

## CURRICULUM VITAE - ELISABETTA CARFAGNA

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### I. SHORT PROFILE

Full Professor of Statistics since 2005 at the University of Bologna, Department of Statistical Sciences. As Chair of the ISI Special Interest Group on Data Science (former Vice-Chair), she is aiming at strengthening the collaboration between statisticians, computer scientists and other communities in the field of data science and fostering the development and use of machine learning, artificial intelligence and big data in research, capacity building, and technical assistance. She is also elected Council member of the ISBIS Association (July 2023 - July 2027) and elected member of the ISI since 2000. Main other memberships: IAOS, IASS, International Biometric Society, and Italian Statistical Society. She served as Member of the Board of the ISI Committee on Agricultural Statistics (2020-2022) and of the Board of EMOS - European Master in Official Statistics (2018-2020). She was Coordinator of the Sample Survey Group of the Italian Statistical Society (2015-2017).

She started her academic career in 1992, after having reached, at the age of 28, a managerial position in the R&D department of a leading Italian company (ENI Group).

Her professional record is characterized by the combination of top academic career and high-level international consultancy, which has allowed her to create a wide and strong network involving academia, international and national organizations, main international donors (particularly B. and M. Gates Foundation and DFID) and the private sector. She has been involved in interdisciplinary research projects with agronomists, foresters, geologists, environmental, civil, and aero-space engineers, economists and business experts, biologists, mathematicians, and computer scientists. The theoretical and applied research she has carried out has informed the international debate, contributing to create a bridge between the most advanced research and the evidence-based policy.

She has led and participated in international research and capacity development projects, in collaboration with several international organizations, among which FAO (since 1994), EUROSTAT (since 1993), Joint Research Centre of the European Commission (JRC - since 1993) and Economic Commission for Europe. She was called to design and start up the implementation of the Global Strategy to Improve Agricultural and Rural Statistics, a joint initiative promoted by FAO, IFAD, World Bank, African Development Bank, Asian Development Bank, and other UN agencies.

Her activities at international level have been complemented by her advisory role at national level, in the Italian Ministry of Agriculture, the Italian National Statistical Office, the US Department of Agriculture, the Ethiopian Central Statistical Office, the Chinese Institute of Agricultural Resources and Regional Planning, and Dutch, Kenyan, Afghan, Iranian and Pakistani Ministries. In Afghanistan, Iran, and Pakistan she was also involved in capacity development projects.

She is author of 116 publications and invited speaker in several international conferences. Her research interests cover a wide range of topics, such as data science, machine learning, merging of data from various data sources, adaptive sampling, design of experiments, quality control and impact evaluation, use of remote sensing, geographic information systems and global positioning systems for producing statistics, spatial statistics, sampling methods, area, list and multiple frames sample designs.

## II. EMPLOYMENT RECORDS

### University of Bologna

**2005 to date:** Full Professor of Statistics since 2005 at the University of Bologna, Department of Statistical Sciences. Previous positions at the University of Bologna: Associate Professor of Statistics (1998- 2005), Research officer and assistant professor (1992-1998).

- **2022-to date:** Academic advisor of the Curriculum Official Statistics of the Second Cycle Degree in Statistical Sciences, EMOS (European Master in Official Statistics) labelled by the European Statistical System Committee
- **2017-2021:** Responsible for public and social engagement for the Department of Statistical Sciences of the University of Bologna;
- **2017:** Organisation of the conference ITACOSM 2017, 5th ITALian CONference on Survey Methodology, with 120 participants coming from 20 countries.
- **2013-2015:** Member of the board for UniBo@EXPO2015 and delegate of the Rector for EXPO 2015. In this role, she has organized 3 EXPO 2015 conferences <https://eventi.unibo.it/expo2015ruralplanning>:
- **2011-2014:** On leave without pay from January 2011 to January 2014 for taking the position of senior statistician at FAO, in order to design and start up the implementation of the Global Strategy to Improve Agricultural and Rural Statistics, see below.
- **2005-2012:** Member of the Board for the Library System and Chair of the Board for Social Sciences of the Library System
- **1998-2010** Coordinator for statistical discipline courses at the Faculty of Economics in Rimini
- **1998-2004:** Vice-chairman of the council of the degree program “Economics and management”

She has led and participated in international research, capacity development and technical assistance projects, in collaboration with several international organizations, among which FAO (since 1994), EUROSTAT (since 1993), Joint Research Centre of the European Commission (JRC) (since 1993) and Economic Commission for Europe and in research projects funded by national institutions.

She has participated as invited speaker in several international conferences, among which nine ISI World Statistical Congresses, and all the International Conferences on Agricultural Statistics from 1998 to 2019.

Teaching: data analysis, survey sampling, statistical inference, and probability theory in undergraduate and graduate programmes.

## III. INTERNATIONAL CONSULTANT

She has designed and implemented plans for improving the methodology for producing, analysing, and using agricultural, rural, and agro-environmental statistics for informing the national and international policies. She has advised international and national institutions and contributed to capacity development through training and technical assistance.

### V.1 Food and Agriculture Organization of the United Nations (FAO)

- **2017 to 2019:** Methodological support to Afghan and Iranian Institutions in the generation of more timely and accurate statistics with the use of geospatial data.
- **2016-2017:** Development of learning material: 3 comprehensive curricula supporting the institutions in the countries in using geospatial information and technology for agriculture statistics and monitoring, for agri-environmental statistics and for assessing the impact of agricultural change on the environment; in the framework of a FAO Pakistan project funded by the United States Department of Agriculture (USDA).
- **2014 - 2017:** Methodological support to the project “Stimulating Innovation for Global Monitoring of

Agriculture and its Impact on the Environment in support of GEOGLAM (SIGMA)”, an international project funded by the European Commission (7th framework programme). Technical supervision and high-level scientific guidance to the development of detailed action plans for Kenya and Pakistan, to the identification of specific roles of the partners of SIGMA and to the development of the distance learning tools in relationship to other potential contributors and partners.

- **2013-January 2014: Senior statistician (P5)** Research coordinator of the Global Strategy to Improve Agricultural and Rural Statistics for Food Security, Sustainable Agriculture and Rural Development:
  - Implement the research plan of the Global Strategy;
  - Manage and supervise staff working on the research plan of the Global Strategy (37 international consultants);
  - Provide leadership on all methodological and conceptual questions for developing advanced and cost-effective methodologies, tools, and guidelines on agricultural statistics foreseen in the Action Plan of the Global Strategy, to be adopted in Member countries for improving agricultural and rural statistics.
- **2011-2012: Senior statistician (P5)** Design the implementation of the Global Strategy to Improve Agricultural and Rural Statistics
  - Main contributor to the Action Plan of the Global Strategy to Improve Agricultural and Rural Statistics for Food Security, Sustainable Agriculture and Rural Development  
<http://www.fao.org/docrep/016/i3082e/i3082e.pdf>
  - Coordinate with senior staff and Directors of several FAO Divisions and main donors for setting up the infrastructure for the implementation of the Global Strategy;
  - Develop relationships with donors resulting in agreements for 50 million US dollars. Main donors: UK Department for International Development (DFID), Bill and Melinda Gates Foundation (BMGF), European Commission and Italian Development Cooperation.
  - Prepare the multi-year strategy and the implementation plan (including the integrated budget and annual work plans and budgets) for the Global Strategy;
  - Develop, coordinate and lead partnerships with institutions including universities, research institutes, Central Statistical Offices, Ministries of Agriculture, UN Organizations, the World Bank, etc.
- **January 2010 to January 2011:** Lead consultant for the research component of the Implementation Plan for Africa of the Global Strategy for improving agricultural statistics.
- **September 2008:** Improvement of the Ethiopian system of agricultural statistics for the FAO project “Support to Food Security information System in Ethiopia”, financed by the European Commission.
- **2003 - 2008:** Responsible for the statistical methodology for accuracy assessment of LCCS based Land Cover Map of AFRICOVER project.
- **July 2001:** Seminar on Food balance sheets: basic data requirements, methods and uses in assessing the food situation, Rome, FAO Headquarter, invited by the Assistant Director General Hartwig de Haen.
- **November 2000:** Bangkok, Invited Professor in the Workshop on Agricultural Surveys based on multiple (area/list) frame sampling methods organised by FAO and SIAP (Statistical Institute for Asia and the Pacific).
- **1998-1999:** Review of the Land Cover Classification adopted in the FAO Production Yearbook.
- **1994-1998:** Co-author of the book Multiple Frame Agricultural Surveys, vol. I Current surveys based on area and list sampling methods (“FAO statistical development series”, n. 7, 119 pp., FAO, Rome, 1996) and vol. II Agricultural survey programmes based on area frame or dual frame sample designs (“FAO

statistical development series", n. 10, 242 pp., FAO, Rome, 1998).

- **1994:** Invited expert. Expert Consultation on Multiple Frame Agricultural Surveys. FAO Statistics Division, Rome, 17-19 October 1994.

### **V.2 European Commission-Statistical Office of the European Communities (Eurostat)**

She has been invited to several meetings for delineating standards and guidelines for producing statistics, which can be considered comparable at the European level. Moreover, she has developed innovative methods and advised on methodologies adopted by countries for producing statistics. Other tasks:

- **2018-2020:** Support the European Statistical System (ESS) Committee with regard to development of European Master in Official Statistics (EMOS) and support the European Commission in meeting learning and development needs in the ESS and advice on questions relating to higher education and training in Official Statistics, in her role of Member of the Board of EMOS.
- **2016-2018:** Support Eurostat in the revision and modernization of the European statistical system in the framework of the "Power from Statistics" project. She has the role of editor of the round tables reports, the Outlook Report, submitted to the high-level conference "Power from Statistics; Data, Knowledge and Information", and the guidance report containing a proposal for an action plan for the long-term development of official statistics.
- **2012:** Reviewer of the project "Agricultural Survey Optimization Service in Malawi", in the framework of the program Global Monitoring for Food Security (GMFS), on behalf of EUROSTAT.
- **1997-1999:** Member, on behalf of Eurostat, of the commission of Italian National Statistical Institute (ISTAT) for the execution of a land use and land cover database and for the construction of an area frame.
- **1998:** Collaboration to the research "Geographic Sampling Strategies and Remote Sensing", sponsored by Eurostat.
- **1998,** Luxembourg, invited expert to the workshop *Land Cover and Land Use Information Systems for European Union Policy Needs*, organised by Eurostat.
- **1996-1998:** Invited expert to the working group "Land Use Statistics", coordinated by EUROSTAT.
- **March-April 1993:** Athens, Lecturer in the course «Remote Sensing Applied to Agricultural Statistics: Regional Inventories», organised by the IRSA (JRC), Directorate General Agriculture (DG VI), Eurostat.

### **V.3 European Commission-Joint Research Centre (JRC)**

She has developed innovative methods, to be adopted by the European Commission and member states, for producing agricultural, agro-environmental, rural and forest statistics with the support of geo-spatial data. She has advised on projects funded by the European Union in developing countries.

- **2015:** Invited speaker to course and to the invited paper session "Remote sensing for agricultural statistics and monitoring" organised by Bettina Baruth (JRC), João Pessoa – PB (Brazil) 25-29 April 2015
- **2013:** Invited expert to the EUROMED "Crop Monitoring and Yield forecasting in North Africa / South Mediterranean countries" Joint Research Centre, Rabat (Morocco) – 18-22 November 2014
- **2013:** Invited expert to the sixth CGMS Expert Meeting "Monitoring Agricultural Resources Unit, Institute for Environment and Sustainability", JRC Ispra – 12-13 November 2013.
- **1997-1999:** Responsible for the methodology of the project "Forest Monitoring in Europe with Remote Sensing" of the Centre for Earth Observation (Joint Research Centre). Other partners: VTT Automation, Centre d'Etude Spatiales de la Biosphere, European Forest Institute, Scot Conseil and Swedish Space Corporation.
- **1993-1998:** Coordinator of the project: "Analysis of Point Sampling to Compute Yield and Production

Estimates Using an Area Frame”.

- **1997:** Member of the working group “Assessing the information quality of maps versus sampling for quantifying forest at regional scales”, coordinated by the JRC.
- **1993-1995:** Coordinator of the project: “Study on the optimum size of sample segments for estimates based on photo-interpretation of high-resolution satellite images”.
- **October 1994,** Villefranche-sur-Mer, invited expert to the workshop “Crop yield forecasting methods”, organised by Joint Research Centre, Eurostat, FAO and European Commission.

#### **V.4 Italian Ministry of Agriculture, Food and Forestry Policies (MIPAAF)**

**1993 to 2013:** Member of the Technical-Scientific Board for agricultural and agro-environmental statistics of the Italian Ministry of Agriculture, Food and Forestry Policies.

She has guided the strategy of the MIPAAF for producing, analysing and using agricultural, environmental and rural statistics and indicators. She has taken care of the relationships with the service providers and related Italian and European Institutions (ISTAT, ISMEA and EUROSTAT).

#### **V.5 Other organizations**

- **2017:** Plenary panellist invited by the Independent Office of Evaluation of IFAD (IOE) at the International Conference on Information and Communication Technologies for Evaluation (ICT4Eval). Rome, 6 - 7 June 2017.
- **2013:** Expert invited by B. and M. Gates Foundation to the Grand Challenge, held in Rio de Janeiro in November 2013, specialized session Geospatial Data & Remote Sensing for Agriculture & Health, aimed at identifying the priority research lines for funding.
- **2007:** Review of the methodologies of the Chinese Academy of Agricultural Sciences, invited by Prof. Chen Zhongxin, Institute of Agricultural Resources and Regional Planning, National Remote Sensing Centre of China.
- **2005:** Review of the methodologies of the US Department of Agriculture, invited by the Director of the Research and Development Division, George Hanuschak.
- **1994-1995:** Methodological support to the Resource Analysis institute for research projects on environment and remote sensing, for the Dutch government.

### **IV. PREVIOUS PROFESSIONAL POSITION**

- **1987-1992:** Statistician at a research and development centre in Aquater SpA. Responsible for statistical methodologies and applications at the Remote Sensing and GIS Service, project manager (from 1990) supervising the work of 12 experts (mathematicians, electronic engineers, geologists and agronomists) and coordinating the activities of a consortium with other industrial partners: Telespazio and Italeco. Main projects:
  - **1991-1992:** Manager of the project for detecting irrigated areas in Italy, for the Italian National Statistical Office (ISTAT).
  - **1990-1992:** Responsible for the development of the spectro-agro-meteorological yield forecasting model (SAM), based on the integration, through geographic information systems, of agronomic, pedological, meteorological and remote sensing data, for the Italian Ministry of Agriculture.
  - **1990-1992:** Responsible for methodological aspects of AGRIT projects for estimating area and production of main crops, for the Italian Ministry of Agriculture.
  - **1989-1992:** Responsible for the methodology for mineral research based on statistical integration of various geographic data sets, including remote sensing data, for the Italian Ministry of Foreign Affairs.

- **1988:** Responsible for adapting to Italian characteristics the methodology adopted by the United States Department of Agriculture for estimating acreage and production for main crops in the United States.

## V. MEMBERSHIP – SCIENTIFIC ASSOCIATIONS AND COMMITTEES

**21 July 2023 to date:** Chair of the International Statistical Society Special Interest Group on Data Science (Vice-Chair from 2021 to 20 July)

**June 2023:** Elected Council member of the ISI International Society for Business and Industrial Statistics (ISBIS) July 2023 - July 2027

**2000 to date:** Elected member of the International Statistical Institute (ISI)

Member of the International Association for Official Statistics, the International Association of Survey Statisticians, the International Biometric Society, the Italian Statistical Society

**2020 to 2022:** Member of the Board of the ISI Committee on Agricultural Statistics

**2018-2020:** Member of the Board of the European Master in Official Statistics (EMOS)

**2015 to 2017:** Coordinator of the Sample Survey Group of the Italian Statistical society

**2006 to 2009:** Member of the Committee “Environmental statistics and sustainable development”

**1996-2006:** Member of the group of experts supporting the board of the Global Terrestrial Observation System (GTOS), constituted by FAO, ICSU, UNEP, UNESCO and WMO

**1993-1998:** Member of the Italian Statistical Society Committee “Environmental Statistics”

**1993-1998:** Member of the Italian Statistical Society Committee “Statistical Aspects of Remote Sensing”

## VI. SPECIALISATION / RESEARCH INTERESTS

- Data science, machine learning, merging of data from various data sources;
- Sampling methods, area, list and multiple frames sample designs; use of administrative data for generating statistics.
- Adaptive sampling, design of experiments, and other statistical methods for continuous innovation, quality control and impact evaluation;
- Use of remote sensing, geographic information systems and global positioning systems for agricultural, rural and agri-environmental statistics. Agro-meteorological yield forecasting models. Rural buildings and land use analysis and planning.
- Analysis and use of geographic and geo-referenced information, impact of spatial resolution, change of support and transformations of spatial data, spatial statistics.