Sri Lanka
12. Struktura S.A. -Ecuador
13. TUYMOTOR SAS –Colombia
14. Unicafe -Guatemala

c. List of participating Research and Academic Institutions

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. A&I SOLUTIONS S.A.S –Colombia 2. AgRefresh - United States 3. Ambiente y Desarrollo Consultores, S. A. -Guatemala 4. CABI –United Kingdom 5. CATIE –Costa Rica 6. Centro de Desarrollo de Productos Bióticos- Instituto politécnico Nacional - Mexico 7. CINPE, Universidad Nacional – Costa Rica 8. Department of Ecology & Environmental Sciences/ The Oikos Trust for Environmental management (TOTEM) Pondicherry University -India 9. EIAR – Ethiopia 10. Environmental Agency -Cuba 11. Federación Nacional de Cafeteros / CENICAFÉ -Colombia 12. Fundación Empresas Polar -Venezuela 13. GTZ -Colombia 14. Hamburg University, Research unit Sustainability and Global Change – Germany 15. Harvard University - United States 16. ICRAF -Indonesia 17. IDIAF - Dominican Republic 18. Indian Veterinary Research Institute - India 19. Instituto de Investigación Agropecuaria de Panamá | <ol style="list-style-type: none"> 20. Instituto Sinchi -Colombia 21. Instituto Tecnológico del Valle de Oaxaca -Mexico 22. Jorge & Mustonen c x a - Dominican Republic 23. Julius Kühn-Institut -Germany 24. National University of Tumbes -Perú 25. Nenhuma -Portugal 26. Nitlapan – UCA -Nicaragua 27. Overseas Development Institute – United Kingdom 28. PGP –Brazil 29. Research Centre and Development of Tropical Dry Land - Indonesia 30. Sea -Bolivia 31. State University of Campinas, Unicamp –Brazil 32. University of California Davis IPO CAES -United States 33. UEMA -Brazil 34. UNIMINUTO -Colombia 35. Universidad Centrooccidental Lisandro Alvarado (UCLA) -Venezuela 36. Universidad de Caldas -Colombia 37. Universidad de El Salvador 38. Universidad de los Andes -Venezuela 39. Universidad Nacional –Costa Rica 40. Universidad Nacional del Centro del Perú 41. Universidad Rafael Landivar - Guatemala |
|---|---|

42. Undetermined –Malaysia/Peru/Mexico
43. Universidad San Carlos de Guatemala
44. Universidad de Costa Rica
45. USAC -Guatemala
46. USAC/FMVZ –Guatemala

d. List of participating Government representatives

1. MAG (Ministerio de Agricultura y Ganadería) - Costa Rica
2. Ministerio de ambiente de Colombia
3. Ministerio de ambiente y recursos Naturales de Guatemala
4. Ministry of Agriculture and Natural Resources of Nigeria
5. Programa Nacional de cambio climático Bolivia
6. Secretaria de Medio Ambiente - Gobernación del Alto Paraná -Paraguay
7. Wildife -Botswana

e. List of industry and commerce representatives

- | | |
|---|--|
| 1. AB Origen Consultorías Ambientales - Colombia | 10. MPT –Peru |
| 2. Bager Safe Environment for Health Services PLC -Ethiopia | 11. Nestle –Panama/ United States |
| 3. ECOM Coffee Indonesia –Indonesia | 12. Nestle Nespresso SA – Colombia/Switzerland |
| 4. FLO-CERT -Germany | 13. OLAM NIG LTD -Nigeria |
| 5. FNC -Netherlands | 14. Taruna Group Ltd - New Zealand |
| 6. Instituto de Ecomercado -Spain | 15. TCHIBO – Germany |
| 7. Koffiebranderij Drie Mollen - Netherlands | 16. Teacraft Ltd - United Kingdom |
| 8. Macahe Asociados SAC –Peru | 17. Unilever PLC - United Kingdom |
| 9. Matthew Algie - United Kingdom | 18. Unique forestry consultants – Germany |
| | 19. Yara International ASA -Germany |

f. List of participating Non-Governmental Organizations (NGO)

- | | |
|--|---|
| 1. ADRA -Perú | 12. Cafes de Mexico Magazine |
| 2. African Cocoa Coalition -Ghana | 13. Carre Geo & Environnement - Cambodia |
| 3. Agro Eco-Louis Bolk Institute -Ghana | 14. CCI Forestry -Indonesia |
| 4. Agroambientalistas -Colombia | 15. Centre for climate change and environmental studies -Nigeria |
| 5. Ambiente Verde, Fundación de lucha contra el cambio climático -Peru | 16. Centro de Desarrollo Ambiental y Humano –Panama |
| 6. AMECAFE -México | 17. Centro para la Sostenibilidad Ambiental de la Universidad Cañetano Heredia - Peru |
| 7. ASECAN -Guatemala | 18. Centro transdisciplinario de estudios FES-sistémicos -Chile |
| 8. Asociación BIOCAMPO -Colombia | |
| 9. Bosques Nuestros –Costa Rica | |
| 10. CAEM -Colombia | |
| 11. Cafedirect Producers' Foundation – United Kingdom | |

- | | |
|---|---|
| <ul style="list-style-type: none"> 19. Climate Asset -Ghana 20. CCN (Climate Change Network - Nigeria) 21. CODESU -Venezuela 22. Conservation International –Costa Rica/ United States 23. Cooperativa de caficultores Alto Occidente de Caldas -Colombia 24. DCE –India 25. Embrapa -Brazil 26. Fairtrade Labelling Organizations International -Germany 27. FAN-Bolivia 28. Federación Nacional de Cafeteros - Colombia 29. FIIT (Fundación Interamericana de Investigación Tropical) -Guatemala 30. FKKM -Indonesia 31. Forest Stewardship Council -Germany 32. Fundação Amazonas Sustentável - Brazil 33. Fundación NATURA -Colombia 34. Fundación NaturaCertificación - Colombia 35. Fundacion Sur Futuro –Dominican Republic 36. Fundazúcar -Guatemala 37. GTZ African Eco-labelling Mechanism - Kenya | <ul style="list-style-type: none"> 38. GTZ-PRORENA Occidente -Honduras 39. HRNS -Germany 40. ICADE -Honduras 41. ICEA -Italy 42. Imaflora -Brazil 43. INCLUSIVA -Mexico 44. ISEAL Alliance –Canada/ United States 45. Mesoambiental, A.C. -Mexico 46. Nature Conservation Foundation -India 47. NCRC -Ghana 48. Organización para el Desarrollo e Integración Ecológico y Turístico -Peru 49. Oxfam GB -Mexico 50. Panthera –Costa Rica 51. Productos y Procesos Sustentables A.C. -Mexico 52. Programa MIDAS -Colombia 53. Rainforest Alliance –Costa Rica/ Guatemala/ Indonesia/ United States 54. Red de Desarrollo Sostenible - Colombia 55. RSB - Switzerland 56. SalvaNATURA –El Salvador 57. SGP -Panamá 58. Soil & More International – Netherlands 59. UTZ CERTIFIED – Netherlands 60. Winrock International - United States 61. WRI - United States |
|---|---|

g. List of other stakeholders represented

- | | |
|---|---|
| <ul style="list-style-type: none"> 1. Acclimatise –United Kingdom 2. Agrico -Guatemala 3. Coopellanobonito R.L.-Costa Rica 4. Delta CO2 - sustentabilidade ambiental -Brazil 5. Ecometrica -United Kingdom 6. Instituto de Desenvolvimento Sustentável Mamirauá -Brazil 7. Nedcoffee Indonesia Makmur Jaya PT -Indonesia 8. Nestle -Belgium 9. PROFOREST –United Kingdom | <ul style="list-style-type: none"> 10. Proyecto Producción Responsable MGAP/BM/GEF -Uruguay 11. Rainforest Alliance / SmartWood - Guatemala 12. Retired- from UNFCCC secretariat 13. RG Unlimited –United Kingdom 14. Rockefeller Foundation – Kenya 15. Independent Consultants – Canada/Colombia/Costa Rica/Honduras/Kenya/Nicaragua/Sweden |
|---|---|

Figure 2 below shows the categories of the stakeholders that participated via the online platform. The major contribution was done by NGOs (44.8%) followed by research and academic institutions (23.5%). Figure 3 shows the geographical distribution of the stakeholders who participated online.

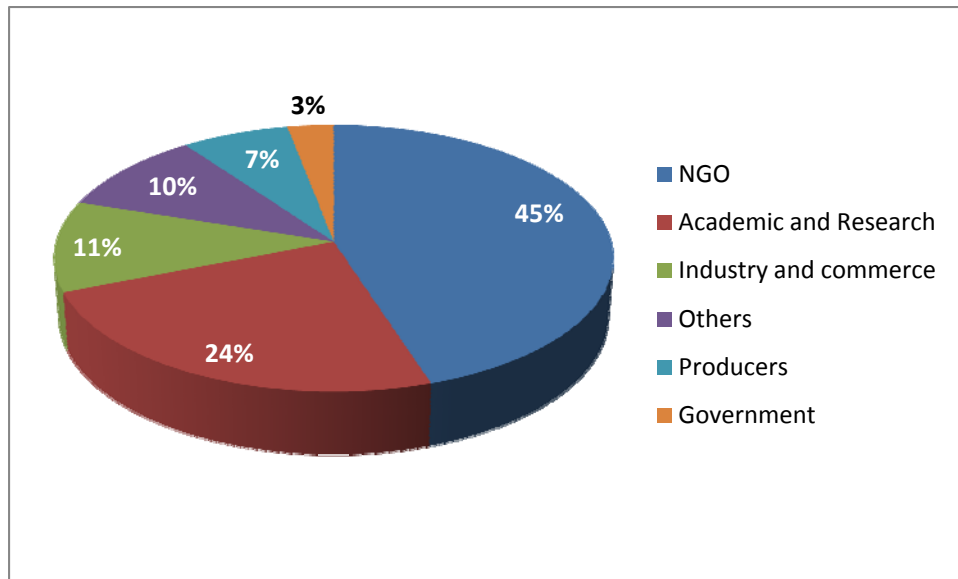


Figure 2. Categories of Stakeholders

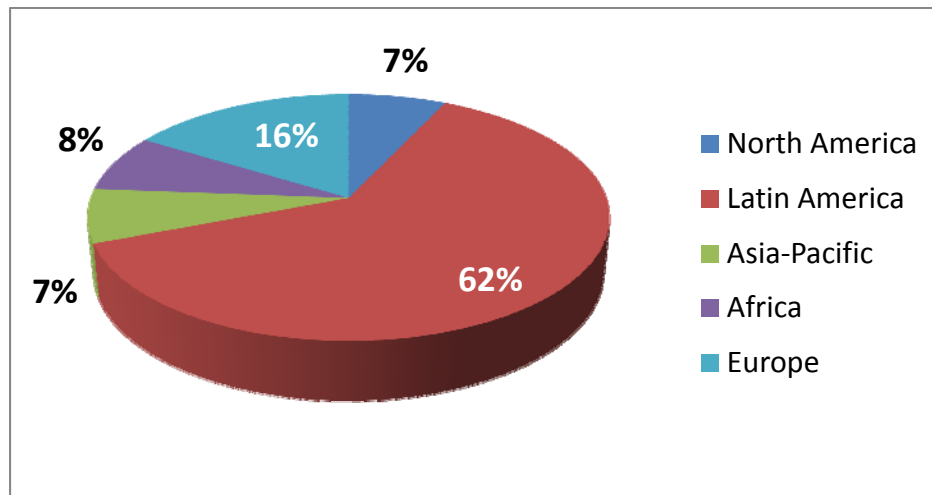


Figure 3. Geographical distribution of online stakeholders

Environmental concerns were the main interest that drove stakeholders to follow and engage in this initiative as shown in Figure 4.

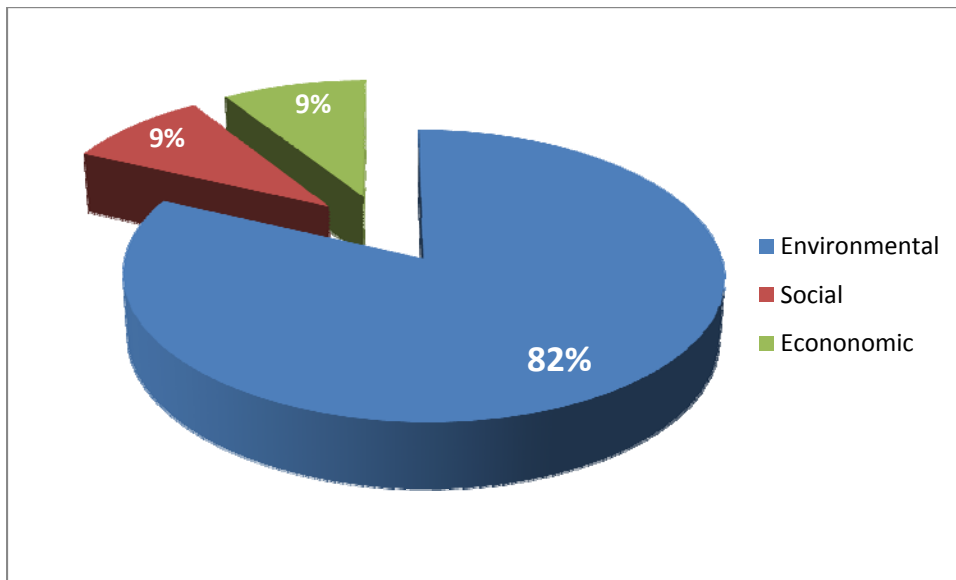


Figure 4. Stakeholder’s Interest Group

The comments received through the online platform amounted to 810. 31.6% of the participating stakeholders posted additional comments as shown in Figure 5.

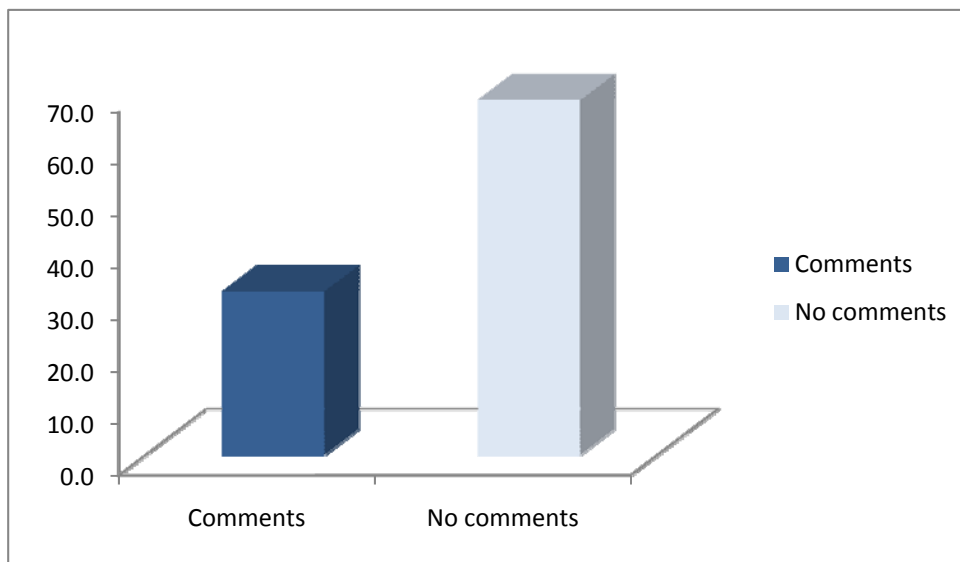


Figure 5. Percentage of participating stakeholders that posted comments

Figure 6 shows the distribution of conformance per criterion or section in the Module. For example, 69% of participating stakeholders agreed with the content of criterion 10.7, while 7% disagreed and 24% had no opinion.

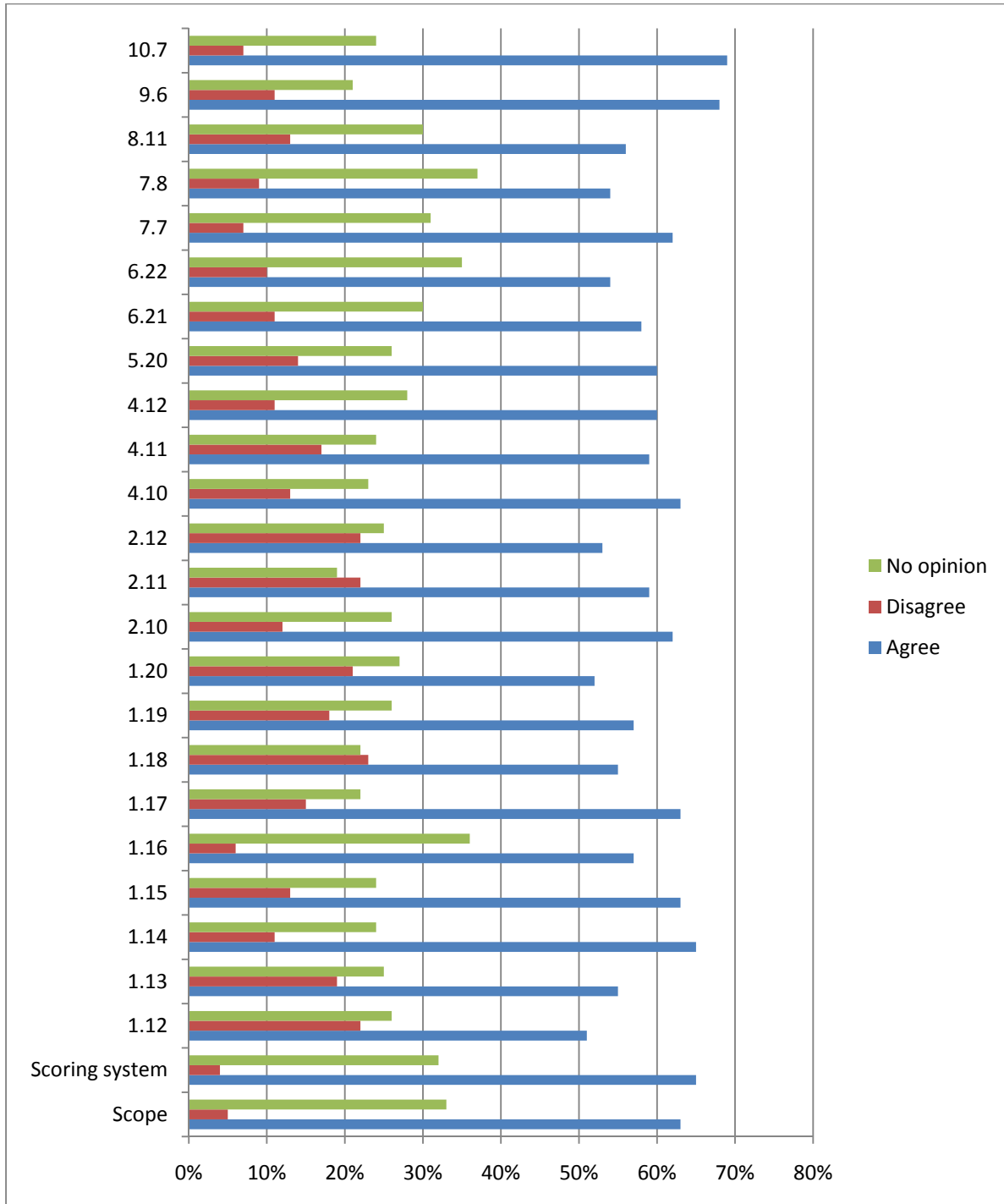


Figure 6. Distribution of conformance per criteria or section in the Module

Figure 7 shows the distribution of comments per criteria or section in the Module. For example, around 40 people had comments on criteria 8.11 (C8-11) while around 60 did not post additional comments.

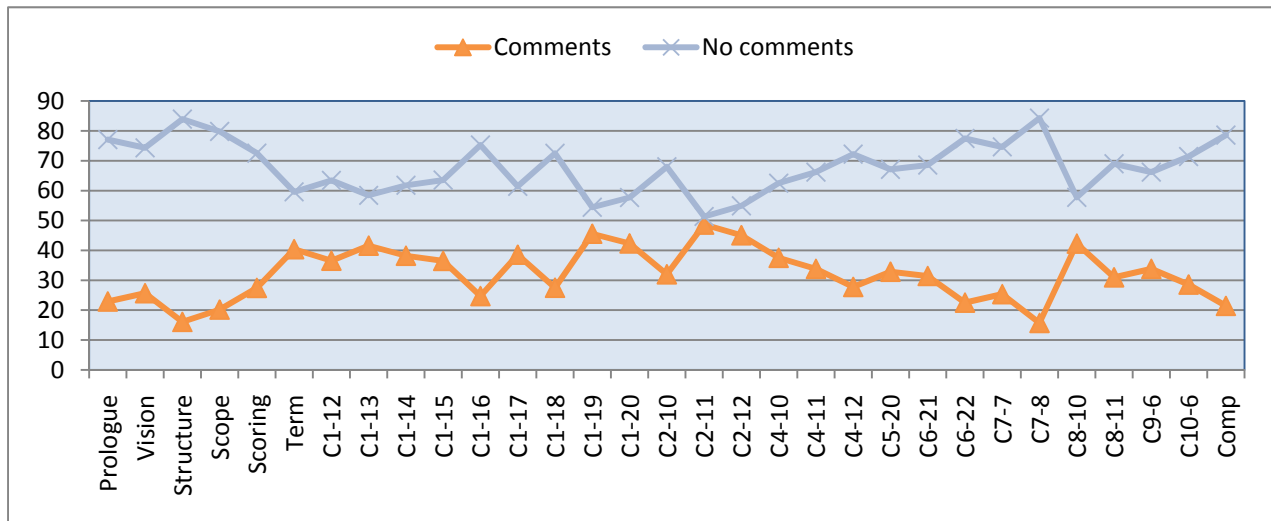


Figure 7. Distribution of comments per criteria or section in the Module

The opinions of the participating stakeholders were distributed in three positions (agree, disagree and no opinion). The position "Agree" was selected for most of the criteria and is the most representative as shown in Figure 8.

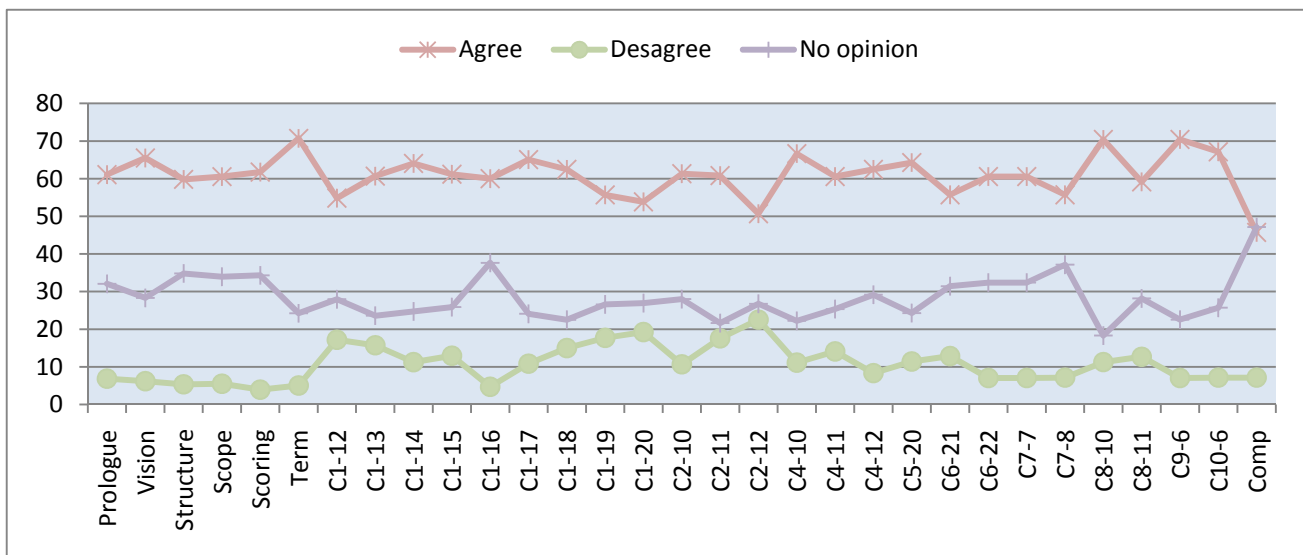


Figure 8. Opinions by criteria/point and percentage of commenting stakeholders

III. Local Workshops

172 individuals participated in Consultation Workshops. 217 comments were received and analyzed from these stakeholders representing different organizations or stakeholders from 7 countries.

- Number of countries: **7**
- Number of comments via local workshop: **217**
- Number of stakeholders who have commented via local workshop: **172**

The workshops lasted 8 hours (on average) and participants worked actively in various smaller workgroups on social and economic aspects of climate as proposed in the SAN Climate Module.

As show in Figure 9, workshop participants per country ranged from 12 in Indonesia to 45 in Guatemala. The Latin America region was the most represented as shown in Figure 10.

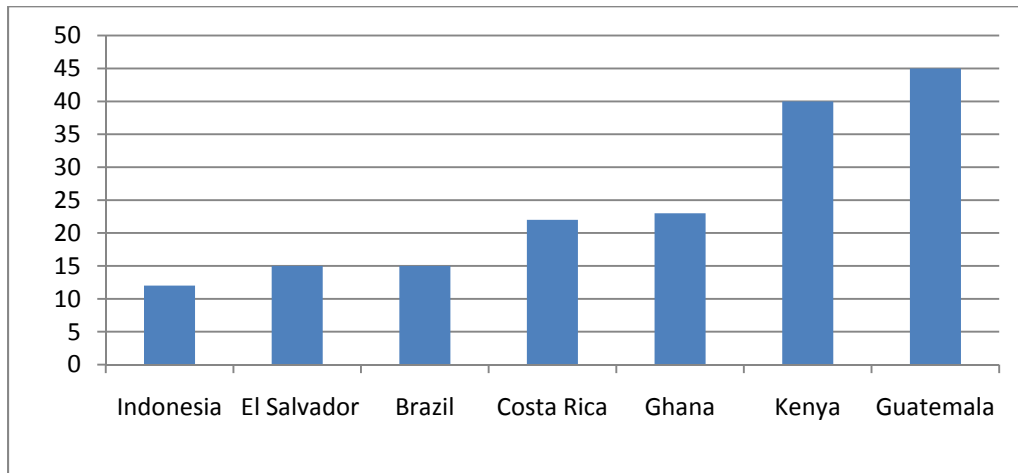


Figure 9. Workshop participants per country

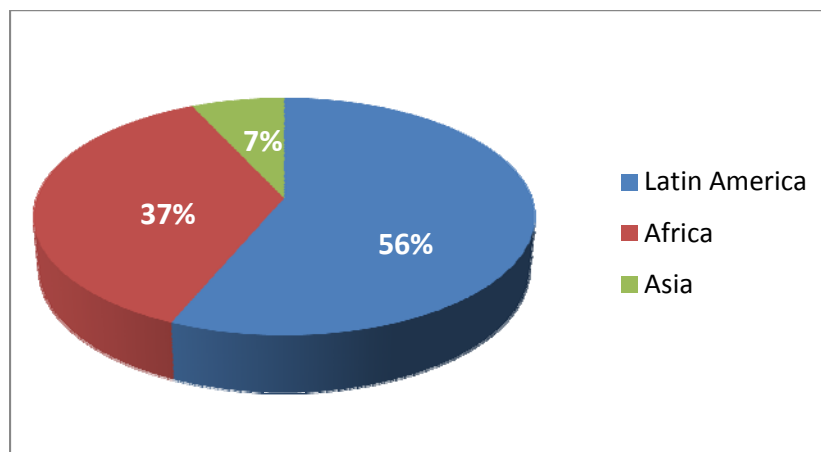


Figure 10. Workshop participation per region

a. Costa Rica Workshop

A local consultation workshop was conducted in San Jose at the Rainforest Alliance offices on September 3, 2010. 22 stakeholders participated representing the following organizations:

- Almagrop Corporativo, S. A
- Agriocola Gazu
- CASAGRI
- Cooparroz R.L.
- COIN CORP., S.A.
- Finca la Montana S.A.
- Follajes de Sarchi
- Genética Productiva, S.A.
- Independientes
- Servicios Bananeros CGUS
- SUMATECH S.A.
- Orplant S.A.
- VTSA
- Vidagro S.A.
- YAMBER, S.A

b. Indonesia Workshop

A local consultation workshop was conducted in Bali (Rainforest Alliance offices) on September 3, 2010. 12 stakeholders attended the event, representing the following organizations:

- Agency for the Assessment & Application of Technology
- Center for International Forestry Research (CIFOR)
- IDEP Foundation
- Rainforest Alliance
- The Nature Conservancy

c. El Salvador Workshop:

A local consultation workshop was conducted in El San Salvador on September 7, 2010 at Hotel Novo with 15 stakeholders representing the following organizations:

- APA
- CONSULTEC S.A. CV.
- Centro Nacional de Producción Más
- FUNDE
- Salvacers
- SalvaNatura
- UES-Agronomía

d. Guatemala Workshop

A local workshop was held in Guatemala City on September 24, 2010 at Anacafé Offices. 45 stakeholders participated representing the following organizations:

- ANACAFE
Agricola San Agustin las Minas,S.A.
- Ambiente y Desarrollo Consultores
- Comercio y Servicios Universales S.A
- COSSERSA
Efico Central America S.A.
- FIIT
- Green Coffee Sourcing
- Mesa Nacional de Cambio Climático
- Programa Reverdecer Guatemala
- USAC-FMVZ
- Rainforest Alliance
- UNIDeseq
- University of San Carlos

e. Brazil Workshop

A local consultation workshop was held in Piracicaba at the offices of IMAFLORA on October 5, 2010. 15 stakeholders participated representing the following organizations:

- Copemonte
- FRVJ
- ESALQ
- IMAFLORA
- OREADES
- NQG Fazendas
- VSINA SAO Francisco

f. Ghana workshop

A local consultation workshop took place in Accra on October 8, 2010 at Airport West Hotel. 23 stakeholders participated representing the following organizations:

- CIKOD
- CARE
- Forestry Commission of Ghana
- Department of Crop Science School of Agriculture, University of Cape Coast
- Environmental Protection Association of Ghana EPAG
- Forest Trends
- KNUST
- IUCN
- Rainforest Alliance
- ReCa
- Samartex
- University of Ghana

g. Kenya Workshop

A local consultation workshop was held in Nairobi at the Southern Sun Mayfair Hotel on October 15, 2010. 45 stakeholders attended the event representing the following organizations:

- Africert Ltd
- Africa Now
- Biomoto Ltda
- CARE
- CMS LTDA
- ETP
- Ecom
- FINLAYS
- ICRAF
- IMANI
- Kenya Organic Agriculture
- KIDA
- KOFINAT
- K.U
- Linton Park PLC
- GTZ- AEM
- GTZ- PSDA
- NKG – Tropical
- Rainforest Alliance
- Sasini Tea
- SMS
- Solidaridad ETCA
- Sustainet
- Tegemed Institute
- Tropical Farm Management
- UNILEVER
- Willianson Tea

During the workshops, the proposed criteria of the SAN Climate Module were analyzed. Given the time constraints, other sections such as the prologue, vision, structure, scope, scoring system and terms and definitions were left for additional comments through the online platform. The participation was very active in all workshops and the comments received represented the opinions of the group.

IV. Field Tests

In order to validate the alignment of the criteria in local conditions, a total of 15 field exercises were conducted in 8 countries: Brazil, Costa Rica, El Salvador, Ghana, Guatemala, Indonesia, Kenya and Tanzania. The main crops evaluated were coffee, tea and cocoa.

The criteria used to select the sites were:

- Certified operations with different production systems and operational scale (small, medium and large)
- Key countries where there were funds to conduct activities, but representing the main areas of work: Latin America, Africa and Asia.
- Emphasis on coffee, tea and cocoa for being the three main crops in the certification program as well as being agro-forestry crops.

The following table details the farms and their varied composition where field exercises were conducted:

Crop	Farm Name	Country	Total area (ha)	Area in production (ha)
Coffee	Copermonte Elo 2	Brazil	531.93	336.36
Coffee	Coopetarrazú	Costa Rica	5	5
Coffee	Finca El Carmen	El Salvador	35	3,371
Cocoa	Ntobroso Organic Project	Ghana	2,785	2,785
Coffee	Cooperativa Dos de Julio	Guatemala		
Tea	Patuah Watee	Indonesia	2,127.15	1,291
Cocoa	Big-Tree Farms	Indonesia	269.08	258.08
Coffee	Farms of Sri Menanti village-INDO Cafco	Indonesia	91.75	91.75
Coffee	Kandara Farmer's Cooperative Society	Kenya		
Coffee	Maakiou Estate	Kenya	166	138.7
Tea	Mabroukie Estate	Kenya	1,514	1,069
Tea	Williamson Tea Kenya Ltd - Tinderet Tea farm	Kenya	1,407	716.60
Coffee	BARAGWI farmers Cooperative Society (Julius Chegue)	Kenya	3.4	3.4
Coffee	BARAGWI farmers Cooperative Society (Martin Muchira)	Kenya	¾ ha	¾ ha
Tea	Unilever Tea	Tanzania	19,682 ha	3,141

V. Monitoring and Logistics

During the public consultation process, additional specific technical activities were conducted, including:

- Database of stakeholders compiled through internal and external sources;
- Database of stakeholders compiled for workshops;
- Monitoring of public consultation online platform, creation of user accounts, categorization and analysis of results;
- Responses to participants who posted comments during the public consultation;
- Messages sent (reminders, invitations, gratitude, confirmations, others) through the climate electronic mail account, clima@sanstandards.org;
- Blogs created for the online public consultation;
- Analysis of comments received through the online public consultation and workshops according to the category of stakeholders, or as needed;
- Review of literature to develop consistent use of terms and definitions;
- Creation of statistics for participation in the online public consultation and workshops;
- Design of forms and presentations required for the consultation process;
- Organization and logistics of some the public consultation workshops.
- The online public consultation results were monitored weekly, beginning 10 days after the consultation opened (July 25, 2010). Weekly reports were analyzed in order to monitor participation.

ANNEX 1: SAN Climate Module (July 2010) draft version submitted to public consultation

The SAN Climate Module (draft version July 2010) included: 24 voluntary criteria -two of them critical- that a climate-friendly farm would have to meet in order to become verified against the *SAN Climate Module*. These criteria followed the same enumeration as the Sustainable Agriculture Standard.

The proposal included that farms would have to meet the following requirements:

- a. Be certified under the scope of Sustainable Agriculture Standard and SAN Standard for Group Certification –when applicable- by an accredited certification body;
- b. Obtain full compliance with all of the critical criteria of *SAN Climate Module*;
- c. Obtain compliance with at least 80% of all other non-critical criteria of *SAN Climate Module*.

1. SOCIAL AND ENVIRONMENTAL MANAGEMENT SYSTEM

Summary of the SAN Climate Criteria (non binding for verification purposes):

Certified farms have a social and environmental management system for the implementation of the best management practices indicated in the Sustainable Agriculture Standard, including a personnel training program and evaluation of service providers. The commitment to climate change adaptation and mitigation represents a set of policies and procedures managed by the farm's management or group administrator under the same system for planning and executing operations that fosters the implementation of best management practices for reducing greenhouse gas emissions from farm production and processing practices and managing carbon storage in soil and farm biomass. Climate friendly farms have a program focused on identification of climate risks, emission reduction measures, strategies to adapt to climate change and, for raising awareness about climate change.

1.12 Critical criterion. The social and environmental management system must include programs and procedures for adaptation and mitigation to climate change in line with national policies. The farm or group administrator must implement activities to identify risks and vulnerabilities, and practices to adapt to climate change, to reduce GHG emissions and implement measures to manage the carbon balance over time.

1.13 The farm or group administrator must conduct a direct GHG emissions inventory on an annual basis and take steps to reduce the main contributing sources.

1.14 The farm or group administrator must map its land-use and monitor land use change on the farm.

1.15 The farm or group administrator must give priority to service providers that incorporate climate friendly practices in their operations.

1.16 The farm or group administrator must include in its training and educational program activities to raise awareness and ensure the collaboration, understanding and implementation among key stakeholders and personnel of the farm's climate change adaptation and mitigation policies and practices.

1.17 The farm or group administrator must annually describe its energy sources, the type and amount of energy used from each source for production processes, transport and domestic use within the farm limits. Records must be sufficient to calculate GHG emissions and monitor consumption over time.

The farm must have an energy efficiency plan with goals and implementation activities for increased efficiency, for reducing dependency on non-renewable sources and for increasing the use of renewable energy. Where appropriate, the use of on-farm renewable energy sources must be preferred.

This criterion's content adds requirements to the SAN Addendum's criterion 1.11

1.18 When processing facilities are managed or owned by the farm or the group administrator, measures must be taken to lower GHG emissions and progressively show reductions in GHG emissions. Energy-efficient equipment and machinery to operate the facilities must be preferred and a preventive maintenance program must be in place in order to guarantee optimum performance.

1.19 The farm or group administrator must access or obtain data about local climate variability that might affect production.

1.20 The farm or group administrator must analyze and implement options to address potential risks associated to climate change such as raising temperatures and changing rainfall patterns; these options can include crop diversification, use of adapted varieties, use of alternative crops and changing management practices.

2. ECOSYSTEM CONSERVATION

Summary of the SAN Climate Criteria (non binding for verification purposes):

Certified farms protect natural ecosystems and work to protect plants and animals that depend upon the farm environment for habitat and refuge. Climate friendly farms make efforts for maintaining and enhancing ecosystem conservation in the face of climate change by enhancing their carbon sequestration capacity, reducing farm's vulnerability and improving the agroecosystem resilience to extreme weather events.

2.10 The farm or group administrator must foster regeneration of native vegetation on degraded lands or sites vulnerable to extreme weather events.

2.11 The farm or group administrator must carry out a tree inventory every five years to estimate the carbon stocks on the farm. A detailed record, at minimum, of tree species and other perennials and their diameter must be maintained.

2.12 The farm or group administrator must have a system to measure and monitor carbon sequestration. The following main carbon pools must be considered:

- a. Soil carbon based on farm soil plot measurements or default variables from IPCC or CDM.
- b. Tree carbon based on above ground biomass calculation and derived below ground biomass root: shoot ratios or historic tracking of agro-forestry practices and tree cover and density. Monitoring of live tree carbon must take place through measurements repeated each five years.
- c. Crop carbon; based height and density for estimation of aboveground biomass.

4. WATER CONSERVATION

Summary of the SAN Climate Criteria (non binding for verification purposes):

Certified farms implement activities to conserve water, avoid surface water contamination caused by the run-off of chemicals or sediments and make efforts to reduce energy use in pumping and distribution. Any irrigation must incorporate best known practices for using water efficiently in the region. Climate friendly farms conduct activities to conserve and minimize the use of water in postharvest processing, therefore reducing the quantity of residual water that needs treatment and minimizing methane emissions from wastewaters. Climate friendly farms identify adaptive measures

for increasing water efficiency when affected by climate change impacts, including extreme weather events.

4.10 The farm or group administrator must have a monitoring program in place to calculate rate of wastewater generation and volume of treated wastewater and must make efforts to progressively shown reductions in the wastewater organic content.

4.11 The farm or group administrator must prefer treatment options that minimize methane emissions and make efforts to recover the generated methane.

4.12 The farm or group administrator must implement adaptation measures in case of lack of water availability, including rainwater harvesting and storage, selection of drought tolerant crop varieties and cost analysis for irrigation system.

5. FAIR TREATMENT AND GOOD WORKING CONDITIONS FOR WORKERS

Summary of the SAN Climate Criteria (non binding for verification purposes):

All employees and their families living on certified farms benefit from fair treatment and good housing conditions and have access to medical services and education. Climate friendly farms offer their employees housing conditions that contribute to minimizing GHG emissions.

5.20 The farm or group administrator must ensure that housing provided for temporary or permanent workers supports conditions to reduce GHG emissions, increase energy efficiency and prefer the use of renewable sources.

6. OCCUPATIONAL HEALTH AND SAFETY

Summary of the SAN Climate Criteria (non binding for verification purposes):

Certified farms identify potential emergencies and are prepared to efficiently respond and minimize their possible impacts on workers and the environment. Climate friendly farms conduct a risk assessment to identify potential climate change risks, including extreme weather events (heat waves, heavy rains, prolonged droughts) and associated impacts, (fires, land slides, floods or other events or incidents that can be reasonably anticipated) and are prepared with plans and measures to respond to them.

6.21 The farm or group administrator must carry out a risk assessment for most likely extreme weather events and develop an emergency response plan for these events.

6.22 The farm or group administrator must define adaptation measures and have provisions in place to reduce workers and property vulnerability according to the risk assessment findings.

7. COMMUNITY RELATIONS

Summary of the SAN Climate Criteria (non binding for verification purposes):

Certified farms maintain good relationships with neighboring communities and periodically consult with local stakeholders about changes on farms that could have potential impacts on the social and environmental well-being of surrounding communities. Climate friendly farms work with local institutions and associations to enhance community's climate change adaptive capacity.

7.7 The farm or group administrator must actively participate in community initiatives and strategies related to climate change adaptation and mitigation.

7.8 The farm or group administrator must define resources that it can contribute in support of community climate change programs and responses to extreme events.

8. INTEGRATED CROP MANAGEMENT

Summary of the SAN Climate Criteria (non binding for verification purposes):

Certified farms work towards the reduction of chemical products use through integrated crop management. Climate friendly farmers are aware that nitrogen based fertilizers can release nitrous oxide (N₂O) and this can be a significant GHG emitted on-farm. The production of inorganic fertilizers and pesticides requires a large amount of energy and the GHG emissions released during application depend on the type and formulas of agrochemicals used and the timing and quantity of fertilizer application. Climate friendly farmers also recognize the value of cultivars such as coffee bushes or cocoa trees as carbon stocks.

8.10 The farm or group administrator must make efforts to reduce the use of nitrogen fertilizers and maximize the crop's nutrient uptake for achieving the highest quality and yields in the farm.

8.11 The farm or group administrator must identify and enhance crop management practices that have a positive impact on the farm carbon stock.

9. SOIL MANAGEMENT AND CONSERVATION

Summary of the SAN Climate Criteria (non binding for verification purposes):

Certified farms implement practices to maintain healthy and productive soils and carry out activities to prevent erosion and loss of nutrients. Soils are large carbon stocks and have the potential to sequester GHG when managed well or to release GHG when mismanaged. Climate friendly farms implement practices that amend soil with crop residues or manures, increase the build-up of biomass and soil carbon, and minimize the disturbance of soil under tillage. Improving soil fertility, structure, and water holding capacity increases crop productivity and reduces vulnerability to climate change impacts.

9.6 *Critical criterion.* The farm or group administrator must implement practices for maintaining or increasing soil carbon in the farm, including control of land use changes over time, reducing tillage, optimizing water retention or infiltration and fostering an abundance of microorganisms.

10. INTEGRATED WASTE MANAGEMENT

Summary of the SAN Climate Criteria (non binding for verification purposes):

Certified farms have programs for managing all wastes, leading to a direct decrease in GHG emissions. Proper, integrated waste management also reduces GHG emissions indirectly by saving energy and materials from nonrenewable sources used to produce the discarded items. Waste -- in particular methane gas released from the anaerobic decay of the organic matter in wastewater -- is a major contributor of GHG emissions. Climate friendly farms use waste treatment procedures that minimize GHG emissions and make efforts to manage agricultural biomass residues to generate energy or by-products.

10.7 The farm or group administrator must manage any kind of agricultural biomass residues to generate energy or by-products and must make efforts to reduce the amount of methane generated from decay of agricultural waste.

ANNEX 2: Analysis of Comments Received via Online Consultation, Select Consultation Workshops, Technical Expert Feedback and Analyses of Literature Review

30 October 2010

Considerations for Climate Criteria Standards Development Process

Purpose:

This is a selection of common trends/themes compiled from various inputs to the climate criteria standards development process. This is not a complete list, nor comprehensive assessment of all inputs. Rather, a preliminary attempt to inform the standards development process. It is recommended that analysis, recommendations and decisions made to adapt and improve the climate module consider and (as appropriate) address these observations.

Documents consulted:

- The SAN Standard (July 2010)
- Draft Climate Module (July 2010)
- Climate Module report, Nigel Melican
- Climate Module comments, Peter Baker
- Approximately 200 comments compiled from the public consultation online platform
- Literature Review, Edwin Alpizar (coffee, Guatemala)
- Literature Review, Anne Christianson – with inputs from Neville Millar and Peter Laderach/CIAT (coffee, tea, cacao, E and W Africa, SE Asia)
- Indonesia Workshop Narrative Report and accompanying audit reports, Julie Baroody

1. GENERAL COMMENTS TO MODULE (NON-TECHNICAL)

- In SAN Standard prologue many references are cited as informing the development of the Standard. The same should be done for the climate module. It will lend credibility and transparency to the process.
- Use internationally recognized definitions (i.e. IPCC) and cite them
- Define “progressive” throughout document
- Clarify the rules of the game: what happens if module becomes obligatory? When and how are farms audited? Can non-certified farms be verified to climate module? What happens if you lose verification but are certified?
- Eliminating redundancies in the climate module is very important. Equally important are eliminating redundancies between the climate module and the SAN Standard. However, in doing so it is important that criteria in the SAN Standard that are not critical are not de-facto excluded from the module. If something is important enough to warrant inclusion in both the SAN Standard and the module, it may be important enough to make a critical criteria in the climate module.
 - Is criteria 2.8 (agroforestry minimum thresholds) important enough to warrant inclusion in climate module?
- Encourage “structured flexibility” to facilitate continual improvement (i.e. tiered system of full compliance, partial compliance, etc).
- In general, carefully consider whether criteria should be results oriented vs. process-oriented (i.e. 1.13)
- Phrase criteria in a way that demonstrates progress, not just monitoring
- Emphasize should be on reducing emissions to reduce costs
- Golden rule should be: pay the farmer for mitigation so can use the funds to adapt.
- Increase clarity, reduce ambiguity in criteria wherever possible
- What activities should be farm *responsibility* (i.e. engagement in community adaptive response plans) vs. *accountability* (i.e. progressive reductions in GHG emissions, tree inventories).
- Compliance with module should be contingent upon cost-effectiveness (i.e. purchase of new machinery)
- If a criteria is to be critical it must be clear and within reach of all farms, irrespective of economic resources
- Demands of criteria should not surpass available knowledge/science

2. MODULE IMPLEMENTATION AND STANDARDS DEVELOPMENT GUIDANCE – TECHNICAL

- Currently, almost half of the criteria deal with the management system. Is this too much?
- Don't forget about the "big picture" carbon balance. It's all about baseline. Ensuring avoidance of deforestation and land degradation, and slash-and-burn agriculture are fundamental. Could/should existing requirements be strengthened?
- How to address trade-offs where best climate practice negatively impacts biodiversity (i.e. eucalyptus woodlot for fuelwood vs. natural reforestation) or other crucial element of standard (i.e. what if adapted crop variety is GM?).
- Fuelwood extraction from forests is major issue, especially in Africa. How does the module address this?
- Need to define what constitutes land use change (1.14)
- SOM – hard to quantify; less is known about soil carbon or how to monitor/measure than above-ground stocks
- Emissions inventory must be cost-effective and credible
- Best practice will greatly differ in small vs. large farms. Module must consider this.
- Water adaptation only addresses drier situations – must also reflect wetter ones

3. SMALL HOLDER CONSIDERATIONS

- Difference in approach small vs. large can be very different
- The criteria should be constructed in a way that decouples economic resources from compliance
- Measuring emissions can be very costly – prohibitive for small producers
- Methane recovery/processing alternatives – similarly prohibitive
- Criteria appear geared towards well-resourced farms in current state
- Criteria should include and facilitate participation of smallholders who will have fewest resources but most susceptible to climate change
- In many African countries electricity is not available – module should not penalize inability to realize efficiency gains in this way
- Social and environment management plan will cause much difficulty for smallholders

4. MARKET/FINANCE CONCERNS

- Without robust financial incentives this is just extra burden on farmers
- Need to ID audit costs of verification
- A cost-benefit analyses should be conducted to ID when transition to low-emissions practices is profitable (in general, but especially for small producers)
- Companies want quantitative data to pass on to consumers, but this is costly for farmers
- Module would benefit from compensatory PES framework in countries of implementation, which would recognize the module
- In short-term, cost-benefit analysis that demonstrates efficiency gains (and cost-savings) via module implementation would help assuage farmer concerns. Need to position compliance with module as cost-savings.

5. TRAINING/GUIDANCE

- Criteria can be vague – farmers and auditors need to know how much/what should be done to demonstrate compliance
- Define scope of energy sources considered on-farm
- RA must provide/facilitate access to information (national strategies; data on climate variability; acceptable monitoring methodologies; local BMPs; etc).
- In general, onus on facilitating compliance should be on RA and not farmers (implying very clear guidance/implementation materials) i.e. RA should develop a template disaster preparedness schedule for farmers

6. VERIFICATION

- Important to establish how to work with cooperative and estimate GHG emissions reliably in mixed-farming system scenario (i.e. cattle vs. agroforestry coffee vs. monoculture coffee).
- Auditors need clear guidance on what activities are lower emissions than others
- Contour planting should be considered as BMP
- Must balance economic resources w/ compliance. Software can reduce costs but produce spurious results, esp. when less common crops are used or ecotype is rare.

ANNEX 3: SAN Climate Module final version (February 2010)

The SAN Climate Module (version February 2011) is comprised of 15 criteria. The module does not contain critical criteria, but farms have to meet the following requirements in order to be verified:

In order to become verified against the SAN Climate Module, the farms must be inspected against the SAN Climate Module and must meet the following requirements:

- a. Certified by an accredited certification body under the scope of Sustainable Agriculture Standard and, if applicable, with the SAN Standard for Sustainable Cattle Production Systems or SAN Standard for Group Certification;
- b. Comply with a minimum score of 80% compliance with all the applicable 15 SAN Climate Module criteria.
- c. Not complying with any or some of the elements defined by a climate module criterion, will result in the assignment of a non-conformity. There are two categories of non-conformities: 1) Major Non-Conformity, and 2) minor non-conformity. The level of compliance for these categories is as follows:
 1. Major Non-Conformity (MNC): indicates compliance with less than 50% of a criterion's element - equaling 0 points.
 2. minor non-conformity (mnc): indicates compliance with equal or more than 50% of a criterion's elements, but less than 100% - equaling 0.5 points.

1. SOCIAL AND ENVIRONMENTAL MANAGEMENT SYSTEM

Summary of the SAN Climate Criteria (non-binding for verification purposes): Certified farms have a social and environmental management system for the implementation of the best management practices indicated in the *Sustainable Agriculture Standard*, including a personnel training program and evaluation of service providers. A farm's commitment to climate change adaptation and mitigation is represented in a set of policies and procedures managed by the farm's management or group administrator under the same system. The climate change-related policies and procedures foster implementation of best management practices for reducing GHG emissions from production and processing practices and managing carbon storage in soil and farm biomass. The management system on a climate-friendly farm should also have a program focused on identification of climate risks, implementing strategies to adapt to climate change and raising awareness about climate change.

- 1.12 **The farm's social and environmental management system must assess climate risks and vulnerabilities and include plans to adapt to and mitigate climate change.**
- 1.13 **The farm must annually record data about its main GHG emissions sources related to, at minimum, nitrogen fertilizer input, pesticide input, fossil fuel use for machinery, methane generated in waste and wastewater treatment and animal husbandry.**
- 1.14 **The farm must obtain available information on climate variability and its predicted impacts and adapt farm practices considering that information.**
- 1.15 **The farm must map its land use and keep records of land use changes.**
- 1.16 **The farm's climate change adaptation and mitigation practices must be included in its training and education programs.**
- 1.17 **The farm must, to the extent possible, choose service providers that incorporate climate-friendly practices in their operations.**

2. ECOSYSTEM CONSERVATION

Summary of the SAN Climate Criteria (non-binding for verification purposes): Certified farms protect natural ecosystems and work to protect plants and animals that depend upon the farm environment for habitat and refuge. Climate-friendly farms make efforts to maintain and enhance ecosystem conservation in the face of climate change by enhancing their carbon sequestration capacity, reducing the vulnerability of the agro-ecosystem to changing climatic conditions and improving its resilience to extreme weather events.

- 2.10 **The farm must reduce vulnerability, prevent land degradation or enhance ecological functions by planting native or adapted species or promoting natural regeneration.**
- 2.11 **The farm must maintain or increase its carbon stocks by planting or conserving trees or other woody biomass. The farm must conduct tree inventories every five years.**

4. WATER CONSERVATION

Summary of the SAN Climate Criteria (non-binding for verification purposes): Certified farms implement activities to conserve water, avoid surface water contamination caused by chemical or sediment run-off and make efforts to reduce energy use in pumping and distribution. Any irrigation must incorporate best known practices for using water efficiently in the region. Climate-friendly farms conduct activities to conserve and minimize the use of water in post-harvest processing, therefore reducing the quantity of residual water that needs treatment and minimizing methane emissions from wastewaters. Climate-friendly farms identify adaptive measures for increasing water efficiency and adapting to water scarcity when affected by climate change impacts, including extreme weather events.

- 4.10 **The farm must analyze and implement wastewater treatment options that reduce methane emissions from wastewater treatment and recover the generated methane, to the extent possible.**
- 4.11 **The farm must adapt to water scarcity by practices such as harvesting and storing rainwater and selecting drought tolerant crop varieties.**

6. OCCUPATIONAL HEALTH AND SAFETY

Summary of the SAN Climate Criteria (non-binding for verification purposes): Certified farms identify potential emergencies and are prepared to efficiently respond and minimize their possible impacts on workers and the environment. Climate-friendly farms are prepared with plans and measures to respond to potential climate change risks, including extreme weather events (heat

waves, heavy rains, prolonged droughts) and associated impacts (fires, land slides, floods or other events or incidents that can be reasonably anticipated).

6.21 The farm must implement an emergency preparedness and response plan for extreme weather events to prevent damage to people, animals and property.

7. COMMUNITY RELATIONS

Summary of the SAN Climate Criteria (non-binding for verification purposes): Certified farms maintain good relationships with neighboring communities and periodically consult with local stakeholders about changes on farms that could have potential impacts on the social and environmental well-being of surrounding communities. Climate-friendly farms work with local institutions and associations to enhance the community's climate change adaptive capacity.

7.7 The farm must initiate or actively participate in community's climate change adaptation and mitigation efforts, including identification of relevant resources.

8. INTEGRATED CROP MANAGEMENT

Summary of the SAN Climate Criteria (non-binding for verification purposes): Certified farms work towards the reduction of chemical products use through integrated crop management. Climate-friendly farmers are aware that nitrogen-based fertilizers can release nitrous oxide (N₂O) and this can be a significant GHG emitted on-farm. Climate-friendly farmers use fertilizers efficiently, since GHG emissions released during application depend on the type and formulas of agrochemicals used and the timing and quantity of fertilizer application.

8.10 The farm must reduce nitrous oxide emissions through the efficient use of nitrogen fertilizers to minimize the loss to air and water.

9. SOIL MANAGEMENT AND CONSERVATION

Summary of the SAN Climate Criteria (non-binding for verification purposes): Certified farms implement practices to maintain healthy and productive soils and carry out activities to prevent erosion and loss of nutrients. Soils are large carbon stocks and have the potential to sequester GHG when managed well or to release GHG when mismanaged. Climate-friendly farms implement practices that amend soil with crop residues or manures, increase the build-up of biomass and soil carbon, and minimize the disturbance of soil under tillage. Improving soil fertility, structure, and water holding capacity increases crop productivity and reduces vulnerability to climate change impacts.

9.6 The farm must maintain or increase its soil carbon stocks by implementing management practices, such as crop residue recycling, permanent cover crops reducing tillage, and optimizing the soil's water retention and infiltration.

10. INTEGRATED WASTE MANAGEMENT

Summary of the SAN Climate Criteria (non-binding for verification purposes): Certified farms have programs for managing all wastes, leading to a direct decrease in GHG emissions. Integrated waste management also reduces GHG emissions indirectly by saving energy and materials from non-renewable sources used to produce the discarded items. Waste - in particular methane gas released from the anaerobic decay of the organic matter - is a major contributor of GHG emissions. Climate-friendly farms use waste treatment procedures that minimize GHG emissions and make efforts to manage agricultural biomass residues to generate energy or other inputs.

10.7 The farm must implement organic residue management practices that reduce GHG emissions, such as production of organic fertilizer or biomass energy generation.