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THE EVOLUTIVE PROCESS OF EUROPEAN AGRICULTURAL RESEARCH POLICIES AND KEY STRATEGIES FOR DEVELOPMENT

JEL classification: I23, O32, O38

Francesco Zecca*

Abstract. *The world is changing quickly and dramatically, bringing a range of challenges to European agriculture, including climate change, impact on the environment, pressures on natural resources, increasing competition and demographic changes. Therefore, Agricultural research (AR) is being asked to address issues that are both multi- and interdisciplinary: convergence of knowledge from different disciplines is important to achieve a better understanding of these complex and interlinked problems.*

The aim of this paper is to analyse the framework of European Agricultural Research activities (mechanisms, policies, strategies) and to reflect on how to further implement the Lisbon key concept of making EU the most dynamic and competitive knowledge based economy in the world. In this knowledge based economy, research and scientific innovation will be

the drivers for human wellness and health and, therefore, research within agribusiness sector and nutrition will have an increasing role in this strategy.

The remarks in the first section of the paper are the starting point for the analysis in the following sections and intend to summarize the present literature at European Community level.

The statements expressed are compared with the current framework of agricultural research and supported by the investigation on the evolutionary process.

On the basis of these premises, the present paper could be considered as a first contribution to the debate that could be developed at national and local level on themes related to the objectives of improving the European Agricultural Research System.

Keywords: *agriculture, research, policies*

1. European agricultural research: definition and scope

A general consensus exists at international level on what agricultural research (AR) encompasses, even if some stakeholders may put different emphasis on different components.

Agricultural research is a key element of the “Agricultural Knowledge System”, together with Education and Innovation to create the “Knowledge Triangle”¹ in the area of agriculture and related fields.

Clearly, AR is multi-dimensional in addressing all the agricultural challenges.

The agricultural domain includes:

- crop production and animal husbandry;

* University of Perugia

¹ The Conference on “The Knowledge Triangle: shaping the future of Europe” held in Goteborg on 31 August-2 September 2009, focused on the importance of a well functioning knowledge triangle (education, research, innovation) for Europe in a situation where the European Union (EU) Research and Education system is perceived as fragmented, and called for intensified interaction between policy areas, notably for higher education, research and innovation.

- agro-forestry;
- fisheries and aquaculture;
- agribusiness and related enterprises;
- animal and human health related issues;
- sustainable management of natural resources
- socio-cultural impact
- bio-diversity

AR aims to provide innovation on technological and socio-economic issues to contribute to a sustainable development.

AR is intrinsically:

- fundamental & applied – dealing with upstream and problem- solving research;
- comprehensive – dealing potentially with research objectives in any field and at any relevant scale, thus encompassing a wide range of scientific disciplines (from molecular biology or genetics to agro-ecosystem management, economics of international trade, political science or modelling of complexity);
- multi-stakeholder – because the people concerned are many and face a variety of specific and often little-known situations, thus requiring iterative and inter-active loops of participatory diagnosis to research product processes that include all players and activities of the local innovation systems;
- global – as similar problems are widely shared among countries and as local interactions with world problems result from globalizations
- multiple policy-oriented – because it contributes to various and different policies: research policies, international relation and trade, development cooperation policies, rural and agricultural policies, health policy, to mention the most important ones for AR.

For the EU, as said, AR intervention area is part of Knowledge-Based Bio-Economy (KBBE) as it is tightly related to all the European challenges and priorities addressed and the relevant exploitation of biological resources in agri -business activities.

2. The European agricultural research: players, mechanisms and policies

2.1. Agricultural research mechanisms and players

There are many important players influencing and animating agriculture research at European level.

The main players and mechanisms have been identified in the following Table 1:

Tab. 1 - Planning procedures and players in agricultural research

| Level | EAR for EU | EAR for Developing Countries |
|--|--|---|
| National level | | |
| Players | Min. Health, Min. Agric. Nat. research institutes. | Min. Health, Min. Agric., Min. Foreign Affairs; |
| Planning procedure | Inter-ministerial processes; National Agricultural Research Organisations and Universities | Inter-ministerial processes; National Agricultural research Organisations and Universities |
| National-to-European and vice-versa | | |
| Players | Min. Sc.; Min Agric.; and National delegations to FP7 Programme Committee | National delegations to FP7 Programme Committee; EIARD; ERA-ARD; ECARTEEIG; NATURA |
| Planning Procedure | National coordination mechanisms for input in the European programmes | Meetings and reports |
| European level | | |
| Players | DG-Res.; DG-Agric.; EP; MS; SCAR; European Research Council; European Science Foundation; | DG-Res.; DG-Dev.; DG-AidCo; EP; MS; GFAR and its regional fora; Global Donor Platform; |
| Planning Procedure | Programme Committee FP7; consultations;conferences; Technology Platforms;European calls. | Programme Committee FP7; consultations, conferences; FSTP; EDF10 |
| Source: FP 7 2007 – 2013 - Seventh Framework Programme on R&D, European Commission | | |

The high number of actors and procedures involved affects the process of setting up and implementing the European Agricultural Research System.

While the number of actors involved creates a critical mass and ensures representation of each public institution, an effective involvement of farmers, agro-industries and consumers is not equally guaranteed. Their involvement is critical in the research process for testing upcoming innovations

Furthermore, contrasts often emerge in identifying research issues as players influence the process in terms of the different research priorities supported.

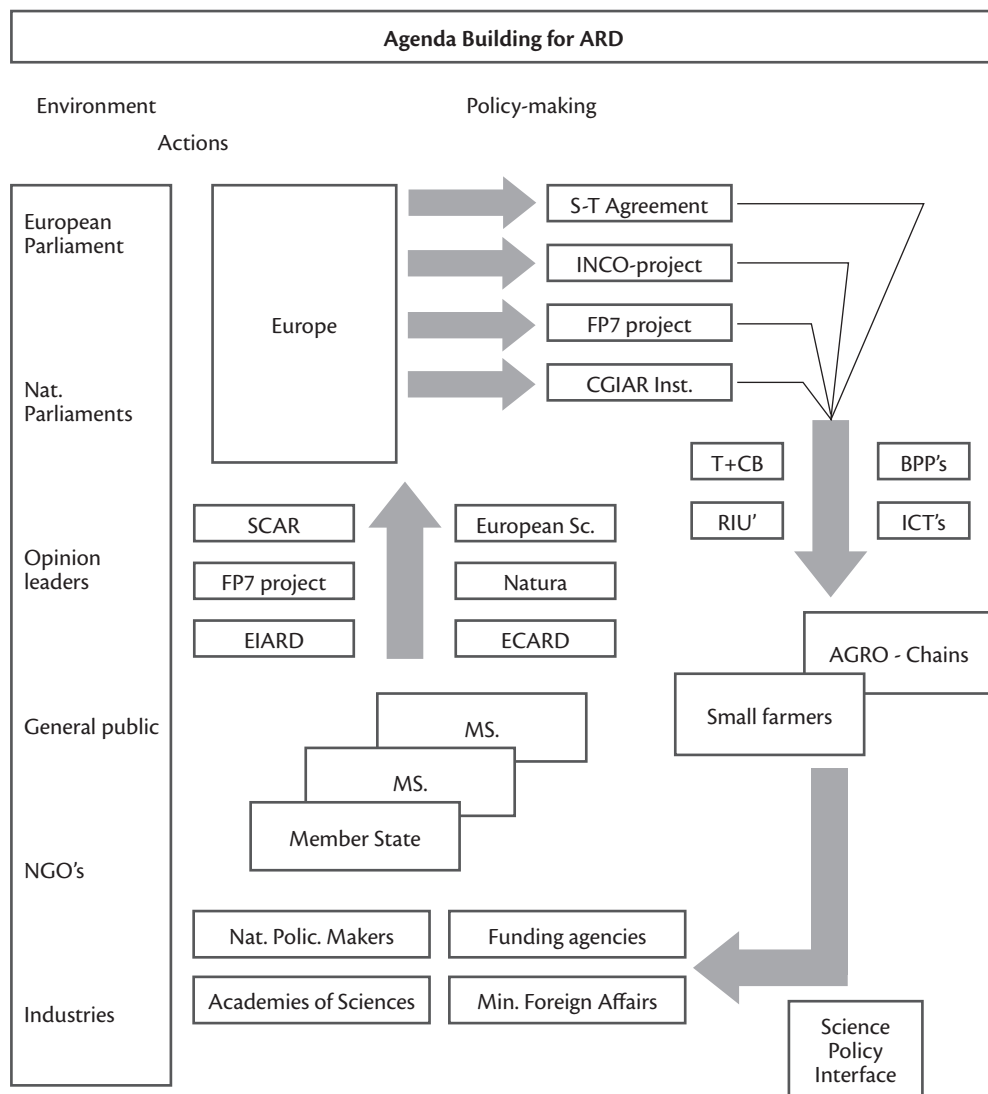
A further consideration in the operation of European agricultural research can be made with regard to transaction costs and knowledge-cycle time.

Concerning the first point, the presence of numerous players has a negative impact on transaction costs along the supply chain of research.

The period of knowledge cycle from a research agenda to a revised research agenda is very long and for this reason it is impossible to respond quickly to the new research questions as they arise.

The following figure describes how the several actors indicated interact:

Fig. 1 - Agricultural research actors interacting



Source: European Commission, *Towards a coherent strategy for a European Agricultural Research Agenda*, 2008

Analysis of the previous figures shows how the main barriers which delay the European Agricultural Research mechanism arise from several different sources:

- the very high number of subjects dealing with research and innovation;
- the high risk of gaps and overlaps in research programmes and projects;
- research programmes often not linked to real needs;
- researchers and extension services acting in different "environments";

and using different technical languages;

- a lack of structures or pathways to bridge the gap between them;
- no common rationale for data bases of research institutions;
- no transparency in the agenda-building process nor full participation of stakeholders in it.

Concerning the last critical point, a very large number of players are involved in the agenda-setting process, especially in the early phases. It is then very difficult to understand these processes and to know how to effectively participate. In the report on the public consultation on the Green paper (EC, 2008), this problem has been recognised and the reduction to a very limited number of persons has been suggested (high level officials of EU, Ministers of Agriculture, etc.). However, it seems difficult to put this into operation.

2.2. Agricultural research policies

At policy level, the overarching “barrier” is that European AR has different policy objectives or at least different policy priorities.

The different policy objectives depend on the following two types of motivation for research:

- science or **research** policy tends to see innovation as a linear process from basic research to commercial application;
- **development** policy focuses on interaction between different **stakeholders** in the process.

The different approach to research policies is reflected in the programmes and priorities implemented by the European Union. The policies based on the combination of science / research are associated with programmes such Horizon 2020, FP7 and Joint Programming Initiatives.

The policies based on the stakeholder approach are the Common Agricultural Policy(CAP), the Leader programme, the European Technology Platforms.

The lack of integration between those who conceive innovation and those who will gain benefits from the same innovation is quite evident. The big change in the upcoming new programming period is the aim to fill this gap.

The European Commission(EC) has developed the Europe 2020 strategy that states as its objective the creation of an smart, sustainable and inclusive EU economy.

In this policy frame, Horizon 2020 will be the new financing programme for research and development innovation projects and will replace in 2013 the 7FP. The linkage between stakeholder and research environment is enhanced in the legal proposal of the Commission for the upcoming Common Agricultural Policy: it recognises the importance of research in addressing the challenges faced by European farmers and the central role of the Agricultural Knowledge System. Amongst other measures, the EC proposal to reinforce the link between research and practical farming is the creation of an European Innovation Partnership(EIP) for agricultural productivity and sustainability. The EIP is supposed to be the new instrument to facilitate the flow of information between research and practice.

Nowadays, the difficulties faced deal with the various obstacles to the implementation of the agricultural research agenda at all institutional levels.

The insufficient coordination between ministries in charge of national policies and programmes related to AR, the freedom and inherent dynamics within European AR institutions to set up their own research agenda, the significantly different AR priorities (see Tab.1) and the different funding mechanisms for AR are all reflected at the national level.

The insufficient coordination between EC DGs in charge of EU policies and programmes related to AR, the insufficient coordination between coordination mechanisms of European policies and programmes related to AR, the weak communication about commonalities at policy level (EP, European Council), the difficulties in building partnerships between scientists in AR for European agriculture to access EC funds in particular FP7, due to the complexity of the procedures are reflected at the European level (see Tab.2). All this often cause “independent planning”.

Tab. 2 - Thematic priorities for EU-14²

| | BG | HR | CY | CZ | EE | HU | LV | LT | MT | PL | RO | SK | SL | TR |
|--|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Plant breeding and biotechnology | * | | | * | | | | | | * | | * | * | |
| Crop production and protection | * | | * | | * | * | | | | * | | | | |
| Forestry, forest resources | | | * | * | | * | * | | | * | | * | * | |
| Biodiversity | | * | | * | | * | | | * | * | * | * | * | |
| Animal resources and breeding | * | * | * | * | | * | | | | * | | * | * | |
| Animal production incl.fish | | | | * | | * | * | | | | | * | * | * |
| Animal health and welfare | | | | * | | * | | | | * | | | | |
| Agro Food biotechnology | | * | | | | * | | | | * | * | * | | |
| Natural resources, Environment | | * | * | * | * | * | * | * | | * | * | * | * | |
| Alternative use of agricultural production | | | * | * | * | * | | * | | * | * | * | * | |
| Agricultural technology | | | | * | | * | | | | * | | * | | |
| Food technology | | * | | * | * | * | | * | | * | | * | | |
| Healthy nutrition | | * | | * | * | * | | | | * | * | | | |
| Organic agriculture | * | * | | * | * | * | * | | | * | * | * | * | * |
| Rural development | * | * | | * | * | | * | * | | * | | * | | |

Source: EU AGRI-MAPPING Sixth Framework Programme 2000 – 2006

Regarding the monitoring and evaluation of agricultural research, the following main barriers have been identified:

- criteria used to evaluate scientists as well as national and European AR programmes and projects are not the same: from one case to another they give greater emphasis to “scientific excellence” or to “development relevance”;
- lack of accepted common methodologies for monitoring and evaluation of the outcome of AR.

² EU-14= New EU member States since 2004 and 2007 plus Turkey and Croatia (candidate States)

Overall, research projects do not fully meet the requirements corresponding with the EC definition (EC, 2004):

- a project is a series of activities aimed at bringing about clearly specified objectives within a defined time period and with a defined budget.
- a project should also have:
 - Clearly identified stakeholders, including the primary target group and the final beneficiaries;
 - Clearly defined coordination, management and financing arrangements;
 - A monitoring and evaluation system (to support performance management);
 - An appropriate level of financial and economic analysis, which indicates that the project's benefits will exceed its costs.

Tab. 3 - Obstacles to the support of an agricultural research system for EU Countries

| Country | Sources of public funding | Obstacles |
|-------------|---|---|
| France | Agencies, Ministries, Regional governments | Logic of tenders limits the innovation abilities of the team |
| Finland | Centre of expertise programme, Regional centre programme | Authorities have difficulty in accepting innovative initiatives |
| Italy | Agencies, Ministries, Regional governments | Quality of project implementation is weak |
| Netherlands | Ministry of Agriculture, separate budget for research and applied research. | Institutional barriers such as financial coordination of public funding |
| Germany | Ministries, Regional governments | Budgetary constraints, insufficient investment in capacity building |
| Latvia | National and EU programmes | Fragmentation in programmes. Lack of coordination |

Source: based on Proost M.D.C, Brunori G., Bourdin D., Knickel K.,2008;

Agricultural research projects are involved in a broad area of work represented by programmes defining as a package projects with a common focus or platform or set of priorities for the formulation, funding and implementation of projects.

3. The evolution of European agricultural research

In 2006 SCAR³ (Steering Committee on Agricultural Research) recommended foresight methods and processes in identifying the long-term research priorities.

As a result, the European Commission established a Foresight Expert Group (FEG). The major task of the expert group was to review the available foresight studies relating to the eight “major driving forces”, which were to be considered together in the formulation of four scenarios of the evolution of the agro-food system.

The analysis of these major driving forces and their possible interactions led to the identifica-

³ The Standing Committee on Agricultural Research (SCAR) was established by Regulation (EEC)No.1728/74 of the Council of 27 June 1974 on the coordination of agricultural research, to advise the Commission, especially DG Agriculture. At the end of 2004 SCAR was transferred to DG Research and took on a major role in coordinating agricultural and food research in Europe.

tion of four future scenarios (Climate shock, Energy crisis, Food crisis, Cooperation with nature) summarised in a paper presented at the EU conference Towards Future Challenges of Agriculture Research in Europe in June 2007.

The SCAR Foresight Experts Group considered that a major hurdle in making the transition to a knowledge-based bio-economy was the growing challenge of knowledge failures and the fact that European agricultural research is currently not delivering the type of knowledge needed by end-users in rural communities. New systems of education and knowledge diffusion are needed considering the implications for education of the shift from engineering, physical and mechanical sciences to “converging technologies” (nano, info, bio, etc.). Related to these needs, knowledge exchange strategies and policies already set up in some EU member states need to be formalised and to acquire a higher profile at the EU level and good practice ought to be shared with other member states.

The overview of emerging global trends, policy developments, challenges and prospects for European agri-futures, indicate the need of a new strategic framework for research planning and delivery articulated in four broad lines of action and a fifth cross-cutting theme:

- the sustainability challenge: facing climate change in the knowledge-based bio-society;
- the security challenge: safeguarding European food, rural, energy, biodiversity and agri futures;
- the knowledge challenge: user-oriented knowledge development and exchange strategies;
- the competitiveness challenge: positioning Europe in agri-food and other agri lead markets;
- the cross-cutting theme: policy and institutional challenges facing policy-makers in synchronising multi-level policies.

The SCAR Foresight Experts Group formulated a list of recommendations as follows:

1. The emerging trends highlight the need for coordinated EU, national and regional policy responses to a range of challenges, affecting the world rural agri-economy, as a result of the growing inter-related impacts of climate change, environment, energy and food supply concerns and the shift to a knowledge-based bio-society.

The predominant effects of climate change and the potentially high impact of climate instability on agriculture and the biosphere, will continue to challenge the balance of basic agricultural functions in specific regions, exacerbating, in some cases, regional differences. Multilevel European actions, addressing agriculture and rural development challenges thus need to reflect a coherent, mutually reinforcing and yet flexible approach, tailored to the realities faced in different European regions.

2. The complex, dynamic inter-connection and challenges will entail re-designing the institutional framework for research and putting in place a two-track approach for agri-futures research: a transition research agenda combined with a more long-term high-tech research agenda.
3. To raise the capacity of rural regions to generate, absorb and integrate research developments into economic growth, a regionally-focused, demand-driven approach to research and innovation needs to be developed.
4. For rural communities a temporary protectionist strategy (based on the WTO treaty) will be necessary. Taking into account the results of the foresight studies, there is a clear concern about the way Europe sustains its Agricultural Knowledge System. In particular the Education and Innovation pillars of this system need to be urgently re-thought and improved.

The result of the whole foresight process undertaken by SCAR provided inputs to a report on the coordination of agricultural research in Europe named “Towards a coherent strategy for a

European Research Agenda” that the Commission transmitted to the European Parliament and the Council in 2008.

On this basis, the SCAR launched the second foresight exercise which would provide assessment and alerts on critical developments of agricultural research in the long term.

The 2° foresight panel concluded that the organisation of knowledge, science and technology in the EU was still inadequate to deal with the challenges identified in an integrated way. Insufficient and incomplete documentation exists about the structure, the functions and the relevance of the Agricultural Knowledge System at all levels. Existing documents are related to a relatively few number of European Countries and are incomplete (EC, 2009).

At international level two major drivers are leading the evolution of Agricultural Research:

- the increasing importance of global research issues;
- the increasing importance of research domains for which the distinction between North and South is no longer scientifically valid.

Concerning infrastructures, for AR these are similar in many agricultural research domains, from genomics to GIS (Geographical Information Systems). The research, moreover, is necessary to sustain and develop the Education pillar of the Agricultural Knowledge System.

Different initiatives have been launched on this issue since the beginning of the new millennium: within the 7th Framework Programme (2007-2013), the Commission funds different activities for existing research infrastructures (Support to Transnational Access, European research e-infrastructure, Integrating Activities) and for new research infrastructures (Support to the construction of new infrastructures, Support to design studies).

For new research infrastructures, the approach of the EU Commission is more targeted thanks to the publication of the ESFRI (European Strategy on Research Infrastructures) Roadmap in 2006. This roadmap presents 35 infrastructure projects corresponding to the identified needs for research infrastructures of pan-European interest in all fields of science and technology. However, as agriculture was not included, the EC has been stimulated to identify the future needs of agricultural research and design new models of governance in order to enable the agricultural sector to share efficiently the European infrastructures.

4. Concluding comments

The results of the foresight studies offer an interesting potential for the entire European agricultural research area which imply, inter alia:

- reinforcing fundamental and applied research;
- moving towards the concept of “third generation universities” based on networking and distance learning
- developing multi-scale, interdisciplinary and cross-sectoral approaches to tackle the increasing complexity of European and global challenges;
- working actively with civil society, farmers’ organizations, scientific associations and governments for increased understanding of the implications of global change and to develop shared pathways for mitigation and adaptation;
- balancing research strategies with open knowledge-sharing strategies and innovation (in the sense of bringing research to end-users and into the market).

As a starting point, assuming that decentralised are better than centralised systems in adaptation to change, it is essential to carry out an assessment of the different systems of agricultural research and to identify and modify the locations where centralised decision-making generates rigidity in research and policy-making.

It is also recognised that decentralised adaptation is enhanced by a high-performance information system to support decision-makers with the best data and to enable the construction of new information systems which can really meet the demand of all the stakeholders.

A wide set of data information is crucial in facing the emergence of “one world” research issues, focused on solving issues of common interest for the global community. Economic development and research questions will reach a higher level of integration in the global priorities.

The European Union can play a unique and leading role thanks to its geographical position and succeed in balancing the different agricultural priorities emerging at global level. This also through a strong education and training system.

The evolution of the agricultural research framework, in particular the emergence of the global issues and stronger continental and national capacities, especially in the emerging economy countries (Brazil, India, China, South Africa), requires an even more comprehensive and coordinated approach of European support to international agricultural research at global, continental and southern levels, for the benefit and interest of Europe.

To deal effectively with the emerging global challenges it is important to maintain responsive research systems capable of tackling the complex research questions.

The European Agricultural Research world should promote the common concept of “Global Agricultural Knowledge System” at policy, programme and project levels. In particular, it should encourage an innovation system approach that involves the different public and private actors in the programming, implementation, monitoring and evaluation of agricultural research.

At the same time, the concept of Technology Platforms, which has already been developed for European agricultural research, could also inspire Agriculture Research at international level to play an integrated alert function: moving towards the concept of “third generation universities” based on networking and distance learning could achieve the purpose.

Concerning coordination at policy and programme levels, the need is evident for a policy framework for international science and technology cooperation, in general, and for international Agricultural Research, in particular, to foster and facilitate coherent international agricultural research activities that will benefit the globalised world.

A first step could be that better development cooperation will not suffice to enable the developing countries to reach the MDGs (Millennium Development Goals) and that there is a need for an effective improvement in the coherence of developed countries’ aid and non-aid policies. A second step should be the ongoing reflection on the “Joint Programming” at EU level where the agricultural research area could be selected as one of the few research area priorities.

Science and technology agreements between the Community and third countries also provide a useful framework for international R&T cooperation.

In this sense the Communications on “International science and technology” and on “Towards a coherent strategy for a European Agricultural Research Agenda” and more recently, the paper on the agricultural knowledge and innovation system (EU SCAR, 2012), could provide the policy framework for enlarging the vision of International Agricultural Research.

There is a need to coordinate better and therefore to build coordination interfaces between agricultural and research policies, on the one hand, and external policies, in particular the development and the neighbourhood policies, on the other, at Member State and EC levels. It should

be underlined that this need for policy coherence at EC and Member State levels is not specific to agricultural research but applies to all research sectors (health, environment, energy, ...).

The creation of a permanent inter-service group between the different DGs on agricultural research should be considered.

Member States should consider creating a national coordination body on international agricultural research that would bring together all the different ministries and research institutions involved in agricultural research.

Europe should be more proactive in contributing to defining the global agricultural research agenda in multilateral fora; (FAO, World Bank, UNESCO, OECD, G20, African Union, ASEAN, MERCOSUR) and with the global agricultural research system (GFAR and CGIAR). In that respect, Europe must speak more with one voice, emphasising a small number of high priority global research themes.

Increasing importance should be given to the research infrastructure issue at European level in order to achieve economies of scale and greater efficiency. Increased sharing of European research infrastructures in Member States where this is not fully the case, would foster closer collaborations.

In relation to research infrastructures, Europe should support agricultural research and education platforms in Europe and in partner countries on international agricultural research that would be open to European scientists and students.

There is a need for a better flow of and easy access to information on the different European policies, programmes, funding instruments and opportunities and activities related to agricultural research.

The evaluation of agricultural research at individual, programme and project levels should be improved in order better to balance “scientific excellence” and “research relevance”. This is a key issue but also a very complex one involving:

- increased coherence of national policies on AR;
- support to the establishment of Research-Policy interfaces;
- including the actors in the food chain and civil society in the AR agenda setting process;
- including workers in the food chain and the civil society in the science and technology agenda-setting process;
- the link between research and education should be strengthened;
- Technology Platforms should deal not only with European-centred challenges but also with global challenges;
- the results of scientific research should be better used; this use should be facilitated;
- research-into-use facilities, and knowledge platforms are necessary;
- changes in European policies towards collaborative funding arrangements and cooperation Mechanisms.

In this sense Europe 2020 represents a strategy with potentialities more inclusive than in the past because it is based on a broader and more inclusive conception of the innovation term.

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GLOSSARY

Fig.1

EAR = European Agricultural Research

EU = European Union

Sc. = Sciences

Agric. = Agriculture

Min. = Ministry

FP. = Framework Programme

EIARD = European Initiative for Agricultural Research for Development

ERA- ARD = European Research Area – Agricultural Research for Development

ECARTEEIG = European Consortium for Agricultural Research in the Tropics European Economic Interest Grouping

DG = Directorate General

MS = Member States

SCAR = Steering Committee on Agricultural Research

GFAR = Global Forum on Agricultural Research

EP = European Parliament

FSTP = Food Security Thematic Programme

EDF = European Development Fund

Fig.2

Nat. = National

NGO = Non Governmental Organisation

ST = Science Technologies

INCO = International Cooperation

CGIAR = Consultative Group on International Agricultural Research

EIARD = European Initiative for Agricultural Research for Development

ECARD = European Commission support to Agricultural Research for Development

Sc. = Scientist

SCAR = Steering Committee on Agricultural Research

FP. = Framework Programme

T+CB = Transfer and Capacity Building

BPP = Best Practice Protocol

RIU = Research Into Use

ICT = Information Communication Technologies

MS = Member State