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COMMISSION ON GENETIC RESOURCES FOR FOOD AND AGRICULTURE

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POSSIBLE WAYS TO BETTER GENERATE, COMPILE AND DISSEMINATE CULTIVAR-SPECIFIC NUTRIENT COMPOSITION DATA

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I. INTRODUCTION

1. The first step in promoting biodiversity for food and nutrition is to ensure a sufficient knowledge base on the nutritional benefits derived from agricultural biodiversity. Once established, the next step is to promote increased awareness at all levels of the importance of biodiversity for food and nutrition, and its central role in sustainable diets,[1] Policy frameworks and guidelines can then be developed for mainstreaming biodiversity across many sectors, including environment, health, agriculture, food industry, social development and more.

2. FAO is actively contributing to improving the evidence basis for biodiversity and nutrition through (i) development and regular updating of the FAO/INFOODS Food Composition Database for Biodiversity, (ii) monitoring of the Nutrition Indicators for Biodiversity and (iii) advocacy and awareness raising in the scientific community through the publication of guidelines, scientific articles, and presentations at important international fora and conferences.

II. FAO/INFOODS FOOD COMPOSITION DATABASE FOR BIODIVERSITY

3. FAO and INFOODS developed the FAO/INFOODS Food Composition Database for Biodiversity (also called BioFoodComp) as a global repository of nutrient data on food biodiversity to support the evidence basis on the nutrient content of food biodiversity. This database includes analytical data on nutrients and beneficial bioactive non-nutrients for plant varieties/cultivars and animal breeds as well as for neglected and underutilized species and wild foods. The entire database, or individual records, can be downloaded free of charge from the INFOODS web site[2] and users are able to easily incorporate these data into national or specialized food composition databases.

4. The database was first launched in 2010 and is updated yearly. In general, a literature search is done on particular foods or food groups. This explains why there are many data for some foods while for others there are no or few data. The current version of the database, BioFoodComp 2.0, contains data on 6411 foods classified into 12 food groups. Entries include fruits (1635), finfish (1069), insects (514), vegetables (354), potatoes (1671), milk (273, including milk from sheep, goat, horse, camel, yak, buffalo, donkey, moose, reindeer and mithun), mammal meat (217), other roots and tubers (199), crustaceans (129), molluscs (106), nuts and seeds (101), cereals (90), legumes (28), reptiles and amphibians (15) miscellaneous foods (5) and eggs (5). Data collection and compilation are ongoing. About 98 percent of the data were compiled by FAO staff and 2 percent came from collaborators working with FAO on the Food Composition Database on Selected Foods from West Africa and from Brazil. The BioFoodComp Database contains 451 components. Most of the data are for fatty acids (31 percent), followed by macronutrients and macronutrient fractions (25 percent), minerals (20 percent), phytochemicals and bioactive compounds (8 percent), vitamins (8 percent), other components (3 percent) and toxic trace elements (1 percent). In the BioFoodComp2.0, most fatty acid data were for fish, one third of the mineral data were for fruits and most of the phytochemical data were for potatoes. Few data are on toxic compounds such as heavy metals or anti-nutrients are included. However, such data were entered into the database when other compositional data were available in the respective data source.

[1] Sustainable diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources (http://www.fao.org/ag/humannutrition/28506-0efe4aed57af34e2dbb8dc578d465df8b.pdf)

[2] http://www.fao.org/infoods/infoods/food-biodiversity/en/

5. The FAO/INFOOD BioFoodComp Database is also a unique resource, containing a comprehensive collection of high-quality compositional data for quinoa, insects, fish, potatoes, and milk from specific breeds and underutilized species. The emphasis in 2013 is on rice, vegetables and fruits. It is expected that, in future, more researchers will share their analytical data so that the database will grow much faster than it would with FAO's efforts alone. Resources permitting, FAO intends to issue updates of this database yearly.

6. The FAO/INFOOD Database is an essential tool in the investigation and promotion of the sustainable use of food biodiversity and in mainstreaming food biodiversity into nutrition. To date, it has been used to complete missing values and include food at variety level in several national food composition databases, which is one of the objectives of the database.

7. Other national food composition tables and databases that potentially could include nutrient values for food biodiversity are found on the INFOODS web site.[3] It is expected that with increasing awareness of the importance of biodiversity for food and nutrition, more tables and databases will include such data. For example, the next editions of the national food composition tables of Bangladesh, Brazil and India will include more foods contributing to biodiversity, i.e. wild and underutilized foods and more varieties.

III. NUTRITION INDICATORS FOR BIODIVERSITY

8. Two Nutrition Indicators for Biodiversity – one on food composition[4] and one on food consumption[5] – were developed by FAO and partners within the framework of the Biodiversity Indicators Partnership (2010)[6] to stimulate the production, collection and dissemination of food composition and consumption data taking biodiversity into account. The indicators can also be used as advocacy tools to promote awareness of the importance of food biodiversity, including wild and underutilized foods. The composition indicator is a count of foods below species level, wild or underutilized (i.e. biodiverse food)in food composition databases with at least one nutrient or bioactive component. The consumption indicator is a count of biodiverse foods identified in a food consumption survey.[7]

9. The Nutrition Indicator for Biodiversity on food composition was developed in 2008. By 2012, about 14 330 foods meeting the criteria for this indicator had been counted. Most of the foods were from Asia (4650), followed by America (3410), Africa (2470), Europe (2280), Oceania (1050) and others (470) (comprising global databases and foods reported without indication of origin). The majority of data were obtained from scientific journals (62 %), followed by food composition databases and other literature (each accounting for 18 %) such as books, posters and theses.

10. Between 2009, when the indicator on food consumption was developed, and 2011, more than 4900 foods were counted. Most of the foods are from Oceania (1720) followed by Asia (1041), Africa (954), America (750) and Europe (481).[8] The instruments used to capture consumption data included market surveys, ethno-botanical investigations, 24-hour recalls, food frequency questionnaires and focus-group interviews. Most of these data are from small-scale

[3] http://www.fao.org/infoods/infoods/tables-and-databases/en/
[4] FAO. 2008. *Expert Consultation on Nutrition Indicators for Biodiversity 1. Food composition*. Rome.
[5] FAO. 2010. *Expert Consultation on Nutrition Indicators for Biodiversity 2. Food consumption*. Rome.
[6] A project of a group of more than 40 international agencies coordinated by the United Nations Environment Programme – World Conservation Monitoring Centre (UNEP–WCMC) and funded by the Global Environment Facility (GEF). It ended in March 2011. In light of the adoption of the Strategic Plan for Biodiversity 2011-2020 and its Aichi Targets, the partnership (BIP) will continue.
[7] Foods reported below species level for common foods (i.e. variety, cultivar or breed) and at species level for wild and underutilized foods. For more details see http://www.fao.org/infoods/infoods/food-biodiversity/en/
[8] FAO. 2012. *Nutrition Indicators for Biodiversity. Report on progress of data availability*. Rome (available at http://www.fao.org/infoods/infoods/food-biodiversity/en/)

local surveys, as only a few national or regional food consumption surveys report foods at the cultivar/variety/breed level or report on wild or underutilized foods.

11. Both indicators show that biodiversity is increasingly studied and valued in nutrition. Nevertheless, more efforts in gaining knowledge and in compiling data on both food composition and food consumption are needed in order to improve the evidence base for the positive impact of biodiversity for nutrition and food security.

IV. BIODIVERSITY IN THE INTERNATIONAL NUTRITION AND RELATED SCIENTIFIC DOMAINS

12. The scientific literature increasingly publishes food composition data on food biodiversity, which is a positive trend. FAO has published several articles on the importance of biodiversity for food and nutrition,[9] including commentaries addressing the general role of food composition and its links to biodiversity and nutrition[10] and review articles analysing the nutrient contents of varieties/cultivars and products from specific livestock breeds, as well as on wild and underutilized species. They cover published articles on rice,[11] potatoes,[12] milk from minor species,[13] and submitted articles on fish, African fruits, beef, quinoa and edible insects. These articles have assisted in highlighting the significant nutritional differences among plant varieties/cultivars and animal breeds. Furthermore, through FAO, full sessions and presentations on biodiversity were included in several international nutrition conferences.[14]

13. Additional advocacy tools have been published to raise awareness of the importance of biodiversity and nutrition among professionals at all levels, including international organizations, governments and research organizations. For example, in Africa, the delegates of the Regional Data Centres for Africa of FAO/INFOODS (AFROFOODS) integrated biodiversity into their Call for Action from the Door of Return for Food Renaissance in Africa.[15] The Cordoba Declaration on Promising Crops for the XXI Century of 2012 includes elements on biodiversity and nutrition and the need for greater efforts to collect and disseminate more food composition and consumption data on underutilized species and varieties/breeds.

14. FAO has produced fact sheets[16] and other publications[17] to raise awareness. In addition, a training module on food biodiversity was included in the FAO distance-learning tool Food

[9] Burlingame, B., Charrondière, U.R. & Mouillé, B. 2009. Food composition is fundamental to the cross-cutting initiative on biodiversity for food and nutrition. *Journal of Food Composition and Analysis*, 22: 361–365

[10] Toledo, A. & Burlingame B. 2006. Biodiversity and nutrition: A common path toward global food security and sustainable development. *Journal of Food Composition and Analysis*, 19: 477–483

[11] Kennedy G. & Burlingame B. 2003. Analysis of food composition data on rice from a plant genetic resource perspective. *Food Chemistry*, 80(4): 589–596

[12] Burlingame, B., Mouillé, B. & Charrondière, U.R. 2009. Nutrients, bioactive non-nutrients and anti-nutrients in potatoes. *Journal of Food Composition and Analysis*, 22(6): 494–502.

[13] Medhammar, E., Wijesinha-Bettoni, R., Stadlmayr, B., Nilsson, M., Charrondiere, U.R. & Burlingame B. 2011. Composition of milk from minor dairy animals and buffalo breeds: a biodiversity perspective. *Journal of the Science of Food and Agriculture*, 92(3): 445–474.

[14] International Food Data Conference in 2007, 2009, 2011; International Symposium on 'Biodiversity and Sustainable Diets: United Against Hunger' in 2010; ICN 2009; ACN 2011; FENS, 2011; SLACA 2011; ICDAM 2012; IoFOST, 2012.

[15] http://www.fao.org/fileadmin/templates/food_composition/documents/pdf/AFROFOOD_CALL_and_APPEL.pdf

[16] ftp://ftp.fao.org/docrep/fao/010/i0112e/i0112e.pdf and http://www.fao.org/fileadmin/templates/food_composition/documents/upload/Interodocumento.pdf

[17] FAO. 2010. *Garden of biodiversity.* Rome (available at http://www.fao.org/agriculture/crops/core-themes/theme/spi/gbsc/en/).

Composition Study Guide[18] to inform students, nutritionists and other professionals about the concept of food biodiversity and its links to food, nutrition and health. A biodiversity module will also be included in the FAO e-learning course on food composition, which will be launched in September 2013. This material demonstrates the importance of food biodiversity for food composition databases and dietary assessment, and aims to assist nutrition professionals in generating, managing and using food composition data for food biodiversity.

V. CONTINUED IMPROVEMENT OF DATA QUALITY

15. To improve the quality and quantity of food consumption and composition data on biodiversity, FAO and INFOODS have developed several tools and guidelines, such as the FAO/INFOODS Guidelines for Food Matching and the FAO/INFOODS Guidelines for Checking Food Composition Data Prior to Publication of User Database/Table,[19] with a special emphasis on food biodiversity. Other guidelines to foster further the inclusion of food biodiversity in food consumption surveys and food composition databases are planned:

a) guidelines on the incorporation of biodiversity into food consumption survey tools;

b) guidelines on the incorporation of biodiversity into national or regional food composition tables; and

c) guidelines on food sampling for chemical analysis with a chapter on sampling for biodiversity.

16. More high-quality data on food composition and food consumption are needed in order to improve the evidence base and the impact of biodiversity for nutrition and food security. For food composition, more data need to be compiled and incorporated in national food composition tables and databases. For food consumption, adequate instruments need to be developed to assess the consumption of biodiversity. A recent good example of integrating biodiversity in a published food composition table is the West African Food Composition Table,[20] published in 2012. With more compositional and consumption data for regional and local foods generated and disseminated, including for biodiversity, better and more reliable nutrient intake estimations of populations will be possible.

VI. PARTNERSHIPS WITH OTHER ORGANISATIONS

17. Several biodiversity projects in FAO are undertaken in collaboration with UNEP, Bioversity International, the European Commission and other partners. They aim to mainstream biodiversity and nutrition into agriculture, food security and health policies and programmes, and to address the unique biological diversity that supports a large share of the world's food supply in a range of ecosystems that are global priorities for conservation.

18. Currently, two GEF Projects[21] to mainstream biodiversity and nutrition are being implemented by FAO alone or in collaboration with the United Nations Environment Programme and Bioversity International. They aim to demonstrate the dietary diversity and nutritional benefit of local agricultural biodiversity by working closely with communities across Bolivia (Plurinational State of), Brazil, Kenya, Sri Lanka and Turkey using community-based participatory approaches. The projects will undertake community based mapping of agricultural

[18] Charrondiere, U.R., Burlingame, B., Berman, S. & Elmadfa, I. 2011. *Food composition study guide. Questions and exercises*. Second revised edition. Rome, FAO (available at http://www.fao.org/infoods/infoods/training/en/). It comes with volume 2 (answers) and PowerPoint presentations.

[19] http://www.fao.org/infoods/infoods/standards-guidelines/en/

[20] http://www.fao.org/infoods/infoods/tables-and-databases/africa/en/

[21] http://gefonline.org/projectDetailsSQL.cfm?projID=4577 and http://gefonline.org/projectDetailsSQL.cfm?projID=3808

landscapes (both on-farm and *in situ*) to record and document the local biodiversity and its nutritional content, the traditional knowledge associated with the biodiversity, the extent to which biodiversity contributes to household diets, the barriers to current use, and opportunities for greater awareness, promotion and utilization of biodiverse foods. The latter will include exploring opportunities to better link farmers with markets. This information will add considerably to the existing knowledge base on food consumption and composition of local biodiversity within several ecosystems. The projects will also analyse the best options for documenting this information and making it accessible to relevant stakeholders in ways that are acceptable to the custodians of this knowledge, i.e. local communities. The projects will be in line with the Nagoya Protocol on Access and Benefit-Sharing.

VII. CONCLUSIONS

19. It is hoped that the increased evidence basis will encourage more researchers to incorporate food biodiversity into their work and investigate food biodiversity (composition and consumption) and its impact on nutrition and health. If nutrient analysis and food consumption surveys of the various food species and intra-species diversity are systematically undertaken, national information systems for food and agriculture will be strengthened and it will be possible to use them as the basis for priority setting and national policy making that may contribute to reducing biodiversity loss and improving food and nutrition security. It is also expected that these data will increasingly be used in other areas of nutrition, for example, for nutrient intake estimations, nutrition education and nutrition labelling for food trade. These data are a prerequisite for successful food-based interventions and for understanding the contribution of biodiversity to nutrition and health.