



联合国  
粮食及  
农业组织

Food and Agriculture  
Organization of the  
United Nations

Organisation des Nations  
Unies pour l'alimentation  
et l'agriculture

Продовольственная и  
сельскохозяйственная организация  
Объединенных Наций

Organización de las  
Naciones Unidas para la  
Alimentación y la Agricultura

منظمة  
الأمم المتحدة  
للأغذية والزراعة

E

# COMMISSION ON GENETIC RESOURCES FOR FOOD AND AGRICULTURE

## Item 11.3 of the Provisional Agenda

### Eighteenth Regular Session

27 September – 1 October 2021

## REVIEW OF WORK ON MICRO-ORGANISM AND INVERTEBRATE GENETIC RESOURCES FOR FOOD AND AGRICULTURE

### TABLE OF CONTENTS

	Paragraphs
I. Introduction .....	1–2
II. Review of the Commission's work on micro-organism and invertebrate genetic resources for food and agriculture .....	3–11
III. Options for addressing micro-organism and invertebrate genetic resources for food and agriculture at forthcoming sessions .....	12–14
IV. Reviewing the Work plan for the sustainable use and conservation of micro-organism and invertebrate genetic resources for food and agriculture in the light of recent developments .....	15–20
V. Guidance sought .....	21
<i>Appendix:</i> Work plan for the sustainable use and conservation of micro-organism and invertebrate genetic resources for food and agriculture	

Documents can be consulted at [www.fao.org](http://www.fao.org)

NG802/E

## I. INTRODUCTION

1. In revising its Multi-Year Programme of Work, the Commission on Genetic Resources for Food and Agriculture (Commission), at its Fourteenth Regular Session, decided to review its work on micro-organism and invertebrate genetic resources for food and agriculture (MIGR) at its Eighteenth Regular Session.<sup>1</sup> At its last session, the Commission adopted the Work Plan for the Sustainable Use and Conservation of Micro-organism and Invertebrate Genetic Resources for Food and Agriculture (Work Plan),<sup>2</sup> which, for ease of reference, is contained in the *Appendix* to this document. With respect to the specifics of the work on MIGR foreseen in the Work Plan for its Nineteenth and Twentieth Regular Sessions, the Commission requested FAO to present options for discussion at the current session.<sup>3</sup>

2. The present document reviews the Commission's work on MIGR and presents options for consideration by the Commission with respect to the specifics of its future work on MIGR, in particular its work at its next two sessions.

## II. REVIEW OF THE COMMISSION'S WORK ON MICRO-ORGANISM AND INVERTEBRATE GENETIC RESOURCES FOR FOOD AND AGRICULTURE

3. The Commission has a relatively longstanding history of dealing with MIGR. A background study paper, *The sustainable management of biodiversity for biological control in food and agriculture: status and needs*,<sup>4</sup> was commissioned in 2007 and provided information on the use of micro-organisms and invertebrates in the context of biological control. Also in 2007, at its Eleventh Regular Session, the Commission decided to include MIGR as a workstream under its Multi-Year Programme of Work.<sup>5</sup> At its Twelfth Regular Session, the Commission considered two brief scoping studies describing the main functions and services provided by micro-organisms and invertebrates of relevance to food and agriculture.<sup>6</sup> It emphasized the need to assess the status and trends of micro-organisms relevant to food and agriculture and requested FAO to prepare targeted assessments of the status and trends in the conservation and use of soil micro-organisms, biological control agents and plant pathogens of important crops.<sup>7</sup> The Commission also requested FAO to prepare further analyses and studies of the role of micro-organisms in ruminant digestion, agro-industrial processes and food processing, as well as a global synthesis of the status and trends of the ecosystems services provided by invertebrates relevant to food and agriculture.<sup>8</sup>

4. At its Thirteenth Regular Session, the Commission welcomed progress made in the preparation of the assessments requested at its preceding session and took note of two studies on the impact of climate change on MIGR.<sup>9</sup> It also welcomed the inclusion of micro-organisms and invertebrates within the scope of the report on *The State of the World's Biodiversity for Food and Agriculture*<sup>10</sup> (Report). The Commission agreed to consider, in the future, the preparation of global assessments of micro-organisms and invertebrates and the establishment of an intergovernmental technical working group on MIGR.<sup>11</sup>

---

<sup>1</sup> CGRFA-14/13/Report, *Appendix I*.

<sup>2</sup> CGRFA-17/19/Report, paragraph 95.

<sup>3</sup> CGRFA-17/19/Report, paragraph 95.

<sup>4</sup> Background Study Paper No. 38.

<sup>5</sup> CGRFA-11/07/Report, *Appendix E*.

<sup>6</sup> CGRFA-12/09/15.1 and CGRFA-12/09/15.2.

<sup>7</sup> CGRFA-12/09/Report, paragraph 60.

<sup>8</sup> CGRFA-12/09/Report, paragraph 63.

<sup>9</sup> Background Study Papers No. 54 and 57.

<sup>10</sup> FAO. 2019. *The State of the World's Biodiversity for Food and Agriculture*. J. Bélanger & D. Pilling, eds. FAO Commission on Genetic Resources for Food and Agriculture Assessments. Rome. (also available at <https://doi.org/10.4060/CA3129EN>).

<sup>11</sup> CGRFA-13/11/Report, paragraphs 92 & 94.

5. At its Fourteenth Regular Session, the Commission took note of a set of comprehensive background study papers on the role of micro-organisms in food<sup>12</sup> and agro-industrial processes<sup>13</sup> and in ruminant digestion,<sup>14</sup> as well as on the role of invertebrates in rice production<sup>15</sup> and root crop-based systems.<sup>16</sup>

6. At its Fifteenth Regular Session, the Commission reviewed its work on micro-organisms and invertebrates. It reiterated the importance of microbial and invertebrate genetic diversity, including the role of pollinators, for sustainable agriculture, food security and nutrition. It also noted that bacterial, yeast and fungal genetic resources used in food processing need to be included in its future work.<sup>17</sup> The Commission emphasized the need for the Report to address issues related to micro-organisms and invertebrates and appealed to all FAO Members to provide relevant information in the course of the preparation of their country reports.<sup>18</sup> It also requested FAO to review the planning of its work on the conservation and sustainable use of micro-organisms and invertebrates following the presentation of the Report to the Commission.<sup>19</sup> In considering the draft report on *The State of the World's Aquatic Genetic Resources for Food and Agriculture*, the Commission also took note of the thematic background study on *Genetic resources for microorganisms of current and potential use in aquaculture*.<sup>20</sup>

7. At its Sixteenth Regular Session, the Commission requested FAO to prepare a draft work plan on the sustainable use and conservation of micro-organisms and invertebrates, taking into account views provided by Members,<sup>21</sup> the findings of *The State of the World's Biodiversity for Food and Agriculture*<sup>22</sup> and any other relevant information, for review by its Intergovernmental Working Groups (Working Groups) and the Commission at their next sessions. The adoption of the Work Plan at the Commission's last session<sup>23</sup> followed a consultative process<sup>24</sup> that included the Working Groups<sup>25</sup> and the Expert Group on Micro-organism and Invertebrate Genetic Resources for Food and Agriculture.<sup>26</sup>

8. The Work Plan addresses micro-organisms and invertebrates as functional groups and foresees a review of two functional groups at each the Commission's forthcoming regular sessions:

CGRFA-18	Pollinators, including honey bees Biological control agents and biostimulants
CGRFA-19	Soil micro-organisms and invertebrates, with emphasis on bioremediation and nutrient cycling organisms Micro-organisms of relevance to ruminant digestion
CGRFA-20	Edible fungi and invertebrates used as dietary components of food/feed Micro-organisms used in food processing and agro- industrial processes

<sup>12</sup> Background Study Paper No. 65.

<sup>13</sup> Background Study Paper No. 64.

<sup>14</sup> Background Study Paper No. 61.

<sup>15</sup> Background Study Paper No. 62.

<sup>16</sup> Background Study Paper No. 63.

<sup>17</sup> CGRFA-15/15/Report, paragraph 66.

<sup>18</sup> CGRFA-15/15/Report, paragraph 67.

<sup>19</sup> CGRFA-15/15/Report, paragraph 69.

<sup>20</sup> FAO. forthcoming. *Genetic resources for microorganisms of current and potential use in aquaculture*. Rome.

<sup>21</sup> CGRFA-17/19/12.2/Inf.1 Rev.1.

<sup>22</sup> FAO. 2019. *The State of the World's Biodiversity for Food and Agriculture*. J. Bélanger & D. Pilling, eds. FAO Commission on Genetic Resources for Food and Agriculture Assessments. Rome. (also available at <https://doi.org/10.4060/CA3129EN>).

<sup>23</sup> CGRFA-17/19/Report, paragraph 95.

<sup>24</sup> CGRFA-17/19/12.1.

<sup>25</sup> CGRFA-17/19/9.1, paragraphs 45–49; CGRFA-17/19/11.1, paragraphs 21–23; CGRFA-17/19/10.1, paragraphs 30–31 and CGRFA-17/19/8.1, paragraphs 42–44.

<sup>26</sup> CGRFA-17/19/3.2/Inf.2.

9. In the first phase of implementation of the Work Plan, the Commission Secretariat, in collaboration with the relevant technical divisions of FAO, coordinated expert studies on the status and trends of conservation, use and access and benefit-sharing for the two functional groups selected for the current session: pollinators, including honey bees; and biological control agents and biostimulants. The studies are based on scientific literature, the analysis of various sources of data, including national biodiversity strategies and action plans (NBSAPs) and databases such as FAOSTAT, previous work conducted under the guidance of the Commission and the results of a questionnaire sent out to all Members and interested stakeholders. The documents *Sustainable use and conservation of pollinators, including honey bees*<sup>27</sup> and *Sustainable use and conservation of biological control agents and biostimulants*<sup>28</sup> summarize the key findings of the studies and seek the Commission's advice on how to advance work in the respective areas.

10. The Commission also regularly receives reports on the specific activities of FAO in the field of MIGR. Since 2007, FAO has been reporting to the Commission on progress in the implementation of the International Initiative for the Conservation and Sustainable use of Pollinators and the International Initiative for the Conservation and Sustainable Use of Soil Biodiversity, established by the Conference of the Parties to the Convention on Biological Diversity (CBD). The documents *Progress report on the implementation of the International Initiative for the Conservation and Sustainable Use of Pollinators*<sup>29</sup> and *Progress report on the implementation of the International Initiative for the Conservation and Sustainable Use of Soil Biodiversity*<sup>30</sup> describe FAO activities on these topics since the last session of the Commission.

11. In conclusion, over the past 14 years the Commission has considered various studies on MIGR and, at its last session, adopted the Work Plan. While this work has been undoubtedly useful, the Commission has not developed policy responses in the area of MIGR as it has done in other sectors.

### **III. OPTIONS FOR ADDRESSING MICRO-ORGANISM AND INVERTEBRATE GENETIC RESOURCES FOR FOOD AND AGRICULTURE AT FORTHCOMING SESSIONS**

12. The Commission requested FAO, with regard to the specifics of its work on MIGR foreseen for its Nineteenth and Twentieth Regular Sessions, to present options for discussion at the current session. The Commission may therefore wish to consider ways and means to better involve Commission Members and observers in the implementation of the Work Plan, to improve the relevance of agreed deliverables to the needs and priorities of Commission Members and, most importantly, to facilitate the formulation and uptake of recommendations by Commission Members and observers. Governance mechanisms that could improve the integration of MIGR into the work of the Commission will form part of the discussion of the organization of the Commission's future intersessional work.<sup>31</sup>

13. The Work Plan foresees that each functional group under consideration will be addressed on the basis of a summary of the status and trends of conservation, use and access and benefit-sharing, a mapping of relevant intergovernmental organizations, and an analysis of gaps and needs and of possibilities for the Commission and Members to address them. It does not, however, foresee arrangements for considering recommendations or potential follow-up activities arising from the review of other functional groups at earlier Commission sessions. Such activities could, for example, include in-depth reviews by Members and observers of documents produced, organization of workshops or capacity-building activities or development of policy responses such as guidelines or tools. The potential need, at forthcoming sessions, both to consider two additional functional groups and to consider recommendations and activities arising from the reviews of other functional group could create a workload that might overtax the Commission and affect its capacity to formulate and implement recommendations and follow-up activities on MIGR.

---

<sup>27</sup> CGRFA-18/21/11.1.

<sup>28</sup> CGRFA-18/21/11.2.

<sup>29</sup> CGRFA-18/21/11.3/Inf.1.

<sup>30</sup> CGRFA-18/21/11.3/Inf.2.

<sup>31</sup> CGRFA-18/21/13.

14. In reviewing the specifics of its work on MIGR at its next sessions, the Commission may wish to create space in the Work Plan for the possibility of considering recommendations and follow-up activities related to functional groups reviewed earlier and, to this end, consider reducing the number of functional groups to be considered at each session.

#### IV. REVIEWING THE WORK PLAN FOR THE SUSTAINABLE USE AND CONSERVATION OF MICRO-ORGANISM AND INVERTEBRATE GENETIC RESOURCES FOR FOOD AND AGRICULTURE IN THE LIGHT OF RECENT DEVELOPMENTS

15. The Commission may wish to review the Work Plan in the light of recent developments relevant to the functional groups foreseen for consideration at the current and forthcoming sessions.

16. During the current session, the Commission will consider pollinators, including honey bees and biological control agents and biostimulants. In reviewing the Work Plan, it may wish to make room for an in-depth discussion of actions it could take in response to the findings of the studies on these functional groups (see paragraph 9), taking into account ongoing work by FAO in these areas.

17. For the Nineteenth Regular Session the Work Plan foresees consideration of soil micro-organisms and invertebrates, with emphasis on bioremediation and nutrient cycling organisms, and micro-organisms of relevance to ruminant digestion. Key developments in the area of soil micro-organisms include the launch of the main report and summary for policy-makers of *The State of knowledge of soil biodiversity – Status, challenges and potentialities*,<sup>32</sup> the Global Symposium Soil Biodiversity “Keep soil alive, protect soil biodiversity”,<sup>33</sup> held virtually from 19 to 22 April 2021, and the launch of Soilex,<sup>34</sup> a global database that aims to facilitate access to information on legal instruments on soil protection and prevention of soil degradation. The fifteenth meeting of the Conference of the Parties of the CBD will consider the adoption of the Plan of Action 2020–2030 for the International Initiative for the Conservation and Sustainable Use of Soil Biodiversity.<sup>35</sup>

18. As far as micro-organisms of relevance to ruminant digestion are concerned, it should be noted that in the context of the growing concern about the subtherapeutic use of antibiotic growth promoters in animal feed and greater appreciation of the role of the microbial ecology of the gastrointestinal tract in determining animal productivity, increasing numbers of probiotic products are being developed and used in animal nutrition. Recent FAO work related to rumen microbiota includes the publication *Probiotics in animal nutrition – Production, impact and regulation*.<sup>36</sup>

19. For the Commission’s Twentieth Regular Session, the Work Plan foresees consideration of edible fungi and invertebrates used as dietary components of food/feed and micro-organisms used in food processing and agro-industrial processes. Since 2003, FAO has been working on topics pertaining to edible insects in many countries worldwide. FAO’s contributions cover the following thematic areas: generation and sharing of knowledge through publications, expert meetings and a web portal on edible insects; awareness-raising on the role of insects through media collaboration (e.g. newspapers, magazines and television); provision of support to member countries through field projects (e.g. the Laos Technical Cooperation Project); and networking and multidisciplinary interactions with various sectors within and outside FAO (e.g. with stakeholders working in the fields of nutrition, feed and legislation). Key publications include *Looking at edible insects from a food safety perspective – Challenges and opportunities for the sector*,<sup>37</sup> *Guidance on sustainable cricket*

<sup>32</sup> FAO, ITPS, GSBI, SCBD, and EC. 2020. *State of knowledge of soil biodiversity - Status, challenges and potentialities, Report 2020*. Rome, FAO. (also available at <http://www.fao.org/3/cb1928en/CB1928EN.pdf>).

<sup>33</sup> FAO. 2021. Keep soil alive, protect soil biodiversity. Global symposium on soil biodiversity, 19–22 April 2021 – Outcome document. Rome, Italy (also available at: <http://www.fao.org/documents/card/en/c/CB6005EN/>)

<sup>34</sup> <http://www.fao.org/global-soil-partnership/resources/highlights/detail/en/c/1369390/>

<sup>35</sup> CBD/SBSTTA/24/L7.

<sup>36</sup> FAO. 2016. *Probiotics in animal nutrition – Production, impact and regulation*, by Y.S. Bajagai, A.V. Klieve, P.J. Dart & W.L. Bryden. Editor H.P.S. Makkar. FAO Animal Production and Health Paper No. 179. Rome.

<sup>37</sup> FAO. 2021. *Looking at edible insects from a food safety perspective. Challenges and opportunities for the sector*. Rome. <https://doi.org/10.4060/cb4094en>

*farming – A practical manual*<sup>38</sup> and *Edible insects: future prospects for food and feed security*.<sup>39</sup> More information on edible insects for food and feed, including the Global Stakeholder Directory (Version 2.0) on Edible Insects, can be found on the FAO website.<sup>40</sup>

20. The Microbiome Learning Network is an interdisciplinary team focusing on a systematic review of transformative scientific research on the role of the microbiome in nutrition and health, agriculture and food systems, and the bioeconomy at large.<sup>41</sup> It was created in July 2020 during a series of virtual seminars and workshops on state-of-the-art microbiome knowledge, and policy and industry issues. Several literature reviews on different microbiome ecosystems (e.g. the soil microbiome and the human gut microbiome) are forthcoming for publication.

## V. GUIDANCE SOUGHT

21. The Commission may wish to:

- i. welcome progress made in the implementation of the Work Plan;
- ii. request FAO to continue reporting to the Commission on progress in the implementation of the international initiatives for the conservation and sustainable use of pollinators and of soil biodiversity established by the Conference of the Parties to the CBD;
- iii. create space in the Work Plan for the possibility of considering recommendations and follow-up activities related to functional groups reviewed earlier and, to this end, consider reducing the number of functional groups to be considered at each session;
- iv. review the selection of functional groups to be considered at its Nineteenth and Twentieth Regular Sessions, taking into account recent developments in FAO and in other fora, including progress made in the international initiative on soil biodiversity;
- v. request FAO and relevant international organizations to strengthen technical support to developing countries in relation to their efforts to achieve the conservation and sustainable use of MIGR; and
- vi. invite donors to contribute to the implementation of the Work Plan.

---

<sup>38</sup> Hanboonsong, A. & Durst, P. 2020. *Guidance on sustainable cricket farming – A practical manual*. Bangkok, FAO. (also available at <https://doi.org/10.4060/cb2446e>).

<sup>39</sup> van Huis, A., Van Itterbeeck, J., Klunder, H., Mertens, E., Halloran, A., Muir, G. & Vantomme, P. 2013. *Edible insects: future prospects for food and feed security*. FAO Forestry Paper No. 171. Rome, FAO. (also available at <http://www.fao.org/docrep/018/i3253e/i3253e.pdf>).

<sup>40</sup> <http://www.fao.org/edible-insects/en/>

<sup>41</sup> FAO. 2019. *Microbiome: the missing link? Science and innovation for health, climate and sustainable food systems*. Rome. (also available at <http://www.fao.org/3/ca6767en/CA6767EN.pdf>).

---

## APPENDIX

---

### WORK PLAN FOR THE SUSTAINABLE USE AND CONSERVATION OF MICRO-ORGANISM AND INVERTEBRATE GENETIC RESOURCES FOR FOOD AND AGRICULTURE<sup>42</sup>

---

1. Micro-organisms and invertebrates are the most numerous and diverse groups of organisms on Earth. They play important roles at all stages of the food value chain. Since 2007, the Commission's Multi-Year Programme of Work recognizes the important contribution of micro-organisms and invertebrates to the provision of ecosystem services, sustainable agriculture and food security.

2. Under the Commission's guidance, targeted assessments of various micro-organisms and invertebrates and of their contributions to food and agriculture have been prepared.<sup>43</sup>

#### I. OBJECTIVES OF THE WORK PLAN

3. Micro-organism and invertebrate genetic resources form part of a number of ongoing international initiatives, programmes and activities that relate to biodiversity for food and agriculture. Through the Global Soil Partnership and the Global Action on Pollination Services for Sustainable Agriculture, FAO provides guidance and technical advice to countries and facilitates decision-making processes on soil issues and pollination. The Organization facilitates the implementation of international initiatives on pollinators<sup>44</sup> and soil biodiversity<sup>45</sup> that were established by the Conference of the Parties of the Convention on Biological Diversity. Furthermore, FAO has a long tradition of working in the field of biological control through its integrated pest management programme.

4. The Fourteenth Conference of the Parties to the Convention on Biological Diversity welcomed the initiative of the Commission to develop a work plan on micro-organisms and invertebrates, including those relevant for soil biodiversity and the sustained provision of soil-mediated ecosystem functions and services essential for sustainable agriculture.<sup>46</sup> It further invited FAO, in collaboration with other organizations and subject to the availability of resources, to consider the preparation of a report on the state of knowledge on soil biodiversity covering current status, challenges and potentialities by 2020.<sup>47</sup>

5. Other organizations, such as the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), also significantly contribute to strengthening the knowledge foundations for better policy development for the sustainable use and conservation of micro-organisms and invertebrates and of the ecosystem services they provide. IPBES' assessment report on *Pollinators, Pollination and Food Production*<sup>48</sup> has generated a wide range of follow-up products, actions and policy initiatives, including an ever-expanding list of national strategies and action plans on pollination, premised on the outcomes of the assessment.<sup>49</sup> FAO is one of the four UN collaborative partners of IPBES.

6. Since 2007, the Commission has also steadily been strengthening its work in the field of micro-organisms and invertebrates. Macroinvertebrates, which make up a significant component of aquaculture and fisheries (23 and 15 percent of global production, respectively) are covered in detail in the report on *The State of the World's Aquatic Genetic Resources for Food and Agriculture* and will

---

<sup>42</sup> CGRFA-17/19/Report, *Appendix E*.

<sup>43</sup> <http://www.fao.org/cgrfa/topics/microorganisms-and-invertebrates/en/>

<sup>44</sup> COP 6 Decision VI/5, *Annex II*.

<sup>45</sup> COP 8 Decision VIII/23.

<sup>46</sup> CBD/COP/DEC/14/30, paragraph 22.

<sup>47</sup> CBD/COP/DEC/14/30, paragraph 23.

<sup>48</sup> IPBES. 2016. *The assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on pollinators, pollination and food production*. S.G. Potts, V.L. Imperatriz-Fonseca and H.T. Ngo, eds. Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Bonn, Germany.

<sup>49</sup> More information available at: [www.ipbes.net/deliverables/3a-pollination](http://www.ipbes.net/deliverables/3a-pollination)

be incorporated into the follow-up priority actions. This process also covers some aquatic micro-organisms such as microalgae. The report on *The State of the World's Biodiversity for Food and Agriculture*, prepared under the Commission's guidance, addresses, *inter alia*, the use and conservation of soil micro-organisms, pollinators and biological control agents, as well as management practices believed to be favourable to the delivery of ecosystem services by micro-organisms and invertebrates.

7. This work plan therefore aims to:

- i) consolidate the Commission's activities and processes relevant to the sustainable use and conservation of micro-organisms and invertebrates, and to plan, in a coherent and consistent manner, future activities in this area;
- ii) raise awareness and strengthen the knowledge and understanding on the importance of micro-organisms and invertebrates to ecosystem functions, resilient food production systems, food security and nutrition;
- iii) promote the uptake of micro-organisms and invertebrates in local, national, regional and international policies and policy development processes for the sustainable use and conservation of biodiversity for food and agriculture, and their sustainable management; and
- iv) strengthen the collaboration between FAO and other relevant international organizations and initiatives to mobilize expertise of relevance to the sustainable use and conservation of micro-organisms and invertebrates and identify areas of mutual interest.

## II. FOCUSING ON FUNCTIONAL GROUPS OF MICRO-ORGANISMS AND INVERTEBRATES

8. Although their important role in the provision of ecosystem services and their importance to food and agriculture are widely recognized, information on the diversity, function and distribution of micro-organisms and invertebrates is uneven and, in many cases, very limited and fragmentary. Moreover, as confirmed by the report on *The State of the World's Biodiversity for Food and Agriculture*, the importance of micro-organisms and invertebrates to food and agriculture is neither adequately reflected in the funds that are committed to related research, nor in relevant policies and decision-making processes.

9. The taxonomic and functional diversity of micro-organism and invertebrate species significantly contrasts with species in the plant, animal, forestry and fisheries sectors. The latter encompass relatively few species for which the taxonomy tends to be well understood. As a result of this, "sectoral" species, breeds and varieties can be managed differently and conservation strategies can, for example, be single-species based. This species-by-species approach faces serious practical difficulties in the case of micro-organisms and invertebrates given the sheer number of species, the enormous taxonomic and ecological variety of these organisms and, consequently, the human and financial resources such an approach would require.

10. Management strategies for micro-organisms and invertebrates relying on a holistic framework that focuses on ecosystem functions and services these organisms contribute to, and on management practices favouring their conservation and sustainable use, might therefore be more feasible, efficient and effective, in particular for micro-organisms and invertebrates managed within production systems, than strategies focussing on the organisms themselves.

11. This work plan therefore addresses micro-organisms and invertebrates as functional groups: pollinators, including honey bees; biological control agents and biostimulants; soil micro-organisms and invertebrates, with emphasis on bioremediation and nutrient-cycling organisms; micro-organisms of relevance to ruminant digestion; edible fungi and invertebrates used as dietary components of food/feed; and micro-organisms used in food processing and agro-industrial processes.<sup>50</sup>

---

<sup>50</sup> CGRFA/16/17/Report, paragraph 79.

12. In light of the recent activities and developments at the global level with respect to pollinators<sup>51</sup> and biological control agents, the work plan addresses these groups first.
13. Moreover, the work plan addresses two functional groups per Commission session.
14. The Commission will address the following functional groups of micro-organisms and invertebrates at its forthcoming sessions:

CGRFA-18	Pollinators, including honey bees <sup>a</sup> Biological control agents and biostimulants
CGRFA-19	Soil micro-organisms and invertebrates, with emphasis on bioremediation and nutrient cycling organisms <sup>b</sup> Micro-organisms of relevance to ruminant digestion <sup>c</sup>
CGRFA-20	Edible fungi and invertebrates used as dietary components of food/feed <sup>d</sup> Micro-organisms used in food processing and agro-industrial processes <sup>e</sup>

*Notes:*

<sup>a</sup> With respect to honey bees, this work will address their roles in pollination as opposed to their roles in the production of honey and wax. The latter is covered under animal genetic resources.

<sup>b</sup> Symbionts, including endophytes, should be included in the scope of this work.

<sup>c</sup> This work should build on Background Study Paper 61.

<sup>d</sup> Aquatic organisms used for food, such as algae, will not be included in this study, as these are covered under aquatic genetic resources for food and agriculture.

<sup>e</sup> This work should build on Background Study Papers 64 and 65.

### III. MAIN ACTIVITIES

15. As confirmed by the report on *The State of the World's Biodiversity for Food and Agriculture*, there is an urgent need to:

- establish national baselines, in particular for soil micro-organisms, invertebrates and pollinators;
- improve the knowledge of the services and functions of micro-organism and invertebrate species within and around production systems;
- assess the impact of management practices on the sustainable use and conservation of micro-organisms and invertebrates and on the ecosystem services they deliver, and identify and validate those practices that are found to be most conducive;
- integrate and promote the sustainable use and conservation of micro-organisms and invertebrates into existing policies and planning processes at local and national levels and incorporate these processes into national accounting and reporting systems;
- strengthen and formalize partnerships and improve the exchange and sharing of knowledge and best practices related to the conservation and sustainable use of micro-organisms and invertebrates; and
- pursue taxonomic work for the MIGR sector, which is vital for monitoring pests and diseases, including invasive alien species.

16. Under this work plan, the Commission will therefore address each of the functional groups on the basis of:

- a summary of the status and trends of conservation, use and access and benefit-sharing, based on previous work of the Commission, existing literature and, as appropriate, an open

<sup>51</sup> E.g. IPBES. 2016. *The assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on pollinators, pollination and food production*. S.G. Potts, V.L. Imperatriz-Fonseca and H.T. Ngo, eds. Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Bonn, Germany.

survey that may also compile best practices with respect to their sustainable use and conservation;

- a mapping of regional and international organizations and other institutions most relevant for the functional group and the identification of strategic areas of possible collaboration; and
- an analysis of the gaps and needs, and possibilities for the Commission and its Members to address them.

#### **IV. PARTNERSHIPS**

17. The work plan will be implemented in partnership with organizations involved in the sustainable use and conservation of micro-organisms and invertebrates. The Commission's partners as well as stakeholders should be involved in the implementation of specific activities of the work plan whenever relevant.

#### **V. REVIEW**

18. This work plan will be reviewed by the Commission as part of the review of the Commission's work on MIGR, as scheduled in the Multi-Year Programme of Work, and monitored closely together with the activities to follow up on *The State of the World's Biodiversity for Food and Agriculture* to avoid duplication of efforts.