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Item 7 of the Draft Provisional Agenda

COMMISSION ON GENETIC RESOURCES FOR FOOD AND AGRICULTURE

WORKING GROUP ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

Third Session

Rome, 26 – 28 October 2005

SUPPORT FOR COUNTRIES TO GENERATE, COMPILE AND DISSEMINATE CULTIVAR-SPECIFIC NUTRIENT COMPOSITION DATA, AND THE RELATIVE PRIORITY OF OBTAINING CULTIVAR-SPECIFIC DIETARY CONSUMPTION DATA

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1. INTRODUCTION

1. At its Tenth Regular Session, the Commission on Genetic Resources for Food and Agriculture (the "Commission") requested the Intergovernmental Technical Working Group on Plant Genetic Resources for Food and Agriculture (the "Working Group") to "provide guidance to FAO on how it could best support countries, on request, to generate, compile and disseminate cultivar[1]-specific nutrient composition data, as well as indicate the relative priority of obtaining cultivar-specific dietary consumption data, in order to demonstrate the role of biodiversity in nutrition and food security, as presented in document, *Report from FAO on its Policies, Programmes and Activities on Agricultural Biological Diversity: Cross-Sectoral Matters*".[2] This document has been prepared to address that request.

2. ROLE OF BIODIVERSITY IN NUTRITION AND FOOD SECURITY

2. For many years, FAO has considered food composition and food consumption data to be important to agriculture, health, the environment and trade. In recent years, FAO prepared a Background Study Paper for the Commission in April 2001 on the nutritional value of some crops that were under discussion in the negotiation of the *International Treaty on Plant Genetic Resources for Food and Agriculture*[3]. FAO also published reports and background papers on *Nutritional contribution of rice and impact of biotechnology and biodiversity in rice-consuming countries*[4] and on *Analysis of food composition data on rice from a plant genetic resources perspective*[5] for the International Rice Commission and the International Year of Rice. An extensive listing is provided in the associated information document entitled "FAO's activities in nutrition and biodiversity"[6].

3. In February 2004, Decision VII/32 of the *Convention on Biological Diversity*'s Conference of the Parties (CBD-CoP)[7] noted the linkage between biodiversity, food and nutrition and the need to enhance sustainable use of biodiversity to combat hunger and malnutrition, and thereby contribute to Target 2 of Goal 1 of the Millennium Development Goals[8]. The CBD-CoP requested the CBD's Executive Secretary, in collaboration with FAO and the International Plant Genetic Resources Institute (IPGRI), and taking into account ongoing work, to undertake the necessary consultations and bring forward options for consideration by the CoP at its Eighth Meeting for a ***Cross-cutting initiative on biodiversity for food and nutrition*** (IBFN) within the CBD's existing programme of work on agricultural biodiversity. The CBD's Executive Secretary was requested to work together with relevant organizations, in order to strengthen existing initiatives on food and nutrition, enhance synergies and fully integrate biodiversity concerns into

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[1] For the purposes of this document, the terms "cultivar" and "variety" should be considered synonymous.

[2] CGRFA-10/4/10.2 para.24

[3] Background Study Paper No.11, *Nutritional Value of Some of the Crops under Discussion in the Development of a Multilateral System*, April 2001, is available on the Commission's web site at http://www.fao.org/ag/cgrfa/docs.htm#bsp

[4] *Proceedings of the 20th Session of the International Rice Commission*, Bangkok, Thailand, 2003. FAO, Rome, p 59-69.

[5] *Food Chemistry* (2003).80:589-596

[6] CGRFA/WG-PGR-3/05/Inf.9

[7] The text is posted at http://www.biodiv.org/decisions/

[8] To halve, between 1990 and 2015, the proportion of people who suffer from hunger.

their work, with a view to achieving Target 2 of Millennium Development Goal 1 and other relevant Millennium Development Goals.

4. A consultation on the IBFN was held in Brasilia, on 12-13 March 2005, jointly hosted by FAO, the Executive Secretary of the CBD, and the International Plant Genetic Resources Institute (IPGRI), in order to explore ways to enhance synergies and integrate biodiversity concerns into existing food and nutrition initiatives, in collaboration with other organizations and their initiatives .

5. As specified in the Report of the IBFN[9], FAO and other organizations and initiatives in the scientific community (e.g. the International Union of Nutritional Sciences (IUNS), the United Nations University (UNU), the International Food Data Conference (IFDC) and the United Nations Standing Committee on Nutrition (SCN)), recognized that biodiversity at the species and variety levels provides the basic components of nutrition, including energy, proteins and amino acids, fats and fatty acids, minerals and vitamins, as well as important bioactive "non-nutrients" (e.g. antioxidant phytochemicals). This diversity, including varietal diversity, of fruits, leafy vegetables and other plants and algae is particularly important, but fish and other animal products are also important. Diversity is of particular significance for indigenous communities and for poor and vulnerable communities, especially in times of shortages of major crops. In addition to its role in supporting and sustaining food production, biodiversity, by underpinning dietary diversity, has a role to play in addressing both undernutrition associated with poverty, and obesity-related diseases associated with urbanization, in developed and developing countries.

6. Similarly, in the Report of the IBFN, FAO and other organizations and initiatives in the scientific community recognized that species and varietal differences in nutrient composition can be significant, and that cultivar-specific food composition and consumption data will form the evidence base by which other activities related to nutrition and biodiversity can most effectively be undertaken.

3. GENERATION, COMPILATION AND DISSEMINATION OF CULTIVAR-SPECIFIC NUTRIENT COMPOSITION DATA

7. Many factors are known to affect the nutrient content of foods, including climate, geography and geochemistry, agricultural practices such as fertilization, and the genetic composition of the cultivar. To date, cultivar-specific differences have received the least attention among these. In the past, generic food composition data were considered sufficient for most purposes. However, the usefulness of cultivar-specific composition data is becoming increasingly acknowledged.

8. Sources of new data on cultivar-specific nutrient composition include scientific literature, the International Network of Food Data Systems, regulations governing import/export and substantial equivalence, and analysis of indigenous and wild foods.

9. Recent compositional research has provided data to confirm the micronutrient superiority of some lesser-known cultivars and wild varieties over some more widely-utilized cultivars. For example, Huang and co-workers (1999)[10] reported that sweet potato cultivars in some Pacific Islands differed in their beta carotene content by a factor of 60, yet the low beta carotene varieties were promoted by the agriculture extension workers. Vitamin A deficiency diseases are still pervasive in certain parts of the Pacific, and therefore cultivar-specific nutrient data should be fundamental to related agriculture and nutrition policies and interventions. Promoting indigenous

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[9] Report of the IBFN is available on the CBD web site at http://www.biodiv.org/doc/meeting.aspx?mtg=IBFN-01

[10] Content of Alpha-, Beta-Carotene, and Dietary Fiber in 18 Sweetpotato Varieties Grown in Hawaii. *Journal of Food Composition and Analysis, Volume 12, Issue 2, June 1999, Pages 147-15.* A. S. Huang, L. Tanudjaja and D. Lum

crops rich in micronutrients such as vitamin A precursors has an important role in promoting nutrition in parts of Sub-Saharan Africa, given the high prevalence of HIV/AIDS[11] . Similar papers on the nutrient content of various plant genetic resources have also been published.

10. These trends have been documented by the Secretariat for INFOODS, the International Network of Food Data Systems, operated by FAO in collaboration with the United Nations University. INFOODS, through its standards development, its network of Regional Data Centres[12] and the *Journal of Food Composition and Analysis*, promotes the importance of identifying and disseminating nutrient profiles of food plants and animals, including wild and under-utilized species and intra-specific data.

11. Absence of cultivar-specific food composition data has at times constituted a technical barrier to trade. Most potential export markets for unique species and cultivars require or encourage nutrient composition data for food labels (e.g. "Nutrition Facts" in the USA) and point-of-purchase materials. Many countries have experienced detentions and confiscations of products because compositional data required by the importing countries' legislation were not provided or were considered to be incorrect.

12. In many countries, voluntary or mandatory safety assessment schemes have been introduced for genetically modified organisms (GMOs) used as food. Such safety assessments usually use the concept of "substantial equivalence": the new food is compared to conventional foods to assess similarities and differences that may impact on the health of consumers[13]. Better knowledge on the nutritional composition of conventional foods (existing cultivars) will facilitate the conduct of safety assessments of GMOs[14],

13. The recommendations of the International Rice Commission's 20th Session[15] provided some important directions for food composition data generators and compilers. The International Rice Commission recommended that existing biodiversity of rice varieties and their nutritional composition needs to be explored before engaging in transgenic research; that nutrient content needs to be among the criteria used in cultivar promotion; and that cultivar-specific nutrient analysis and data dissemination should be undertaken systematically.

14. Knowledge of the nutrient composition of the native diet of endangered animal species is an important requirement for protecting them. In some countries, scientists have studied the nutrient composition of the original diets of birds in their native habitats, to ensure that the same nutrients in the same quantities were being supplied in the artificial diets on their offshore island sanctuaries and other protected, artificial habitats.

15. Climate change and other environmental phenomena affect the nutrient content of foods in many ways[16]. Ozone depletion has been shown to modify beta-carotene and other carotenoids and bioactive non-nutrients, while global warming has been shown to effect carbohydrate and fatty acid profiles[17]. The fat content of fish has been used as a marker in charting the climatic

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[11] FAO, 2002. State of Food Insecurity in the World.

[12] Regional Data Centres in the FAO/UNU INFOODS network include the following: AFROFOODS, ASEANFOODS, CEECFOODS, EUROFOODS, LATINFOODS, MEFOODS, NEASIAFOODS, NORAMFOODS, OCEANIAFOODS, SAARCFOODS. In addition, there are several sub-regional Data Centres.

[13] The joint FAO/WHO Codex Alimentarius Commission adopted guidelines for the conduct of food safety assessments of GMOs and is pursuing its work in this area.

[14] OECD has been publishing a series of "consensus documents" on a number of food plants..

[15] FAO, 2002. Report of the International Rice Commission 20th Session (23–26 July 2002, Bangkok), FAO, Rome.

[16] USDA. Agricultural Research Service (2001). National Program, Global Change Annual Report: FY 2001

[17] Seasonal variations of lipid fatty acids of boreal freshwater fish species. Comparative Biochemistry and Physiology B 88:905-909, 1987. Ågren, J., Muje, P., Hänninen, O., Herranen, J., Penttilä, I.

phenomenon of El Niño[18]. However, more data on diversity among genetic resources needs to be generated and documented before such changes related to climatic phenomenon can be elucidated.

16. FAO has reported that wild plants, animals, tree foods and forest foods are essential for many rural households[19]. At least one billion people are thought to use them. For instance, in Ghana, the leaves of over 300 species of wild plants and fruits are consumed. In rural Swaziland, wild plant foods provide a greater share of the diet than domesticated cultivars. In India, Malaysia and Thailand, about 150 wild plants have been identified as sources of emergency food. In developed countries, wild food plants also have an important place. In Italy, mushroom and forest-fruit gathering is popular, and throughout North America and Europe, wild foods feature on menus of the most fashionable restaurants.

17. Many wild plants have the potential to become foods of the future -- useful parents in breeding programs, convenient sources of income, and the vehicles for improved nutrition and increased food supply. Nutrient composition varies among wild plant ecotypes as well as crop cultivars. Some data have been generated, which mainly have been disseminated through specialised scientific publications.

18. Integrating biodiversity and nutrition can contribute to the achievement of Millennium Development Goal 1 (Target 2)[20], Goal 7[21] and related goals and targets, and thereby raise awareness of the importance of biodiversity, its conservation and sustainable use.

19. Through FAO/UNU INFOODS, in collaboration with other organizations, food composition courses are conducted for training in laboratory techniques and practices for generating data and computer systems for compiling data, although they do not always provide training at the cultivar-specific level.

20. Most countries have food control laboratories that undertake analyses for heavy metals, pesticide residues and other chemical contaminants. Some countries have established laboratories that can undertake both chemical food safety analyses and nutrient analyses, since sampling protocols, instruments, quality assurance and quality control systems are similar or identical. Thus, these combined food-control / food-composition laboratories are capable of efficiently generating cultivar-specific nutrient composition data and data on chemical contaminants.

21. Many developing countries and countries in transition are unable to devote resources to strengthening laboratory capabilities and are therefore not able to systematically undertake the nutrient analyses of individual cultivars. However, many countries and regions in the INFOODS network have developed small projects, generating, compiling and disseminating nutrient data on their plant biodiversity. Through FAO Technical Cooperation Projects, food composition activities have been funded to strengthen laboratory capability for nutrient analyses of indigenous species and varieties, to provide funds for sampling and analyses, and to prepare, print and disseminate food composition tables and databases. At a CEECFOODS[22] meeting held on 26 -27 July 2005, the member countries requested FAO's assistance in order for them to be able to generate more nutrient data on local cultivars and varieties and to mainstream those data by including them in national food composition tables and databases to ensure widespread availability.

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[18] Fat Content of Peruvian Anchovy (*Engraulis ringens*), After "El Niño" Phenomenon (1998—1999). Journal of Food Composition and Analysis, Volume 15, Issue 6, December 2002, Pages 627-631. María Estela Ayala Galdos, Miguel Albrecht-Ruiz, Alberto Salas Maldonado and Jesús Paredes Minga

[19] FAO, 1996. World Food Summit, Food for All. 13-17 November 1996. http://www.fao.org/documents/show_cdr.asp?url_file=/DOCREP/x0262e/x0262e04.htm

[20] See footnote 4 above.

[21] Ensure environmental sustainability

[22] CEECFOODS is the INFOODS Regional Data Centre for Central and Eastern European Countries.

4. RELATIVE PRIORITY OF OBTAINING CULTIVAR-SPECIFIC DIETARY CONSUMPTION DATA

22. In the past, as in the case of nutrient composition data described above, generic food consumption data were considered sufficient for most purposes, but increasingly, the usefulness of greater detail in dietary consumption, including cultivar-specific data and an ecosystem approach, is becoming acknowledged as important for understanding diet-related morbidity and mortality.

23. Agricultural production now provides enough food to supply the world with its dietary energy requirement, on a global basis. However, many millions of people with adequate, or even surplus, energy intake suffer from micronutrient deficiencies. A diet low in diversity is capable of providing adequate energy, but biodiversity should be utilized to provide the spectrum of micronutrients and other beneficial food components necessary for health.

24. A global epidemic of obesity and its associated diseases is emerging as increasingly urbanized people adopt diets which are higher in energy, and lower in diversity of fruits and vegetables than those consumed traditionally (this is known as "the nutrition transition"). Many countries now face the so called "double burden of malnutrition": the simultaneous challenges of high prevalence of undernourishment and underweight, and the increasing prevalence of overweight/obesity with its accompanying chronic diseases. In both groups, high prevalence of micronutrient deficiencies is found. By underpinning dietary diversity, biodiversity has a particular role to play in addressing micronutrient deficiencies, and also the poverty- and urbanization-related problems of undernutrition and obesity, in both developed and developing countries.

25. Food consumption survey projects are undertaken, with representative sampling at the sub-national and/or national levels, in order to ascertain the adequacy of nutrient intakes. Current survey instruments and methods generally do not address cultivar-specific intakes, and thus prevent evaluation of this level of dietary biodiversity. However, recent studies have shown that survey respondents are capable of reporting intakes of species and varieties by local names[23].

26. As more cultivar-specific compositional data become available, the more important it becomes to modify the methods and instruments in order to capture cultivar-specific consumption in individual and household surveys. Knowledge of composition and consumption of intra-species diversity may be useful in the development of food-based dietary guidelines and nutrition education programmes for populations.

27. In summary, the absence of cultivar-specific composition and consumption data limits our ability to assess the value of these cultivars and their importance to individual, household and national food security, as well as to trade and the environment sector. Therefore, where detailed dietary consumption methods are used (e.g. weighed portions, 24 hour recall, diet histories), as opposed to methods that only record by food groups, clusters or generic food lists, then collection of cultivar-specific dietary consumption data is feasible and could be considered a high priority.

5. GUIDANCE REQUESTED FROM THE WORKING GROUP ON PLANT GENETIC RESOURCES

28. The Working Group may wish to consider recommending that the Commission request FAO to prepare a draft action plan to better support countries to generate, compile and disseminate cultivar-specific nutrient composition and consumption data. It would include the following activities:

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[23] See for example "Field testing of plant genetic diversity indicators for nutrition surveys: rice-based diet of rural Bangladesh as a model". *Journal of Food Composition and Analysis, Volume 18, Issue 4, June 2005, Pages 255-268.* G. Kennedy, O. Islam, P. Eyzaguirre and S. Kennedy

a) assisting INFOODS Regional Data Centres in their efforts to increase the quality and quantity of food composition data on individual cultivars and under-utilized species, and to compile and disseminate those data in national and regional food composition tables and databases (see para.10);

b) enabling the *Journal of Food Composition and Analysis* to provide an international, peer-reviewed forum for publishing high quality scientific papers on nutrition and biodiversity, with particular attention to papers from developing countries (see para.10);

c) developing a biodiversity training module for courses on nutrient composition, focusing largely on developing sampling plans in order to generate cultivar-specific data (see para.19);

d) providing support for extending analytical capabilities and accreditation for nutrient analyses for existing food control chemical laboratory facilities, in order to more economically and efficiently generate cultivar-specific nutrient data (see paras.20-21);

e) increasing the coverage of FAO's Technical Cooperation Projects on national and regional food composition to strengthen laboratory capacity for nutrient analyses, in order to generate, compile and disseminate cultivar-specific nutrient data for national food composition databases and published food tables (see para. 21);

f) organizing national level sensitization, advocacy, and policy workshops in order for countries to appreciate undertaking such activities, thereby supporting them in their proposals for projects in the area of food composition and consumption, in the context of agricultural biodiversity, and publishing country-specific appropriate communication materials (see paras 24-25);

g) conducting an expert consultation or technical workshop on addressing biodiversity in consumption survey methodologies, including an ecosystem approach to population sample stratification (see paras 25-26); and

h) mainstreaming food composition biodiversity data into nutrition education, food security, emergency preparedness, community nutrition, indigenous knowledge and culture activities, and other applied nutrition projects and programmes.

29. The Working Group may wish to propose that the Commission be made aware of the progress of the ***Cross-cutting initiative on biodiversity for food and nutrition*** (IBFN) within the existing programme of work on agricultural biodiversity of the CBD, and in particular FAO's activities in this regard.