

ESF GENOMIC-RESOURCES

Standing Committee for Life, Earth and Environmental Sciences (LESC)

Introduction

ESF-GENOMIC RESOURCES Research Networking Programme funded two science meetings in 2011: a workshop in Reykjavik (Iceland) organized by Juha Kantanen and the Nordic genetic Resource Center, and a summer school in Vienna (Austria) organized by Maria Wurzinger at the University of Natural Resources and Applied Life Sciences. We present here a report on these activities.

Scientific workshop on the “Socio-economic and Cultural Values of Farm Animal Breeds” Reykjavik, Iceland September 7-9, 2011

NordGen-Nordic Genetic Resource Centre organised in collaboration with the Agricultural University of Iceland and MTT Agrifood Research Finland a scientific workshop on socio-economic and cultural values of farm animal breeds. The workshop was held in Reykjavik Iceland on September 7-9, 2011.

The aims of the workshop were to strengthen and develop national and regional policies in the conservation and sustainable use of animal genetic resources, to increase the collaboration and networking between stakeholders and to identify new relevant and innovative topics

for future research and development projects.

The workshop program was implemented in four sessions: 1) Human-animal relationships, 2) Conservation of endangered farm animal breeds in the frame of sustainable development, 3) Methodological approaches to value farm animals and local breeds and 4) Conservation policies and practices with five invited speakers. In addition an open call to submit abstracts to the workshop was launched, in total 28 abstracts were obtained. Of these, the organizing committee of the Workshop selected 16 to be presented at the workshop, so the total number of presentations was 21. The workshop themes were also discussed in working groups and an excursion was organised on the final day.

The workshop participants acknowledged the multidisciplinary approaches and studies presented at the workshop. In general, it was considered that the social sciences can add new dimensions to conservation of genetic resources and it is important to continue the networking, and to promote research. The implementation of approaches of social and cultural sciences in the conservation of farm animal genetic resources is a relatively new multidisciplinary field of research for natural scientists as well as for social scientists. The workshop participants recognized that scientists and stakeholders from both the field of social sciences and that of genetic resources and conservation should acquire better knowledge of the basic terminology and approaches applied in the different fields. This is a prerequisite for the development of multidisciplinary studies. Moreover, socio-economic and socio-cultural approaches for animal

genetic resources could also be seen as a research field of its own. Nordic Genetic Resource Centre (NordGen) will establish an 'ad hoc' working group of Nordic experts that will develop future activities and research projects on socio-economic and socio-cultural valuation of farm animal breeds and promote networking among stakeholders and scientists from the field of social sciences and that of genetic resources –conservation.

1.1. Human-animal relationships

“Understanding human-animal relation in the past is a precondition for understanding those relations at present and in the future.”

The session on Human-animal relationships included eight presentations. The presentations addressed the domestication of animals and its biological, social, cultural and economic implications, temporal changes in human-animal relationships and human-animal relationships in the industrialized agriculture. The key-note speech ‘The ambiguous boundaries between the wild and the domestic’ was given by Karl Benediktsson, Professor of Human Geography from the University of Iceland. Two case studies were presented: one was dealing with historical importance of dairy cattle and dairying culture in Iceland and the other one focused on anthropological analysis on differences in traditions keeping cattle, horses and reindeer in the Yakutian region in Eastern Siberia.

The domestication of wild animal species led to many biological, social, cultural and economic implications and had remarkable effects on human lifestyle. The presentations of the session showed that the relationship between humans and animals (both domestic and wild ones) is clearly mutual. As pointed out in the key-note speech by Professor Karl Benediktsson, social scientists have in recent years paid a greatly increased attention to the often problematic relations

between humans and non-human animals. The farm animals are interesting subjects for analyses of social sciences because they have retained closeness to ‘wild’ nature. The boundaries that separate the wild from the domestic are highly ambiguous. So called ‘feral animals’, such as untamed sheep flocks in some European countries or reindeer in Northern Europe, are examples of populations crossing the border between ‘wild’ and ‘domestic’.

1.2. Conservation of endangered farm animal breeds in the frame of sustainable development

“Conservation of farm animal breeds should be understood within wider socio-ecological and cultural systems that should sustain”

The session Conservation of endangered farm animal breeds in the frame of sustainable development comprised four presentations which provided examples of national in situ and ex situ –conservation actions and motivations for them.

The key-note speech was given by Professor Leo Granberg from University of Helsinki, Finland on diversity in ecology, in society and in the relationships between humans and animals. The presentation discussed the concept of system in sociological tradition and presented suggestions to reconnect society into the debate on biodiversity. The challenge to connect social system and ecosystem was analysed, and socio-diversity was suggested to be the precondition for conserving bio-diversity in ecosystem, including farm animal genetic resources.

The conservation of genetic resources is typically based on their instrumental or economic stance: genetic resources are seen as something that is needed to conserve in order to protect the variations of (human) forms of life (tradition, culture, aesthetics, and economy). However, diversity is valuable in itself even if it has

no use for humans (intrinsic value of diversity). In conservation practice the instrumental and intrinsic value types intersect and are subsumed to each other at multiple levels of the conservation process.

Two practical presentations on in situ conservation issues were given. In Norway, 51% of the cows of the six native and endangered cattle breeds are currently kept as suckler cows although originally all these native breeds have been dairy breeds. The problems, challenges and opportunities related to this conservation method to maintain native cattle genetic resources were discussed. In addition, branding activities of native sheep and chicken in north-eastern Italy were presented. The branding program, which is co-ordinated by Veneto Agricoltura and which links a native breed to regional, traditional products, has run several years. The (critical) evaluation of strengths and weaknesses of the program was presented.

1.3. Methodological approaches to value farm animals and local breeds

“Variety of theoretical and methodological approaches is needed for understanding socio-cultural values of farm animal breeds.”

The session Methodological approaches to value farm animals and local breeds included four presentations, two of which were key-note talks given by Principal Research Scientist, Dr Katriina Soini from MTT Agrifood Research Finland and University of Jyväskylä, Finland and Professor Eija Pouta from MTT Agrifood Research Finland, Finland.

Katriina Soini has studied a typology and profiles of European farmers keeping local cattle breeds. The data have been collected in the EU-funded Agri Gen Res Project ‘EURECA’ and analysed qualitatively. Three main types of farmers were identified: 1) production oriented, 2) product and service oriented and 3) hobby

oriented farmers, which differed from each other in particular by their economic orientation towards breeds and their keeping. These main types were further divided into seven subtypes: sustainable farmers, opportunists, multi-users, brand-makers, traditionalists, pragmatists, and new-comers. The results indicate that there is a diversity of farmers who keep local cattle breeds in Europe. This can be considered as strength for the future of local breeds but also as challenge when developing effective and sustainable policy measures for in situ conservation.

Eija Pouta discussed the economic valuation of genetic resources where both use and non-use values should be considered. It has been argued that non-use values may be more important for animal than plant genetic resources. The valuation of genetic resources requires the use of valuation methods designed for estimating non-market benefits typically with the concept of willingness to pay. Practical examples of studies on valuation of farm animal genetic resources were given and results of meta-analysis summarizing the results of 22 previous empirical valuation studies presented.

The two other presentations of this session focused on a quantitative SWOT analysis to identify strategies for the conservation of farm animal breeds and the future of the native and culturally unique Icelandic Cattle. The quantitative SWOT analysis applied in the development of conservation strategies finds factors that will finally drive to the definition and selection of sound conservation strategies. The SWOT approach was developed in the EURECA project. In Iceland, a debate is ongoing on the selection of the most optimal dairy cattle breed for dairy production and if farmers should be allowed to import a foreign commercial dairy breed, which would replace the native breed in farming. Cost reduction analysis of breed preference analysis was presented.

1.4. Conservation policies and practices

“Scientific knowledge and exchange of best practices are needed for developing conservation and preservation programmes.”

Three presentations (one of the original four was cancelled) were given in the session The Conservation policies and practices. The key-note speech was given by Daily Leader of Farmer’s market Aina Bartman from Norway. She talked about the ways in which consumer alliances and direct sales from farmers to consumers can strengthen local breeds and their conservation. She pointed out that local breeds can be efficient in making use of marginal resources and strengthen the economy in rural areas through diverse strategies based on local countryside and culture. Farmer’s Market organizes possibility for local farmers to sell their products directly to the consumers. The consumers meet producers face to face at markets and get the story behind the food they buy.

Two examples of conservation activities were presented: one from Finland and one from Serbia. In Finland, several small- and medium-scale enterprises are interested in branding of the Finish native cattle breeds. The differences in milk processing properties in cheese making and milk’s biochemical composition (e.g. fatty acids in milk) between the native and commercial cattle breeds are investigated to promote the branding and conservation through utilization of native breeds’ genetic resources. In Serbia, wool of endangered sheep breeds is used to weave traditional carpets in the Stara Planina Region in the north-eastern part of Serbia. The weaving tradition, which is important in terms of social development, maintenance of local culture and conservation of sheep genetic resources, has been renewed recently.

1.5. Excursion, 9th of September 2011

An Excursion to visit Icelandic Cattle and Icelandic Horse farms and to explore “Göngur og réttir“ - Roundup of the sheep – was organised. Roundup of the sheep is old Icelandic tradition in sheep husbandry to sort sheep after collection from the common grazing areas in late summer and autumn (mid-September).

2. Assessment of the results and impacts on the future direction of the field

The workshop participants acknowledged the multidisciplinary approaches and studies presented at the workshop. In general, it was considered that the social sciences can add new dimensions to the conservation of genetic resources and it is important to continue the networking and discussions and promote research. It was mentioned that the workshop was a start for further future activities, like joint publications and research and development projects. The workshop supported the capacity-building of institutions and organizations co-ordinating the national gene conservation activities. In addition, a state-of-art scientific knowledge on valuation of genetic resources was disseminated by incorporating social and cultural issues in conservation policy. Furthermore, knowledge on the conservation and sustainable use of animal genetic resources was strengthened by promoting innovations through network of experts with different professions. The participants realized that many countries face similar challenges the in situ conservation. Therefore formal and informal exchange of knowledge and experience is extremely useful. The implementation of approaches of social and cultural sciences in the conservation of farm animal genetic resources is a relatively new multidisciplinary field of research.

However, the workshop participants recognized that scientists and stakeholders from the field of social sciences and that of genetic resources - conservation should know better the basic terminology and approaches applied in these two different fields. This is a prerequisite for the development of multidisciplinary studies while currently there is in many cases a lack of “the same language”. On the other hand, it was felt that this kind of common effort, as this workshop, assist in finding common angles and approaches. The workshop also brought forth that diversity of theories and methodologies are needed for examining socio-economic and cultural values of the farm animals. In addition, a ‘huge’ gap was found between theoretical discussions and the current (not only future) needs in the development and implementation of policies which promote conservation and sustainable utilization of farm animal genetic resources. Several new research topics were suggested, such as method development in valuation of farm animal genetic resources, temporal and spatial variation in human-animal relationships, and analysis of social life in rural areas (particularly among farmers) reflecting the changes in the farming practices. Also possibilities for joint publications and establishment of COST network were discussed. In addition, a workshop was suggested to be held on the topic ‘feral animal populations and their importance in terms of eco-services and gene resource conservation’.

Nordic Genetic Resource Centre (NordGen) will establish an ‘ad hoc’ working group of Nordic experts which will develop suggestions for future activities and research projects on socio-economic and socio-cultural valuation of farm animal breeds and promote networking among stakeholders and scientists from the field of social sciences and that of genetic resources – conservation.

The Workshop abstracts have been published in the Abstract Book edited by Juha Kantanen and Benedicte Lund. The Abstract Book and all presentations are available on the NordGen’s Internet pages:

<http://www.nordgen.org/index.php/en/content/view/full/1563>

Summer School “Animal Breeding Meets Social Sciences“, Vienna, Austria, September 26 - 29, 2011

The ESF-funded Summer School “Animal breeding meets Social Sciences” was hosted by BOKU-University of Natural Resources and Life Sciences, Vienna, Austria and took place from September 26 to 29. A total number of 25 participants from 19 different countries attended the Summer School.

The education level was heterogeneous. Masters students, PhD students, but also (senior) researchers from universities and national research organisations and one staff member from Ministry of Agriculture participated.

The 4-days program was a mixture of different topics in the field of social sciences. On the first day the opening presentation was given by Prof. Sölkner (BOKU-University) to give an input from an animal breeder’s perspective on needed interdisciplinary research and joint activities with social scientist.

The first two days were held by Dr. Ranjitha Puskur (ILRI). On day two she was supported by MSc Frederik Oberthür. These sessions were dedicated to the theories and concepts on innovation

systems and how this approach can be applied in the field of livestock improvement. All participants were asked to actively bring in their expertise from their own work and lively discussions were held.

The third day was held by Dr. Adam Drucker (Bioversity). He gave an overview on economic approaches how livestock genetic resources can be evaluated. He presented new, unconventional ways of involving farmers in developing countries to participate in in-situ conservation strategies.

The fourth day was facilitated by Dr. Frank Hartwich (UNIDO) and he gave an introduction to Social Network theory. After a theoretical introduction into the topic, participants got the chance to get a first insight in the software package Visualizer and test their new knowledge with a dataset. Actors in the network of animal breeding were identified and possible links and interactions were identified.

The course was combining different didactic concepts such as presentations, group work, reflections, plenary discussions and exercises on the computer.

Dr. Ranjitha Puskur of the International Livestock Research Institute, Addis Abeba, Ethiopia, was chairing the first two days of the summer school. Her first session was entitled: Perspectives on Knowledge, Technology and Development – Insights from Science, Technology and Society Studies and Theories of Knowledge. The starting point was the creation of knowledge. The production of knowledge was discussed. In group discussion changes in knowledge production have been assessed. These changes ranged from new, faster ways of communication roots in the development of internet and new media to the paradigm shifts the research process has undergone in the last decades. The sheer amount of information researchers have to deal with and the resulting large differences in knowledge quality were

explained. The context specificity of knowledge was elaborated.

Furthermore the participants were introduced to the concepts of tacit and explicit knowledge; knowledge as intellectual property; mode-1 and mode-2 knowledge; differences between cross-, trans-, multi- and interdisciplinary knowledge-flow and how theory and practice of knowledge creation are interconnected. From this first introduction the course moved to Knowledge and Innovation. After the introduction of the importance of innovation the terminology was defined, triggers of innovation were discussed; actors and innovation capacity were debated. Dr. Puskur introduced the Integrated Agricultural Research for Development (IAR4D) approach to the participants. Frameworks and limitations of this currently evolving approach were discussed and this session closed with the major challenges encountered in practice.

The second session dealt with “Innovation Systems”. The term was defined, key elements and actors shown and the possibility to answer research questions using an innovation systems approach was discussed. The next unit on “Value chains in the livestock sector” introduced the participants to an alternative way of seeing one field of research in a broader context. Again a definition of terms was followed by a description of important factors. In examples market chain actors and links, enabling environment and value chain mapping was illustrated. Gender was introduced as an aspect not to be ignored for the use of value chains to answer research questions.

In group work participants developed case studies which were used for group exercises during the rest of Dr. Puskur’s sessions. The exercises were helpful in applying newly acquired knowledge to examples from the participants’ experiences. In plenary discussions results of all groups were presented. The following interesting discussions sparked,

in many cases, more informal discussions during the whole week.

The next session entitled “Analyzing Innovation Systems” supplied the participants with information on tools and approaches to analyze their research projects following an innovation systems approach. The 4 element approach (actors and their roles; attitudes and practices, patterns of interaction, enabling environment) developed by the World Bank was discussed. Positive Deviance was introduced as a useful tool. Institutions and policies were also one of the topics as were frameworks for analysis and mediation. Definitions and processes were discussed for: Institutional Analysis and Development (IAD) framework, RAPID framework, Policy Systems Analysis and Mediation (PSAM) and communication for policy influence. An emphasis was put on the importance of communication for a thorough analysis. On the second summer school day Participants were invited to brainstorm on how they would do things differently if their research used an innovation systems perspective in combination with a value chain framework? The application of Innovation Systems Perspective in the design of agricultural research for development was also covered. The session dealt with social change, institutional learning and change, impact pathways analysis and logframe and outcome mapping. As far as useful tools are concerned information was given on action research, appreciative enquiry and Participatory Impact Pathway Analysis (PIPA) Complementary to Dr. Puskur’s sessions was the session held by Frederik Oberthür, PhD student at the University of Vienna, on this second summer school day. During his session: “Ways of knowing” he acquainted the participants with “Actor-network-theory” (ANT). He gave an introduction on theory in general and on social theory more specifically and additionally on theories of technology. The concept of ANT was introduced, and its

historical background and components explained. Among these components were: agency of „nonhumans, tracing the social and black boxing. In group exercises the new knowledge was applied by small groups to examples from their own experience.

On the third summer school day Dr. Adam Drucker of Bioersity International gave a session on “Economics and policy of Animal Genetic Resources Conservation and Sustainable use”.

After a quick introduction of his organisation’s mission and objectives the participants were introduced to economics. Basic concepts were explained. The Total Economic Value with its components was discussed. The importance of the development of methods and decision support tools for the analysis of Animal Genetic Resources (AnGR) was raised. Constraints to an economic analysis of AnGR were explained (methodology, data availability, non- market values, required use of rural appraisal techniques). A number of case studies were given and to illustrate methods, tools, problems and findings. The Payment for Agrobiodiversity Conservation Services (PACS) and necessary steps were discussed. It was elaborated in which different ways agro-biodiversity conservation could be achieved. In group works the participants developed projects for the conservation of an endangered breed chosen by each working group. 4 projects were presented which tried to take all necessary components for a sustainable conservation program into account. The session closed with a group discussion of the challenges ahead.

The closing day of the summer school was chaired by Frank Hartwich from UNIDO. He conducted an introductory course on Social Network Analysis (SNA). Starting with the roots and historical background the lecture moved to the explanation of different networks and their components and the possible application of SNA.

Different types of interaction, network effects, the importance of networks for learning and innovation processes, and the applications for the livestock sector were discussed. In exercises the data format and analysis methods were presented. Furthermore the participants were introduced to analysis itself: different measures were presented (e.g. centrality, degree, distance...). After the theoretical introduction, a SNA software (“Visulyzer”) was presented and tested in exercises.

Assessment of the results and impact of the event on the future direction of the field.

The course offered students and researchers in the area of animal breeding the opportunity to get an insight in a completely different discipline. Courses of Social sciences are usually not, or only to a minimum included in the curricula of Animal Sciences. Participants learned that livestock production is embedded in a larger production system and therefore other aspects have to be taken into consideration when interventions to improve livestock production have to be taken into account.

One immediate result is that participants got familiar with new concepts and theories. As the course not only presented theories, but also gave everybody the chance to directly use and “translate” the information for their own situation, the participants could relate to their current work. These exercises stimulated the self-reflection process for each person. Current concepts and approaches were critically analysed and possible deficits were identified.

In the long run, researchers are sensitized that the successful implementation of livestock improvement programs can only be achieved by involving many disciplines, but also various stakeholders from different sectors. This can lead to new designs of research and/or development projects.

Another positive effect of the course is that new networks and contacts were

established and this might lead to new research projects in the future. One participant already used the opportunity to link up with BOKU-University and to get accepted as a PhD student. Different informal discussions were held how further collaboration could be ensured.

Recommended Bibliography

1. FAO (2011) Molecular genetic characterization of animal genetic resources. FAO Animal Production and Health Guidelines. No. 9. Rome (contributed in collaboration with P. Ajmone Marsan and P. Boettcher): this text was prepared during the meetings of the GlobalDiv project www.globaldiv.eu and has now been published including guidelines and recommendations for studying the genetic diversity of livestock species
2. Hall, S.J.J., Lenstra, J.A., Deeming, D.C and the European Cattle Genetic Diversity Consortium (2011). Prioritization based on neutral genetic diversity may fail to conserve important characteristics in cattle breeds. *J. Anim. Breeding Genet.*, in press., contributing to a most fundamental discussion
3. Cortes O, Tupac-Yupanqui I, Dunner S, Fernández J, Cañón J. (2011) Y chromosome genetic diversity in the Lidia bovine breed: a highly fragmented population. *J Anim Breed Genet.* 128, 491-6.; a follow up on the comprehensive account Y-chromosomal diversity of European cattle (Edwards et al., 2011, see the previous newsletter), which shows that the diversity of paternal lineages in the Iberian Peninsula is also reflected in

the Y-chromosomal haplotypes observed in the various separately bred subpopulations ('castas') of the Lidia (fighting) cattle with the Y1 haplogroup, typical for northern European bulls, predominant in 6 out of 33 castas.

4. Murray C, Huerta-Sanchez E, Casey F, Bradley DG (2010) *Philos Trans R Soc Lond B Biol Sci.* 365, 2531-9. Cattle demographic history modelled from autosomal sequence variation; showing the feasibility of sophisticated historic reconstructions.
 5. Marleen Felius, Peter A. Koolmees, Bert Theunissen, European Cattle Genetic Diversity Consortium and Johannes A. Lenstra (<http://www.mdpi.com/1424-2818/3/4/660/>); a collaborative landmark study on previous and new classifications of cattle breeds.
 6. D'Andrea, M., Pariset, L. Matassino, D., Valentini, A., Lenstra, J.A., Maiorano, G., Pilla, F. (2011). Genetic characterization and structure of the Italian Podolian cattle breed and its relationship with some major European breeds. *Ital. J. Anim. Sci.* 10, e54; on one of the most genetically diverse European cattle breed
 7. Withen, K.B., Gravlund, P., Pedersen, B.V., European Cattle Genetic Diversity Consortium & Bruniche-Olsen, A. (2011) The Agersoe Cattle: The Last Remnants of the Danish Island Cattle (*Bos taurus*)? *J. Anim. Breeding Genet.*, 128,141-152.
 8. Mohamad, K., Olsson, M., Andersson, G., Purwantara, B., Van Tol, H.T.A., Rodríguez-Martínez, H., Colenbrander, B. & Lenstra, J.A. (2011) The origin of Indonesian cattle and conservation genetics of the Bali cattle breed. *Reprod. Dom. Anim.* 47 (suppl, 1), in press; on the unique species origin of Indonesian cattle
 9. Van de Goor, L.H.P., Van Haeringen, W.A. and Lenstra, J.A. (2011) Population studies of 17 equine STR for forensic and phylogenetic analysis. *Anim. Genet.*, in press. This study shows the extreme inbreeding of the Friesian horse breed, the breed of the month in GlobalDiv 18th newsletter 'Dark future for black horse?' – www.globaldiv.eu
 10. Li M-H, Stranden I, Tiirikka T, Sevón-Aimonen M-L & Kantanen J - A Comparison of Approaches to Estimate the Inbreeding Coefficient and Pairwise Relatedness Using Genomic and Pedigree Data in a Sheep Population" by was recently published in PLoS ONE and is available online at <http://dx.plos.org/10.1371/journal.pone.0026256>
 11. Johan T. du Toit. Coexisting with Cattle -*Science* 23 September 2011: 1710-1711.
 12. Wilfred O. Odadi, Moses K. Karachi, Shaukat A. Abdulrazak and Truman P. - Young. African Wild Ungulates Compete with or Facilitate Cattle Depending on Season -*Science* 23 September 2011: 1753-1755.[DOI:10
 13. Paul J. Boettcher and Irene Hoffmann - Protecting Indigenous Livestock Diversity - *Science* 25 November 2011: 1058.
-

Funding

ESF Research Networking Programmes are principally funded by the Foundation's Member Organisations on an *à la carte* basis. **GENOMIC-RESOURCES** is supported by:

- Fonds zur Förderung der wissenschaftlichen Forschung (FWF), FWF Austrian Science Fund, Austria
- Fonds National de la Recherche Scientifique (FNRS), Belgium
- Fonds voor Wetenschappelijk Onderzoek - Vlaanderen (FWO), The Research Foundation - Flanders, Belgium
- Nacionalna zaklada za znanost, visoko školstvo i tehnologijski razvoj Republike Hrvatske, National Science Foundation for Science, Higher Education and Technological Development, Republic of Croatia
- Suomen Akatemia, Biotieteiden ja ympäristön tutkimuksen toimikunta, Academy of Finland, Research Council for Biosciences and Environment, Finland
- Deutsche Forschungsgemeinschaft (DFG), German Research Foundation, Germany
- Nederlandse Organisatie voor Wetenschappelijk Onderzoek (NWO), The Netherlands Organisation for Scientific Research, The Netherlands
- Norges Forskningsråd, The Research Council of Norway, Norway
- Forskningsrådet för miljö, areella näringar och samhällsbyggande, Swedish Council for Environment, Agricultural Sciences and Spatial Planning (FORMAS), Sweden
- Schweizerischer Nationalfonds (SNF), Swiss National Science Foundation, Switzerland
- Biotechnology and Biological Sciences Research Council (BBSRC), United Kingdom

GENOMIC-RESOURCES Steering Committee

Dr Stéphane Joost (Chair) Ecole Polytechnique Fédérale de Lausanne, Switzerland – Dr Göran Andersson, University of Uppsala, Sweden – Prof Philippe Baret Université Catholique de Louvain, Belgium – Prof Michael W. Bruford, Cardiff University, United Kingdom – Prof Nadine Buys, Katholieke Universiteit Leuven, Belgium – Prof Ino Curik, University of Zagreb, Croatia – Dr Juha Kantanen MTT Agrifood Research Finland, Finland – Dr Johannes A. Lenstra, University of Utrecht, The Netherlands – Prof Theo Meuwissen, Norwegian University of Life Sciences, Norway – Prof Jutta Roosen, Technische Universität München, Germany – Prof Johann Sölkner, University of Natural Resources and Applied Life Sciences, Austria

Advisory Expert: Prof Paolo Ajmone Marsan, Università Cattolica del Sacro Cuore, Italy

Project coordination : Elena Murelli

ESF Liaison : Dr. Kirsten Steinhausen, Science | Ellen Degott, Administration

The European Science Foundation (ESF) provides a platform for its Member Organisations to advance science and explore new directions for research at the European level.

Established in 1974 as an independent non-governmental organisation, the ESF currently serves 79 Member Organisations across 30 countries.



1 quai Lezay-Marnésia • BP 90015
67080 Strasbourg cedex • France
Tel: +33 (0)3 88 76 71 00 • Fax: +33 (0)3 88 37 05 32
www.esf.org