



**Food and Agriculture
Organization of the
United Nations**

COMMISSION ON
GENETIC RESOURCES
FOR FOOD AND
AGRICULTURE

Conservation and use of genetic diversity to build resilience to climate change in food and agriculture systems

- Highlights from a global survey -



Background

As part of its Programme of Work on Climate Change and Genetic Resources for Food and Agriculture¹, the Commission on Genetic Resources for Food and Agriculture (Commission) proposed that a survey be undertaken on “*Lessons learned about ways and means to conserve and use genetic diversity to build resilience to climate change in food and agriculture systems*”. The results of the survey provide up to date information on ongoing work and a reality check on the challenges currently faced around the world by those seeking to conserve and use genetic diversity to build resilience to climate change in food and agriculture systems. The survey covered all genetic resources (plants, animals, forestry, aquatic, invertebrates and micro-organisms) and was concerned with both technical and policy related aspects (Box 1).

Box 1. The Survey

The survey included both direct questions and opportunities to comment or share information and documents on:

- Effects of climate change on the conservation and use of genetic resources for food and agriculture (GRFA);
- Technical and policy related adaptation and mitigation activities;
- The contribution of the Global Plans of Action for genetic resources;
- Research, information management public awareness and capacity building activities.

The survey was sent to GRFA sector national focal points of the Commission, a range of civil society organizations and experts on different disciplines. The survey was also available through the website of the Platform for Agrobiodiversity Research (PAR) and promoted through a PAR newsletter and FAO social media channels to provide opportunities for wide participation.

394 participants completed at least parts of the main questions of the questionnaire and 53% of these completed the whole questionnaire (see Appendix 1 for more information on the participants).

This document presents the highlights from the survey. The full survey report is available at <http://www.fao.org/3/a-mm501e.pdf>. The findings complement and confirm many existing analyses and provide new information on a number of aspects of climate change and the conservation and use of genetic resources².

¹ CGRFA-14/13/Report Appendix D. The Secretariat of the Commission commissioned the Platform for Agrobiodiversity Research (PAR), with the support of Bioversity International, to conduct an online survey. The survey was undertaken during August and September 2013.

² Including the Commission’s Background Study Papers No. 53-57, 60 on climate change and micro-organism, invertebrate, animal, forest, aquatic and plant genetic resources, the synthesis paper prepared by PAR on agrobiodiversity and climate change, and a range of relevant research papers and other documents.

Main conclusions from the survey

1. Nearly 75% of the participants considered that climate change was already having a moderate or major effect on production and on genetic resources for food and agriculture (GRFA) in their countries.
2. A wide variety of technical adaptation options are already being tested around the world by all GRFA sectors.
3. Mitigation activities involving the use of GRFA are in progress and are often linked to adaptation activities.
4. Enhanced conservation efforts, particularly of useful wild species such as crop wild relatives, were often identified as a major priority to cope with climate change.
5. Accessibility of suitable GRFA is of central importance in responding to climate change.
6. Social and economic dimensions of adaptation and mitigation require greater consideration by those involved in conservation and use of genetic resources.
7. Working in participatory ways with farmers, taking account of gender dimensions, and building local institutions are key elements contributing to success of adaptation and mitigation activities.
8. Improved ways for monitoring the effect of climate change on the conservation and use of GRFA and the effectiveness of adaptation or mitigation measures are needed.
9. Inclusion of GRFA conservation and use in national climate change strategic planning and policy development is uneven. There are often significant barriers to participation in the different policy processes.
10. Links between Global Plans of Action and climate change related national planning activities need to be strengthened.
11. More attention needs to be given to mainstreaming and up-scaling GRFA related activities.
12. Knowledge gaps are limiting the capacity to respond to climate change.
13. Capacity development is essential to support work on conservation and use of GRFA in the context of climate change.
14. Increasing public awareness is widely recognized as an important feature of work on GRFA conservation and use for climate change.

Highlights

1. Nearly 75% of the participants considered that climate change was already having a moderate or major effect on production and on genetic resources for food and agriculture (GRFA) in their countries.

The most common effect on production identified was a change in the crops, varieties, animal species, breeds, forestry species or populations, and aquatic species or populations (noted by 69-86% of participants³). Changes in production practices and in the availability and use of inputs, which often involve changes in the GRFA used in any production system, were also highlighted. Over 70% of participants also considered that climate change was already affecting regulating and supporting ecosystem services.

GRFA related issues were often placed within the wider context of the impact of climate change on rural societies. The problems faced by rural communities working and living in increasingly challenging climates with increased human disease problems and growing transport difficulties were noted, as was increased conflict over forage and pasture resources.

2. A wide variety of technical adaptation options are already being tested around the world by all GRFA sectors.

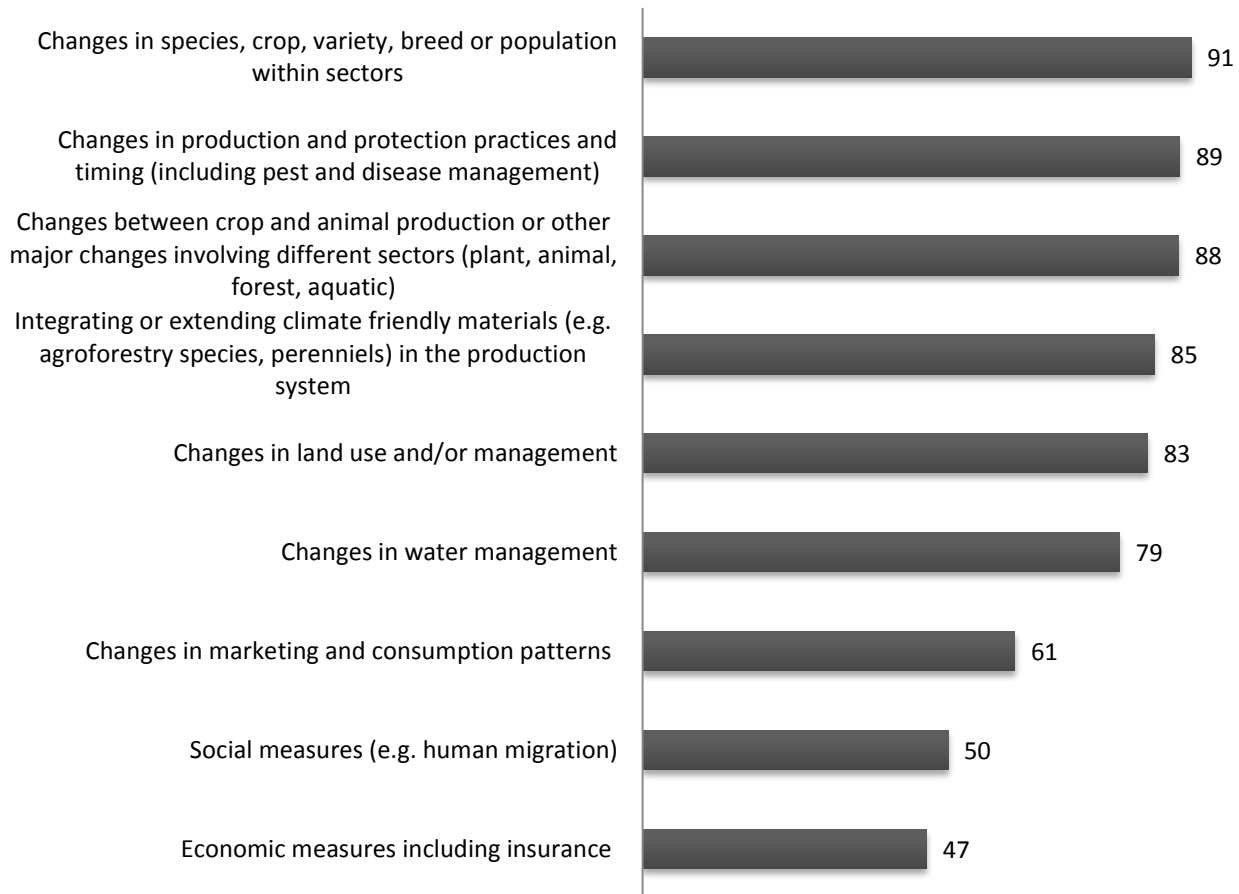
Two thirds of the survey participants indicated that they, or their country, had been involved in GRFA related adaptation measures. A wide variety of different approaches and actions were described by survey participants and showed the importance of:

- Changes between crop and animal production or other major changes involving different sectors (plant, animal, forest, aquatic);
- Changes in species, crop, variety, breed or population within sectors;
- Integrating or extending climate friendly materials (e.g. agroforestry species, perennials) in the production system; and
- Changes in production and protection practices and timing (including pest and disease management).

As Figure 1 shows, actions involving changes in land use or management, water management, marketing and consumption patterns were also important, as were economic measures such as insurance, and social measures such as human migration.

³ Percentages or proportions in respect of participants are calculated relative to the number answering the section of the survey concerned.

Figure 1. Percentage of respondents indicating that some or many adaptation actions of different categories had been undertaken (% of respondents)



Participants provided many examples of adaptation actions in which they or their country were involved. The most frequently mentioned were:

- Increased efforts to conserve (both *in situ* and *ex situ*), characterize and evaluate potentially useful GRFA, especially crop wild relatives, but also important medicinal and agroforestry species and livestock breeds.
- Identification, selection and breeding of new and improved materials adapted to changed conditions. Drought, heat, cold and flood tolerance were all identified as important traits together with resistance to pests and diseases. The importance of crop wild relatives, traditional varieties and participatory breeding were explicitly noted.
- The adoption of planned diversification programmes that involved introduction of new crops, animals or agroforestry species. A number of significant agroforestry based diversification programmes were described.
- The development of production practices that were considered to be more sustainable, to improve the provision of ecosystem regulating or supporting services and to increase the resilience of production systems. Conservation Agriculture, improved irrigation and water management, reforestation and restoration of riparian corridors, reduction in use of wood as fuel and the system of rice intensification were provided as examples.

In many of the examples given, different types of activities were combined so that, for example, changes in agricultural practice were combined with the development and distribution of new species, crops, varieties, breeds or populations. A number of participants emphasized the importance of this integrated approach.

Most of the adaptation actions targeted the farm or community level. Only one fifth involved landscape level interventions which generally included the increased use of agroforestry. Many participants stressed the importance of further research to identify and assess potential adaptation actions and the importance of monitoring their effectiveness.

3. Mitigation activities involving the use of GRFA are in progress and are often linked to adaptation activities.

Half of the participants answering this section of the report had been involved in mitigation activities. From a list of options provided, over 75% of the respondents reported that mitigation activities, in which they were involved, included:

- Cropland-related mitigation practices in specific areas such as organic agriculture, Conservation Agriculture or bioenergy production;
- Crop residue management and production of biogas;
- Improved efficiency in the production of livestock and fisheries;
- Introduction of combined irrigation and fertilization techniques to increase efficiency;
- Rehabilitation of degraded watersheds through improving and sustaining their hydrological regimes, including conservation of wetlands;
- Reduced forest conversion and plantation of forests on agricultural land;
- Restoration of grasslands and degraded agricultural lands; and
- Improved fodder crop production.

Most of the mitigation actions described more in detail by respondents related to actions that took place at farm level and involved utilization of GRFA (rather than activities which were primarily concerned with improving conservation or the availability of genetic resources). Many of the participants noted the link between adaptation and mitigation with respect to the use of GRFA that were adapted to climate change and contributed to mitigation.

4. Enhanced conservation efforts, particularly of useful wild species such as crop wild relatives, were often identified as a major priority to cope with climate change.

Participants recognized the importance of both *ex situ* and *in situ* conservation in their replies throughout the survey. The importance of intensifying conservation efforts for crop wild relatives and other useful wild species was highlighted by a number of participants. These resources were regarded as already significantly threatened in some cases and in need of protection or conservation action. Their value and potential use was a recurring theme in survey replies.

Survey participants highlighted three other issues related to conservation:

- Threats to forage and the availability of pasture and potential conflict over resource availability;
- The need for improved monitoring of the effects of climate change on GRFA; and
- The need to enhance conservation capacity in respect of facilities and personnel to secure useful wild species.

5. Accessibility of suitable GRFA is of central importance in responding to climate change.

Effective access requires the availability of potentially useful materials and information about them. A significant number of participants referred to problems in access to adapted materials and noted that appropriate national and international policies are needed that can support access at all levels from farm to country. Both traditional and new materials are used in adaptation and the involvement of rural communities in identifying potentially useful materials is essential.

6. Social and economic dimensions of adaptation and mitigation require greater consideration by those involved in conservation and use of genetic resources.

In reporting on and describing adaptation and mitigation actions, survey participants focused mainly on specific technical actions with relatively little reference to the wider social and economic dimensions of the implementation of such actions. Some participants specifically noted problems in relation to the implementation and acceptance of adaptation measures. The comment was made by several participants that farmers needed to see clear benefit from adoption of adaptation measures otherwise levels of adoption were likely to be low.

7. Working in participatory ways with farmers, taking account of gender dimensions, and building local institutions are key elements contributing to success of adaptation and mitigation activities.

The importance of working with communities and of combining any actions with measures to strengthen local social institutions and capacity, engage rural communities and adopt participatory approaches was often emphasized. The activities reported which described participatory activities included appraisals of community concerns and needs, participatory planning of adaptation measures and participatory plant breeding.

8. Improved ways for monitoring the effect of climate change on the conservation and use of GRFA and the effectiveness of adaptation or mitigation measures are needed.

The need for information on the effect of climate change on conservation and use of GRFA was noted by different participants in response to questions on awareness of climate change, adaptation and mitigation. Monitoring should include ongoing assessment of vulnerabilities and risks in relation to observed climate change effects and expected future changes. Monitoring procedures should also be able to assess the effectiveness of adaptation or

mitigation measures. The ways in which existing information systems (such as WIEWS, DAD-IS) can be used or developed to provide the information needed by countries should be explored.

9. Inclusion of GRFA conservation and use in national climate change strategic planning and policy development is uneven. There are often significant barriers to participation in the different policy processes.

Information on the inclusion of GRFA perspectives in climate change related policy processes revealed a very mixed picture. About half of the national planning activities such as National Adaptation Programmes of Action (NAPAs), National Adaptation Plans (NAPs) or other strategic plans mentioned by participants were reported to contain references relevant to conservation and use of GRFA. The references to GRFA that were most commonly cited by participants were:

- Utilization and the development of adapted species, varieties, breeds and populations;
- Conservation of GRFA, including *in situ* and *ex situ* conservation and policy changes for more conservation actions;
- Improving availability of GRFA, especially in relation to increasing diversity and supply of planting stock;
- Agroforestry and tree planting programmes; and
- Enhancing sustainability through support to organic agriculture, regulating marine fisheries and other relevant activities.

Most of the information provided referred to crop genetic resources followed by information on forest and animal genetic resources. There were few references to aquatic, invertebrate or micro-organism genetic resources.”

About two fifths of participants had been involved in some way in the development of NAPAs, NAPs and other strategies. About half of these were involved in parts of the process of developing any plan (e.g. stakeholder meetings, comments on documents, membership of advisory committee) while the rest described their work as supporting implementation. In fact, a number of participants specifically noted their lack of involvement in the processes of developing any plan and expressed concern about this.

The inclusion of GRFA perspectives in mitigation policy planning (incl. Nationally Appropriate Mitigation Actions, NAMAs) appeared to be less than that for adaptation and little information was provided on either the aspects that were included or the specific issues surrounding inclusion.

The main challenges identified for securing appropriate inclusion of GRFA perspectives in policy planning at national level for both adaptation and mitigation strategies were:

- Complexity of policy processes;
- Lack of funds needed to undertake necessary baseline studies;
- Limited stakeholder participation;
- Poor appreciation by government of the importance of GRFA; and

- Inadequate collaboration between different groups, institutions, agencies and ministries involved in GRFA.

These challenges emphasize the importance of developing collaborative and inclusive processes to support recognition of GRFA and of developing a wider awareness of GRFA among policy makers.

10. Links between Global Plans of Action and climate change related national planning activities need to be strengthened.

The Commission's Global Plans of Action (GPA) for plant, animal and forest genetic resources⁴ were recognized by many participants as an important aspect of supporting climate change related aspects of GRFA conservation and use. One third of participants felt that the climate change provisions in GPAs were adequate while a quarter considered them insufficient. The areas of activity in the GPAs that were considered as important for climate change adaptation were (in order of frequency):

- Conservation of GRFA including establishment of genebanks for *ex situ* conservation of plants and animals;
- Utilization of GRFA such as breeding for adapted varieties or breeds; and
- Activities implemented at regional and national level or that are part of international projects funded from UN or multilateral sources.

Some participants emphasized the importance of including conservation activities in national climate change policy planning. They indicated that a fuller integration of GRFA and GPA related perspectives into national planning required:

- Greater stakeholder involvement and inclusion of both GRFA specialist and rural communities in planning processes;
- Improved coordination among different stakeholders;
- Wider awareness among policy makers and society; and
- Improved capacity of GRFA specialist to participate in planning processes.

Some 30% of respondents indicated that they were not aware of the different GPAs suggesting that awareness of GPAs needs to be strengthened.

11. More attention needs to be given to mainstreaming and up-scaling GRFA related activities.

Many of the activities reported by participants were in the initial stages of implementation or on a small scale and, in fact, problems of ensuring adequate mainstreaming or up-scaling were reported by participants. The reasons given for these problems included:

- Limited capacity and finance;
- Inadequate collaboration between different actors (sectors, institutions and agencies);
- Insufficient inclusion of farmers and rural communities; and

⁴ www.fao.org/nr/cgrfa/cgrfa-global/cgrfa-globplan

- Absence of appropriate policies.

Some participants emphasized that adaptation actions did not succeed unless farmers benefitted directly from them.

12. Knowledge gaps are limiting the capacity to respond to climate change.

Considerable research is being undertaken on different aspects of conservation and use of GRFA in the context of climate change. Despite this, the absence of adequate knowledge on the conservation and use of GRFA in response to climate change was a recurring theme in participants' replies. Participants often mentioned the need for information directly relevant to their climate change realities (context specific). This would suggest that the maintenance of strong national research programmes is important and that increased research is needed on the conservation actions and farming practices appropriate to changing climatic conditions at local levels. To date much of the research has focused on biological aspects of adaptation to climate change. The survey suggests that research would also be valuable on:

- Use of participatory approaches that strengthen local involvement in developing adaptation actions;
- Ways of embedding social sciences and economic aspects and of addressing policy constraints; and
- Ways of using diversity to enhance adaptability, to reduce vulnerability and increase resilience under different climate change scenarios and climate uncertainty.

Strengthened research should be accompanied by the continuing development of information systems that can bring together information from different sources.

13. Capacity development is essential to support work on conservation and use of GRFA in the context of climate change.

Training on genetic resources and climate change appears to be lacking in many places. Only about two third of participants had been involved in any training in relation to climate change and only 35% in training that involved both climate change and conservation and use of GRFA. Two areas of capacity development needed were emphasized – tertiary level training of GRFA specialists and local capacity building among rural communities. In addition, the importance of training in schools and of extension agents was also noted.

14. Increasing public awareness is widely recognized as an important feature of work on GRFA conservation and use for climate change.

The need for greater public awareness was identified as an important aspect both in response to specific questions and in comments in other parts of the questionnaire. Many activities from around the world were described and included TV and radio programs, publications and the use of social media. Specific guidance based on sharing successful experiences would be valuable to many of those working on GRFA.

Appendix 1

Figure 1. Respondents by Regions (% of respondents; N=281)

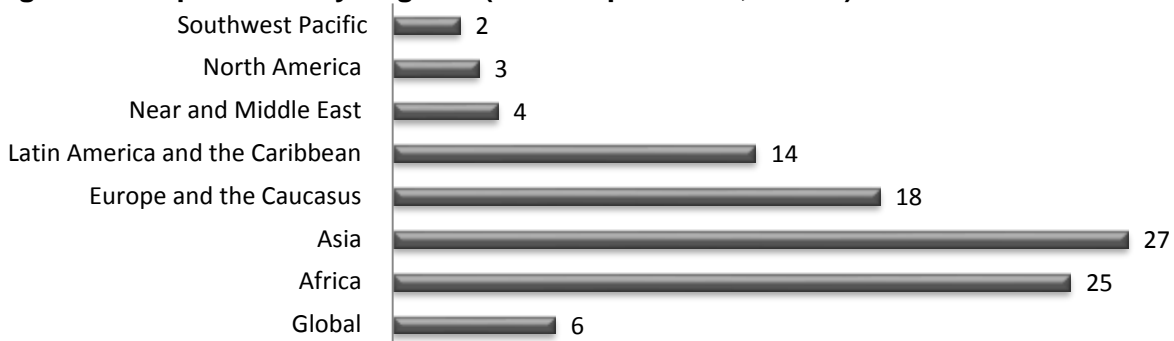


Figure 2. Respondents by affiliation (% of respondents; N=288)



Figure 3. Level of implementation of respondents' work (% of respondents; N=288)

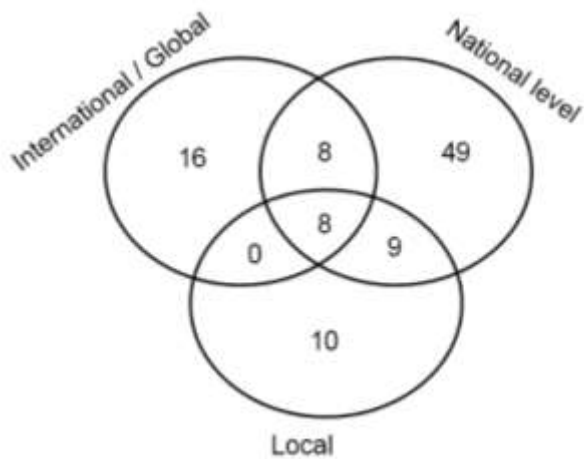


Figure 4. Respondents by field of expertise (% of respondents, N=277)

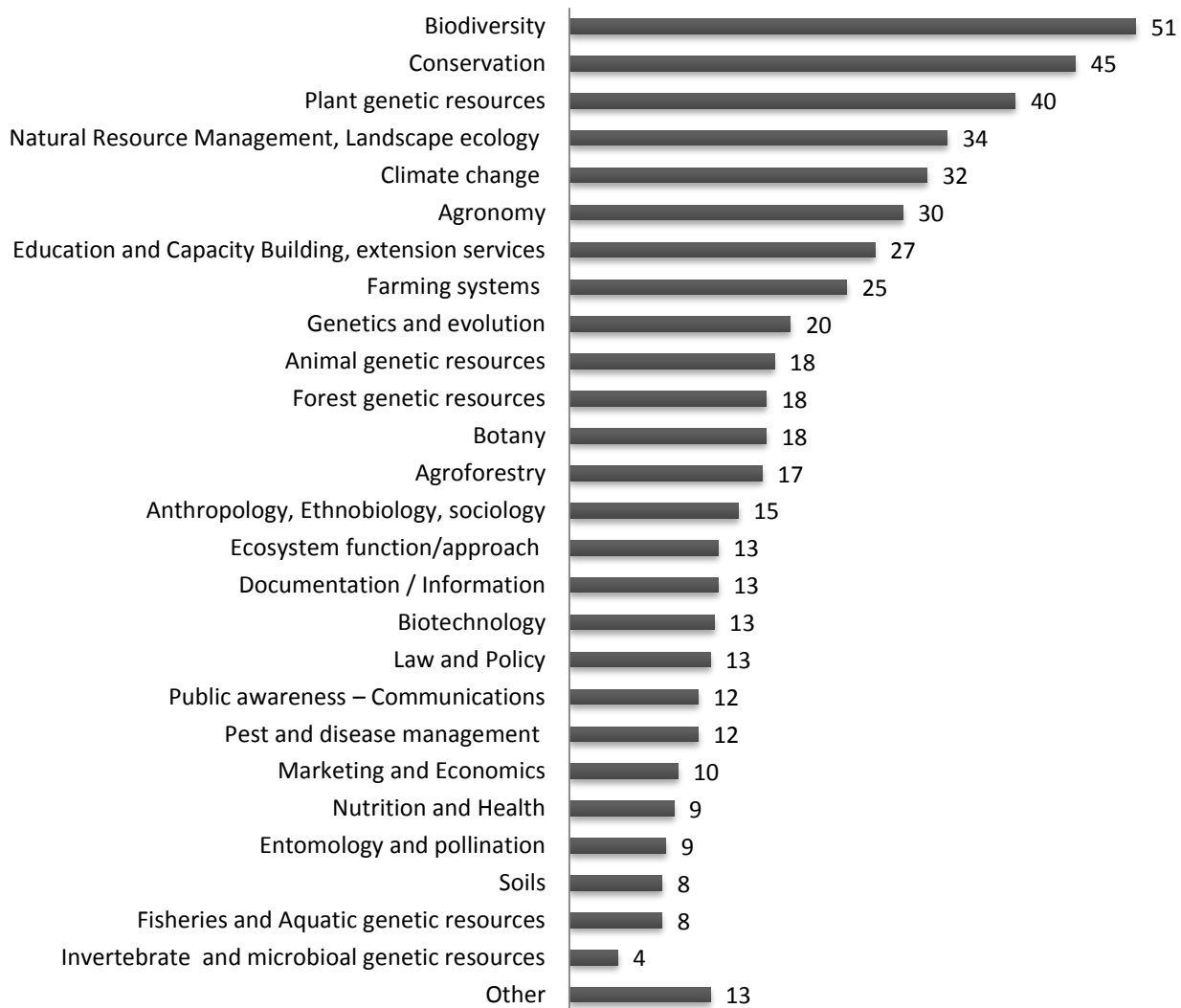


Figure 5. National focal points respondents by genetic resources sector (% of responses; N=88)

