INTERNATIONAL BENCHMARKING STUDY OF COMPETITIVENESS POLES AND CLUSTERS AND IDENTIFICATION OF BEST PRACTICES

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Introduction

Clusters are seen as an important factor for the explanation of the empirical phenomenon of geographical concentration of economic and innovation activities that are related to each other, as well as key drivers of competitiveness and innovation in a given region and therefore for the growth or increase / improve jobs and living conditions of the population. Many different cluster definitions exist, depending on the purpose and context in which they are used. However, in many of these definitions, there is no clear distinction between the definition of "cluster" and "cluster initiatives". This distinction should be clear, the cluster being considered as real phenomena and cluster initiatives as structures / entities that aim to build new clusters or its expansion.

The "Community Framework for State Aid for Research and Development and Innovation" defines innovation clusters as “groupings of independent undertakings — innovative start-ups, small, medium and large undertakings as well as research organisations — operating in a particular sector and region and designed to stimulate innovative activity by promoting intensive interactions, sharing of facilities and exchange of knowledge and expertise and by contributing effectively to technology transfer, networking and information dissemination among the undertakings in the cluster.”

More generally, clusters can be defined as a group of companies, institutions and economic agents, which are located near each other and have reached a sufficient scale to develop specialised expertise, services, resources, suppliers and skills. A common element in the cluster definition is the aspect of a concentration of one or more sectors within a given region, as well as the emphasis on networking and cooperation between companies and other institutions in that cluster.

Clusters are defined by relationships, being its geographical boundaries variable, not corresponding necessarily to political boundaries. The geographic dimension of a cluster can be defined by the distance and time that people are willing to go to work together and to hold meetings and networking. The new forms of communication such as the Internet are also changing the spatial dimension of a cluster.

On the other hand, cluster initiatives can be understood as "organized efforts to increase growth and competitiveness of clusters within a region, involving cluster firms, economic and political and / or the scientific community." The cluster initiatives often play an important role as providers of services to support clustering. Cluster initiatives can be defined as a legal entity that supports, manages and directs a given cluster.

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The establishment of cluster initiatives is often supported and financed by public funds from government agencies with a regional (or national) - top-down approach - or more spontaneous and less common initiatives among companies, universities, incubators and financial institutions - bottom-up approach - with the aim of overcoming barriers to cooperation and enable strong partnerships between different institutions. When mature and successful, cluster initiatives tend to raise most of their operating costs themselves by membership and service fees, participation fees for training / workshops, support / sponsorship, etc.

The emergence of a cluster in a particular location can be explained in different ways. On one hand, it may be related to competitive advantages of a given factor inherent in that region, such as particular soil and climatic conditions, availability of forest resources or access to transport or ports / airports. The location of clusters based on natural resources can often be explained by the geography of production factors. A second type of explanation for the clusters emergence in a given location is related to historical events such as, for example, where many successful entrepreneurs started a business and / or met a wide range of skills and research and development. For clusters to grow and prosper many ingredients are needed, including demand sophistication, factor upgrading and specialization, emerging strategies of competition and cooperation, institutional conditions favouring innovation and change or political actions.

As stated in the ABC-Network study (EUROPE INNOVA, 2007), in the agro-food sector, one of the major industrial sectors in Europe, the “cluster dimension” is different from what happens with other industrial sectors: agro-food clusters are not characterised by the same type of geographical concentration, i.e. scientific resources are highly concentrated (in particular those of the highest level), while technological resources are much more scattered because they have to be close to producers, and the producers themselves, being of very different sizes, are generally scattered all over a given region. Scientists in large scientific concentrations are involved in international networks of a high level of excellence, but are not very much accustomed to collaborate with producers and industry at regional level. In addition, SMEs in the agro-food sector have in general a very limited culture of collaboration and partnership, and a rather poor direct relationship with research.

The continuous success of clusters depends on their ability to change and to adapt. The high level of specialisation associated with clusters bears the risk of greater vulnerability to market shocks. Openness and international cooperation work against these risks. Besides that, a higher agglomeration of economic activities is likely to cause over time agglomeration disadvantages in terms of increasing factor costs or traffic congestions, which may at some point outweigh the advantages of clusters. Finally, the potential benefits of clusters may lead to the pitfall of regions aiming to create clusters from scratch (or from a very weak base), especially in high growth sectors, without consideration of regional strength and attractiveness or a necessary critical mass in a global context, however defined.

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It is important to identify the success factors for the design, implementation and growth of clusters. According to the study Mühlig & Brenner (2007) there are several success factors for the emergence of clusters, such as the existence of qualified labour and strong networks between actors in the region, the existence of renowned universities and research centres; tradition and historical preconditions, industrial structure and local policies, the existence of leading companies in the region, cooperation between companies and the possibility of co-location / sharing facilities and infrastructure between companies. Another interesting result of this study is that policy measures are considered to be of high importance and that its importance even increased over time.

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Study objectives

- Identification, selection and establishment of international contacts with Competitiveness / Technological Poles and Clusters;
- Description and detailed analysis of identified Competitiveness / Technological Poles and Clusters;
- Promotion of international partnerships with the contacted organizations / cluster initiatives.

The results of the benchmarking study aim to develop a guide for cluster initiatives best practices and more specifically to develop a strategic document for the Cluster Agro-Industrial do Ribatejo.

Methodology

Selection of cluster / cluster Initiatives

In order to perform this benchmarking study it was necessary to identify clusters / cluster initiatives, at an international level, that operate in the agricultural and agro-food sectors. For this identification were used the following databases:

- European Cluster Observatory - http://www.clusterobservatory.eu/index.html
- European Cluster Collaboration Platform - http://www.clustercollaboration.eu/
- TCI Network - http://www.tci-network.org/
- European Cluster Organization Directory - http://www.europe-innova.eu/web/guest/cluster-cooperation/cluster-innovation-library/reports;jsessionid=CF38010F8BA6A18401C425D0AFA60023

The clusters identification at international level, particularly outside Europe, was not an easy task. At European level there is already compiled, in the form of digital databases, large and diverse information on such structures. These platforms are free and their search is relatively dynamic (searchable by sector, type of organization, region, etc.). Regarding other regions of the world, it was very difficult to find information compiled and available online about cluster initiatives.
Once identified various international clusters, 73 clusters / cluster initiatives were selected and contacted. These clusters were contacted in one of two ways:

- Through meetings at international events (e.g.: SIAL 2010, PIC 2011) or programmed visits (e.g.: Spain-France mission);
- By sending e-mail with the detailed description of the project, the entities involved and the objectives to be achieved (this latter approach was less efficient than the first).

From the clusters / cluster initiatives contacted, 13 responses were obtained (Figure 1).

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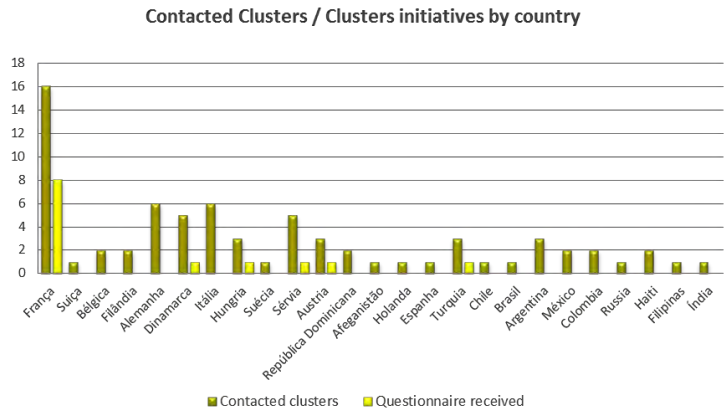

Fig. 1 Contacted Clusters / Clusters initiatives by country

Benchmarking questionnaire structure

The questionnaire developed for this study was based on the ABC-Network study, with input and validation of the project partners (INOVISA and ANIMAFÓRUM). The questions were formulated in order to make appear the cluster managers' opinion about the barriers to innovation and networking and the best practices in cluster management and governance. The questionnaire contains also some cluster performance indicators and questions regarding factors favouring cluster success. (questionnaire in the appendices).

The questionnaire was structured in five main fields with a total of 26 questions:

1. General profile of the cluster
2. Cluster strategy
3. Management system
4. Barriers and best practices of innovation and networking
5. Results and impacts of the cluster

Three types of questions where used:

1. Multiple-choice questions (with or without addition of comments)
2. Open questions (where answer is a free text)
3. Ranking questions (the answer is a ranking number: from "strongly disagree" = 1 to "strongly agree" = 5 and DK/NA "Do not know / not applicable")

Result analysis

The responses obtained from the questionnaire were analysed and processed to be presented in aggregate form (no institution is identified). The information presented in this document is a summary of the obtained information.

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The present study doesn't have the ambition to provide statistically significant results, but results that contain relevant information. The limited number of responses, as well as the diversity of clusters' types and geographical locations permitted only to depict tendencies and personal opinions of cluster initiatives' managers.

The multiple-choice questions analysis and rating are presented graphically, and the answers to the open questions summarized in the related sections.
The NRC number (e.g.: NRC = 12) is the number of clusters having answered to a given question ("Number of Responding Clusters").
The analysis is structured based on different areas of the questionnaire in order to highlight best practices.

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Clusters Benchmarking Analysis

Cluster general profile

Most of the questioned clusters are in development phase of its life cycle, i.e., they have three to seven years of existence. However, two of them have already about twenty years of existence - category "other" (Figure 2). On the other hand, SMEs are the most important on the category representatives / cluster members (in "Other" category agricultural producers were identified) (Figure 3) and cluster members are mostly national or regional (Figure 4).

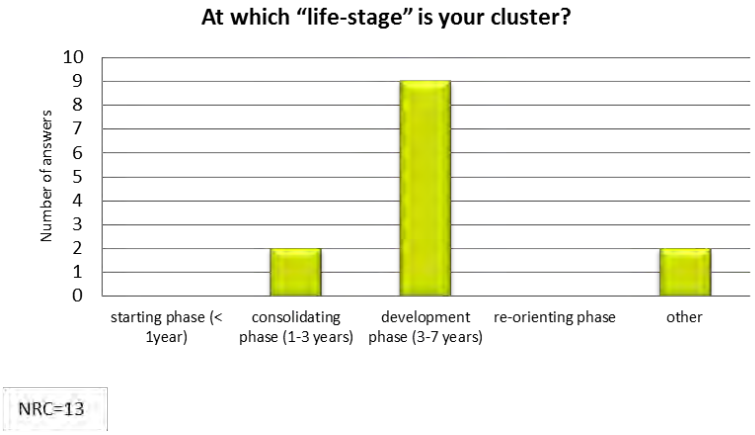

Fig. 2 Cluster development stage

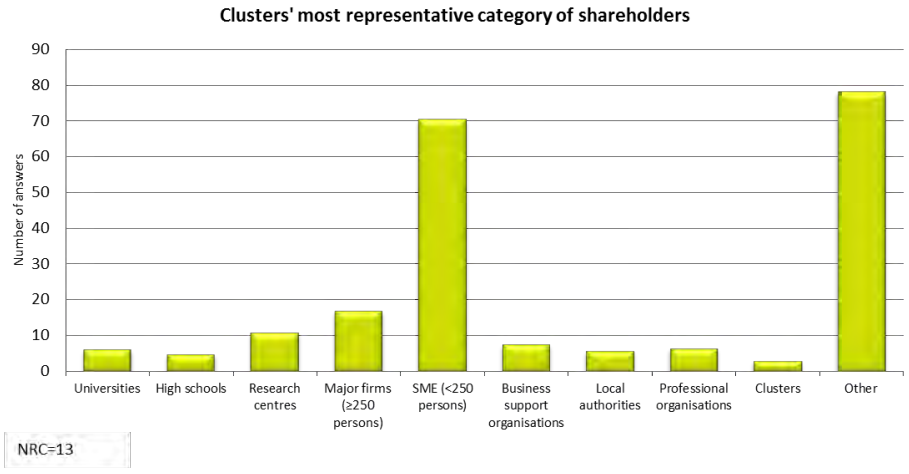

Fig. 3 Most representative category of shareholders

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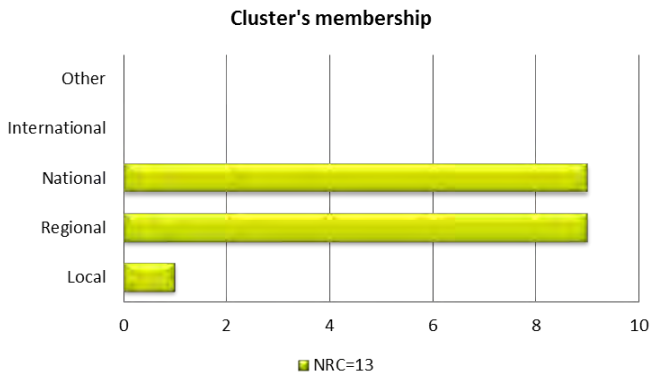

Fig. 4 Cluster members' origin

Conclusion – Cluster general profile

According to data provided it can be concluded that most of the cluster initiatives are relatively new. These results are in line with that described in literature: the "Global Cluster Initiative Survey 2005" identifies more than 1,400 cluster initiatives around the world, with 40% of respondents saying that their cluster initiative was created in 2001 or after and 72% in 1999 or after, reflecting the growing importance of cluster initiatives as a tool for economic development.

Most of these structures are businesses support oriented (mainly SMEs) but mostly have a broad participation of other entities, rarely excluding foreign companies or competitors.

On the other hand, it is interesting that the focus of these structures is mostly at national and/or at regional level. Most of the cluster initiatives described in the "Global Cluster Initiative Survey 2005" also has a small geographical action focus, and 50% of these structures members are located less than an hour of travel.

Cluster strategy

From the contacted clusters, 35% have their origin in the industry but the creation of clusters from government initiatives is also very common ("Institutional" and "Other" categories) (Figure 5).

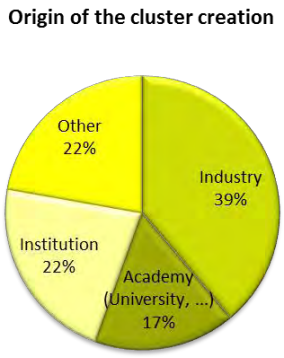

Fig. 5 Origin of cluster creation

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Regarding the clusters objectives, these vary and depend on the members / cluster players. Nevertheless, the two main objectives seem to be "Research and Networking" (partnerships between businesses and research centres and cluster development) and "Innovation and technology" (promoting innovation in companies, technology transfer among cluster members, intellectual property management, ...) (Figure 6).

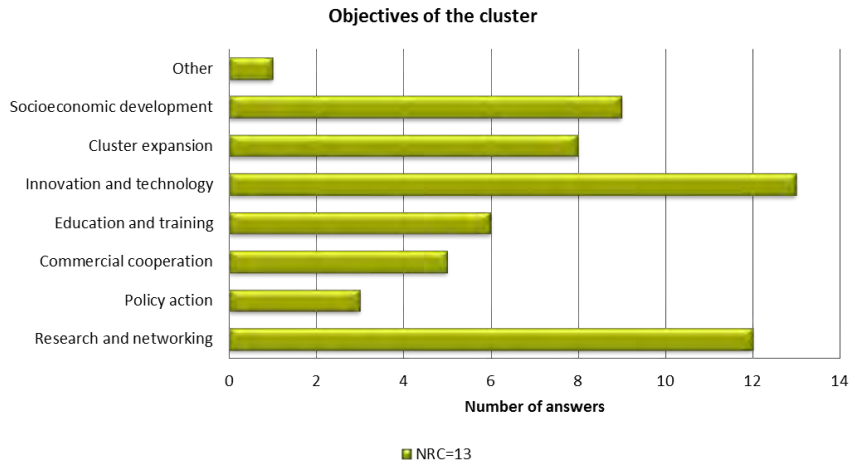

Fig. 6 Cluster objectives

The clusters strategy is in fact mostly focused on research (developing research partnerships between cluster members) or in business, i.e. the development of trade cooperation between clusters members) (Figure 7).

Fig. 7 Cluster strategy

For the future development of clusters, geographical targets in terms of shareholders and stakeholders are mainly international, but national actors are also considered as potential stakeholders targets. Thus, it is possible to say that most of the clusters are considered as a tool for improving competitiveness at an international level (Figure 8).

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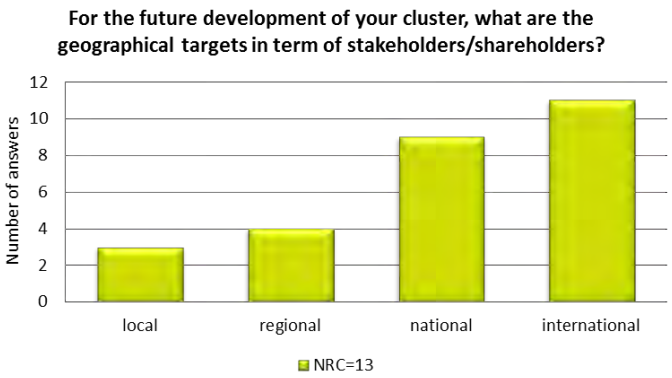

Fig. 8 Partner agencies/target cluster members

Regarding the financing sources of the clusters (Figures 9 and 10) most of them have diversified sources and mainly public funds (regional, national and European - on average 58% of clusters funding come from public sources). Members and projects / services fees (i.e., commercial activities, organization of events, etc.) are also important for clusters financing. European funds are less mentioned but contribute up to 6% of the clusters financing (in "Other" category, with only 1% can be considered soliciting support / sponsorship, revenues from real estate, etc.). The importance of each financing source decreases in the following order: national public funds, member fees, regional public funds, projects and services fees, European public funds and other funding sources.

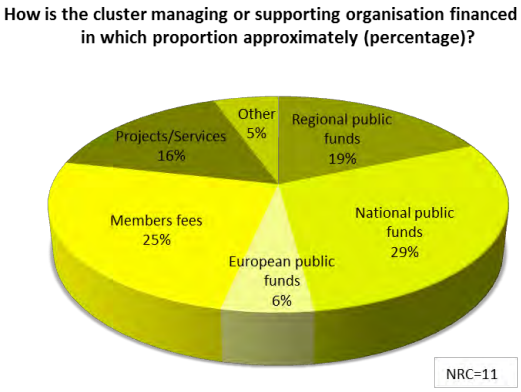

Fig. 9 Cluster Financing

Currently, most clusters think that the budget allocated to them is sufficient to achieve its objectives. As for the future, their opinion is more pessimistic about their ability to adequately finance themselves.

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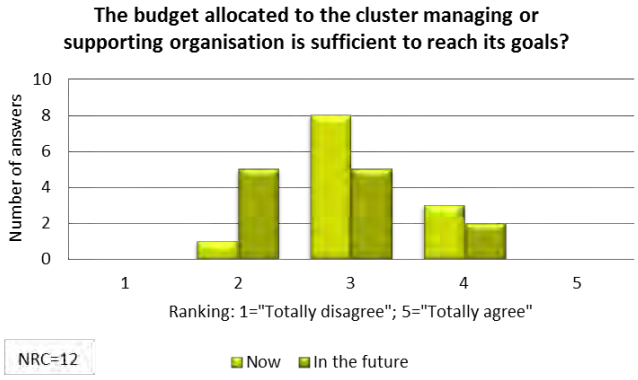

Fig. 10 Cluster Budget

Conclusion – Cluster Strategy

With respect to several points on the strategy of the clusters, it can be taken several conclusions comparing the results obtained with the ones described in literature. In most cases, cluster initiatives are derived from public-private partnerships, i.e., by government and industry, being less common being initiated only by one of the parties or other entities (for example, by contracting the scientific and technological system). Moreover, these initiatives are almost always triggered by government initiatives. This strong government involvement in the creation of these structures is also reflected in how cluster initiatives are financed, i.e., mainly by public funds. This phenomenon is a common feature in most of the cluster initiatives, verifying that this support tends to decrease over time. Funding from public sources is more important in the initial phase of the cluster initiatives in order to enable the consolidation of trust between its members, developing of activities, creating partnerships, etc. After this first phase, these structures tend to rely on other types of financing, such as, members fees, projects / services fees, support and sponsorship, enrollment in workshops and seminars, training, etc. It is important to note that a large part of the clusters has serious reservations about the ability to get financed without the support of public funds.

Management system

All the questioned clusters are supported by a management team, i.e., there are cluster initiatives that represent the clusters and, mostly, these structures have their own office where they develop their management activities and cluster coordination (Figures 11 and 12).

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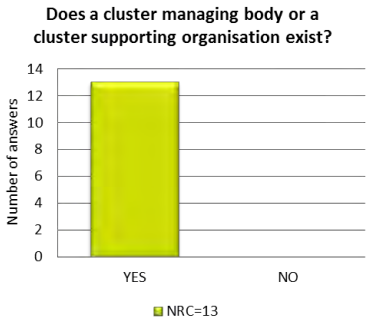

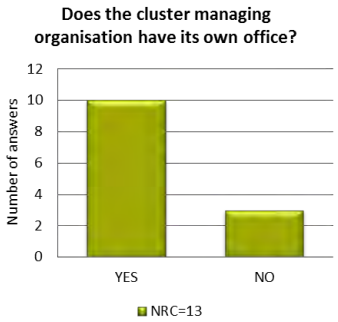

Fig. 11 e 12 Cluster Management team

Regarding the structure of the management team, the average number of working people is ten and their functions can be as director/cluster initiative manager, assistants, project managers, innovation and communication managers, etc. It's not possible to identify an organizational structure type. There are several models of organization and function definitions in the various clusters. There are also some cluster initiatives that externally hire some services/functions such as economic consulting, intellectual property management, computer services, accounting and finance.

For the network activities, most of the clusters managers think that exist good level of trust and openness between the cluster members. The development and organization of initiatives that promote networking among cluster members must be therefore enhanced. The activities of this nature that are most important for clusters managers are, in decreasing order, regular meetings, working groups and projects in consortium (Figures 13 and 14).

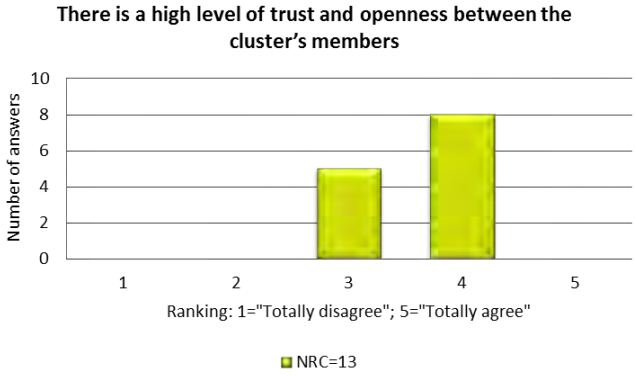

Fig. 13 Cluster members trust level

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Fig. 14 Networking between Cluster members

Moreover, most of the clusters cooperate with other similar clusters of the sector, from different areas or different countries. The average number of cooperation with other clusters is seven (Figure 15).

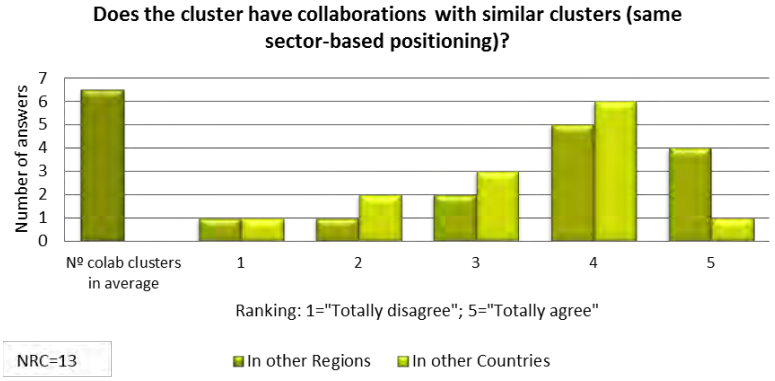

Fig. 15 Collaboration with other similar clusters

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Conclusion – Management system

Most of the cluster initiatives are based on professional structures, including a manager and a management team dedicated to the cluster, an office and a website. It is also important to note that for cluster initiatives to be able to successfully implement the proposed objectives, it is necessary to develop and organize various activities that promote not only the establishment of a strong network and trust among cluster members, as also to develop and promote consortia among cluster members and other national or international clusters. These alliances / partnerships with other international clusters that operate within the same sector, or in complementary sectors, are growing their importance. During recent years, cluster initiatives have become more active in the promotion and establishment of international relations and strategic alliances with other clusters in order to gain "critical mass" and to better meet the needs of its members. It is essential that companies internationalize their business and activities, so cluster initiatives that support these companies should help to achieve this goal. Enhancing this international cooperation, cluster initiatives are helping internationalization member activities (on business for companies, R&D and innovation competencies for research centers) and access to scientific and technological competencies that aren't available within the cluster limits. Companies need to keep up to date and opened to new ideas and innovations, so it is vital to access to global networks of innovation and R&D in the sector of the cluster activity.

Barriers and good practice for innovation and networking

Barriers and best practices in innovation

As previously stated, innovation is showed to be more intensive in clusters than in companies not involved in clusters. Nevertheless, despite the positive aspects of networking and clusters in support of innovation, several barriers still impede this innovation process. Especially in the agricultural and agro-industrial sectors, innovation may be delayed by several factors. The results obtained in this study regarding this question are shown below (Figure 16).

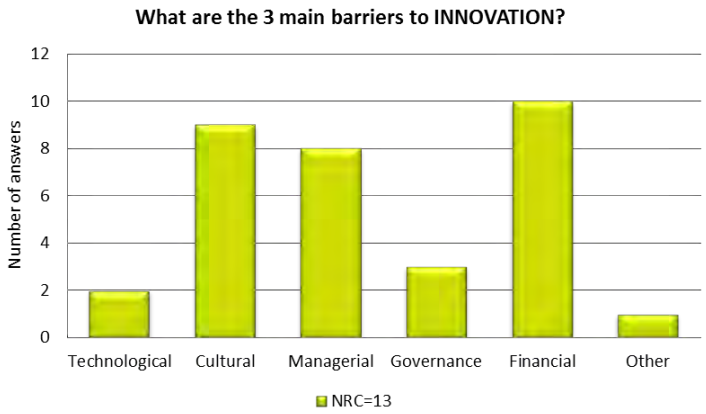

Fig. 16 Major barriers to innovation

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The barriers to innovation that are most frequently mentioned by clusters are financial barriers (gaps in the innovation funding system). Examples of such barrier to innovation can be:

- High level research requires a lot of money (top equipment and top researchers), but funding at development and scale-up stages are not easy to find;
- The availability of public funds to support specific initiatives is sometimes lately notified and there are usually long delays to get them (and all the bureaucracy associated with these processes);
- In some regions, the R&D funding system is not strong enough to favour innovation.

Cultural and management barriers are also quite mentioned. Cultural barriers to innovation (cultural gaps among cluster members) can be, for example:

- Particularly in the agricultural and agro-industry and for SMEs, innovation is often perceived as a cost and not as an opportunity. Most managers prefer to run traditional business models (where the risk is lower) and feel uncomfortable with the introduction of innovations in their business;
- Many SMEs lack experience in running research projects / innovation, or dealing with research partnerships, such as universities or research centres;
- R&D entities and companies work in a very different way, and there are usually differences regarding: objectives and results in the research they want to achieve, the way to perform it, intellectual property issues (publicity / confidentiality); timeframe and deadlines, etc. Company-university research partnerships lead frequently to misunderstanding and tensions, especially when they are not supported by experienced teams in the technology transfer process.

About management barriers (i.e., innovation management capabilities) there may be, for example:

- Lack of autonomy of the cluster initiative management team;
- Lack of relationships with other entities outside the cluster;
- Lack of international relations of cluster initiatives and its members;
- Lack of leadership and vision to anticipate global opportunities for business development.

In a smaller proportion, governance barriers and technological barriers are also identified as a possible cause for difficulties in supporting innovation. Governance barriers (networking capability, weakness of the governance system, non-perennial cluster support organisation) can go through, for example, the existence of an unstable governance structure: e.g. the cluster manager tied to a local authority which changes periodically and modifies the strategy of the cluster.
Technological barriers to innovation (difficulty to absorb new technologies) may also be associated with several aspects:

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- Processes in agro-food sector are usually based on traditional techniques and limitations can appear from legal as well as from market structure constraints;
- In emerging countries the lack of new technological device manufacturers leads to the need to import new lab products or equipment at high prices;
- The amount of investment needed to implement new technologies is huge and the lack of these new technologies is a barrier to the innovation process.

Finally, barriers in the "Other" category can go through:

- In some regions innovation is not a priority ; in consequence support to clusters is very limited;
- The legal framework and the slow decision process of the official authorities in this matter do not favour the innovation processes;
- The geographic isolation of the country or cluster region;
- The lack of universities and research centres within the cluster geographic area, leads to a weak capacity for research and development.

Conclusion – Innovation barriers and good practices

According to the results, the main barriers to innovation seem to be financial, cultural and managerial. For the first two issues, namely the financial and cultural barriers, cluster managers often have low control and power that is needed to solve these issues. These seems to depend more on the official entities/government and from the legal and regional framework where clusters are inserted, the availability of funds for innovation financing and the existence of critical mass (R&D institutions). Nevertheless, clusters managers can develop and organize activities to promote innovation among its members and inform public authorities and Business Support Organisations about the barriers to innovation encountered by the cluster members. In order to solve cultural barriers, interfaces can be created to promote networking and links between the various stakeholders. It is therefore essential to set-up cluster management bodies in partnership with the cluster members, in order to eliminate such barriers.

Networking barriers and best practices

Regarding the identified barriers to networking, (weaknesses / cultural differences between the cluster members) cultural barriers seem to be those that contribute the most to the failure of a strong network within the cluster (Figure 17). Can contribute to this:

- The lack of procedures regarding the treatment of confidentiality between the management team and cluster members;
- The diverging interests and working habits of R&D institutions and companies, reducing the partnership possibilities;

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- The lack of experience in collaborative research projects, particularly for SMEs, which do not favour networking activities and academic-industry partnerships;
- The lack of R&D interest of some companies.

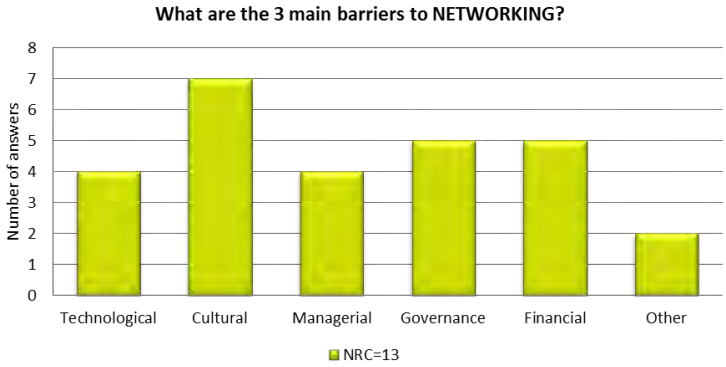

Fig. 17 Main barriers to networking

On the other hand, the governance and financial barriers are also seen as a strong obstacle to the development of networking activities. Governance barriers (networking capabilities, weakness of the governance system, non-perennial cluster support organisation), such as an influential partner of the network tries to be the main institution and to lead the strategy and actions of the cluster towards a way that suit it to the detriment of the other cluster members, is an example of a governance barrier. The lack of financial support for the development and organization of networking activities can also be considered as a financial barrier to networking.

The management and technological barriers are also mentioned (but to a lesser degree) as an impediment to networking. Management barriers may be due to:

- Cluster development and management are difficult tasks and it is sometimes difficult to find a cluster manager with the needed skills and expertise;
- Company managers as well as academic researchers and other cluster members are usually very busy and focused on their own business or research.

In the "Other" category, barriers to networking can be identified:

- Geographical isolation - in such case an international network is of prime importance in order to reach larger markets;
- Lack of SMEs critical mass in the cluster, too many large companies;
- Lack of public research centres/universities linked to agro-food in the cluster area;
- A limited presence of food industry and agro-food R&D in the cluster area.

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Conclusion – Networking barriers and good practices

Cultural aspects are considered by clusters as the main barriers to networking. The creation of an efficient network involving different entities and actors (SMEs and large companies, R&D entities, business development supporting organizations, public authorities, etc.) is a very important process, but difficult to maintain in a long-term, and where cluster initiatives have a key role. On the other hand, the development of networking activities aimed to achieve concrete results (economic or other), facilitates interactions between cluster members and can build trust, on the cluster initiative work. Thus, managerial and networking qualities of the cluster initiatives manager and management team are critical for the cluster success. Other aspects may also be important barriers to networking, but being so diverse, they must be analysed individually.

Agriculture and agro-industrial sector challenges

It was asked to the various clusters to express their views regarding the main challenges that agricultural and agro-industry clusters must face. Seven of the twelve clusters that responded expressed their opinion on this point. The most important aspects that were mentioned are displayed below:

- Lack of adequate funding for their activities, particularly for equipment and infrastructure;
- Cultural barriers - the need for a change in the approach of cluster members to the various issues related to innovation;
- Lack of innovative spirit in the agro-industrial companies (particularly SMEs);
- Gaps between agricultural companies and industries / agro-food companies;
- Products claiming high added value, whilst in reality they have little profit;
- Regulations (EFSA);
- Internationalization;
- Lack of incentives for researchers to devote time to innovation projects and technology transfer in the agro-food sector.

In addition to the presented points of view, the study of ABC-Network identifies other important challenges for the agro-industrial sector clusters:

- The communication and information efforts to the public have to be intensified. Thanks to co-operation with the authorities and the press with the objective to reduce the people concerns about the agro-biotech sector;
- The link to other complementary sectors of agricultural and agro-food sectors is crucial for boosting innovation (for example, materials, biotechnology sectors etc.);
- It is important to know the market needs to develop new products (e.g. functional food, food for specific population groups, convenience products, etc.).

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Conclusion - Agricultural and agro-industrial sector challenges

Some challenges that clusters have to meet are common to most types of clusters: performing a high-level cluster animation, increase the level of commitment of the members in the cluster activities, increase collaboration between cluster members, etc. However some challenges are more specific to the agro-food or agro-biotech sectors like: higher innovation-minded actors, enhance cooperation between agents in the same sector and trans-sectorial co-operation, improve the attractiveness and willingness to invest in these sectors.

Identification of best practices in management and governance of clusters

It has also been asked to the clusters managers to identify best practices in relation to governance and management. The most important aspects that were mentioned are listed below:

- Development of networking activities, such as annual visits to cluster members or annual brainstorming meetings for specific topics;
- Industry based Governance, involving and bringing the agriculture and agro-food sector together;
- Presence of a strong cluster management team, which carries out activities that bring real benefits to the various cluster members and that is flexible and dynamic and autonomous;
- Real involvement of the various cluster members through, for example, the existence of a management committee. This committee will guide and validate the decisions taken within the cluster activities. The committee shall be fully independent, ensuring fairness in the decisions and processes involved in strategy;
- Existence of a good relationship, with local and national government entities, based on stable and lasting partnerships.

In addition to the experiences shared by the clusters managers, with regard to best practices of management and governance, the study of ABC-Network also identifies some best practices:

- A business-driven strategy is considered as a success factor;
- Ability of the cluster managing body to make a diagnosis of its sector specific needs, and devise strategies to overcome identified weaknesses;
- Offering agriculture and agro-food cluster members broad technological and scientific resources is seen as a valuable service;
- The initiation and support for co-operative projects between businesses, R&D and training institutions with the collaboration of official authorities – which is one of the most common objective of the clusters – is pointed as an interesting service;
- The centralisation of information on different topics like research competencies and funding possibilities is of great value. The cluster can support the projects funding, which leads sometimes to product commercialisation.

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Conclusion - Best practices in clusters management and governance

Considering the specificity of each cluster and its actual situation, the results obtained are only indicative, though very interesting. The following best practices in relation to governance and management issues of cluster initiatives can be pointed out:

- A strong management team (experienced, independent, dynamic and flexible);
- Continuity and stability of the management team and governance structures;
- An external control performed by independent entities.

Identification of cluster best practices in networking activities and internationalization

Regarding the networking activities and the international positioning of the cluster, the following best practices were mentioned by the clusters managers:

- Cluster involvement and link to international networks, which promote both sectors / specific activities (e.g., networks, technology transfer, market, etc.) and networks that promote the link between clusters;
- Existence within the cluster of strong competencies in R&D and innovation, which can be internationally recognized;
- Focus on international activities, particularly in developing partnerships with other industry clusters or complementary sectors;
- Involvement in international projects;
- Design of a single image that enhances the international projection of the cluster members (i.e. that can be used in various international activities such as fairs and exhibitions);
- Ability to mobilize beyond the cluster members;
- No competition between the different members.

Conclusion - Good practices in cluster networking activities and internationalization

Acting as an interface between all stakeholders, the management team has as main tasks the establishment of tools that enhance communication and networking and are tailored to the needs of the cluster. The activities mentioned are promoted by most cluster initiatives being considered as valuable services to the various members. The international position of the cluster seems to be a major factor for its success, and a structured and professional internationalization strategy should be built in.

Cluster results and impact

The benchmarked clusters were asked to evaluate some performance indicators related to their activities (Table 1). 69% of the inquired clusters said that clusters do a regular assessment of their performance (Figure 18). This assessment is made, for example:

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- Each year or periodically (e.g. every three years);
- From entities outside the cluster (e.g. governmental authorities);
- Internally, based on a "score card" method;
- Through the drafting of a results report (e.g. projects, benefits and economic impacts), sent or not sent to cluster members.

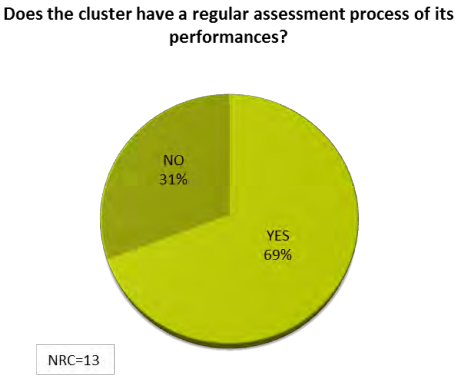

Fig. 18 Cluster Performance Evaluation

Performance evaluation by clusters managers

Factor	Negative evaluation (1 and 2)	Median evaluation (3)	Positive evaluation (4 and 5)	DK/NA
The cluster meets its goals	1	1	11	0
The cluster members are satisfied with the services provided	0	4	9	0
The cluster has led to…				
… an extension of the activities / services offered by some of its members	2	3	8	1
… closer relations between industry and academia	0	4	9	0
… an increase in investments of its members	3	4	4	2
… a job increase	1	5	5	1
… new businesses establishment	3	3	8	0
… dialogue with policy makers	0	3	9	0
… specialized training development	3	2	7	1
The number of cluster members is increasing	0	3	9	1
The cluster has attracted new companies to the region	2	2	9	0
New technologies have emerged from the cluster	1	3	8	1

Classification: from 1 = “totally disagree” to 5 = “totally agree” e DK/NA = “Don’t Know/Not applicable”

Table 1 – Cluster performance evaluation

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Conclusion – Cluster results and impact generated

Apparently, most of the questioned cluster initiatives enjoy good working conditions, and introduce the necessary measures to achieve these conditions. This seems to have a significant impact on their and its member's performance. By the available indicators it can be concluded that the cluster initiatives, in general, positively evaluate the results they obtained: clusters meet their goals, their members are satisfied, the number of clusters members is raising and some new technologies have emerged thanks to the cluster actions. Clusters have also led to some extension of the activities/services offered by their members, closer relations between industry and academia, new companies establishment, a well-established dialogue with policy makers and the development of specialized training.

Most of the results obtained are in line with what was described in literature, so these good performance results can be considered as a consequence of a good management of the cluster team initiatives.

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Clusters development and management guidelines

After analysing the results and make some conclusions, it is important to outline some best practices regarding clusters implementation and management. For cluster initiatives to be successful on enhancing their member's activities, it's necessary to implement some actions that can be divided into five general points:

1. Information and communication
    a. Detailed database
    b. Frequent customer interviews
    c. Internet / Web page
    d. Newsletters and information to its members
    e. Services catalogue
    f. Regular events and companies visits
    g. Press book promotion

2. Training and qualification
    a. Analysis of business /activities requirements from cluster members
    b. Human resources training
    c. Organisation of regular events
        i. Workshops and seminars
        ii. Study visits
        iii. Technical training

3. Cooperation
    a. Establishment of contacts between potential projects partners
    b. Initiation and support of co-operation projects
    c. Promotion of partnerships with R&D entities, universities and qualified service providers

4. Marketing and public relations
    a. Creation of a regional identity
    b. Information and marketing materials
    c. National and international dissemination activities
    d. Presence at fairs and exhibitions, visits to other companies and entities in R&D/clusters at national and international level
    e. Internal skills presentation to potential clients/partners

5. Internationalisation
    a. Participation in international events/conferences
    b. Access to international markets and customers
    c. Support of international cooperation
    d. Support of companies during internationalization
    e. Set-up of network activities between comparable/complementary international clusters
    f. Attract foreign visits in the cluster

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A smooth information infrastructure is necessary to keep the cluster working effectively. The information system often comprises a web page presenting general information about the cluster, a company catalogue giving short descriptions of the participating companies, a co-operation "stock exchange" where companies can announce their proposals for cooperation projects and an agenda for meetings and short reports about current activities, it is essential to inform all the initiative members (and the general public) on what is being developed. All these contents should be publicized to enhance the internationalization (Ex.: Portuguese and English website).

In addition to the defined points, it is important to identify the factors that lead to the cluster initiatives success or failure. Examples of such factors:

Success factors:

- The cluster initiative should be implemented based on the existence of strong skills and a good business environment in the region
- The cluster initiatives should be created in order to enhance and streamline real clusters, rather than support the creation of new clusters
- The cluster initiatives should be seen as part of a broader strategy defined for the region in order to improve its competitiveness and attractiveness
- Cluster initiatives should have a sufficient operating budget for its implementation

Failure factors:

- Cluster initiatives that are isolated tend to have less impact
- Lack of consensus among cluster members with regard to outlined strategies and activities
- Framework/government policies weakness to cluster initiatives support
- Lack of networks/networking
- Lack of a strong management team
- Lack of adequate infrastructures
- Lack of adequate funding
- Negligence on the cluster identity projection

Development and implementation of cluster initiatives

The establishment of a cluster initiative varies substantially according to the purpose for which it was created and the circumstances under which the cluster members are supposed to cooperate. The general phases which lead to the successful implementation of these structures can be schematised as follows:

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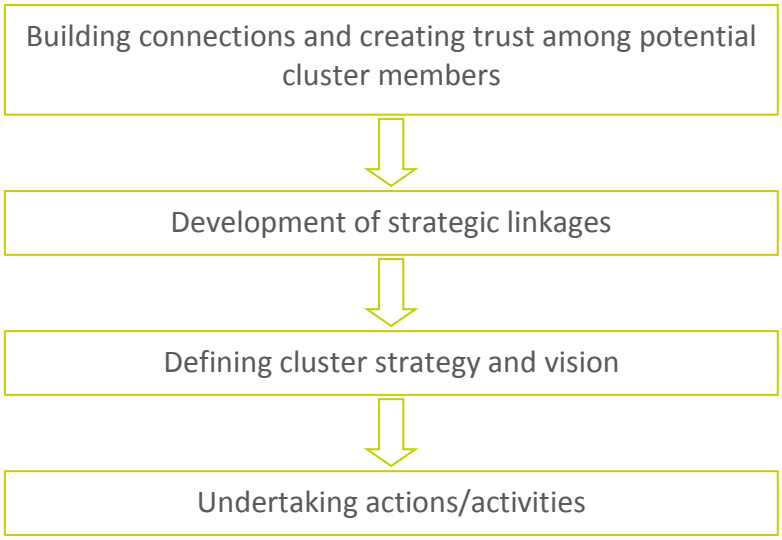

Initially, the cluster initiative must develop the following actions:

- Analysis of government policies or actions that are in progress - it is important to understand the regional context and the policies and regulations that are being used at any given time. This is essential to ensure that the cluster strategy is in line with existing policies and thus make better use of the existing support;
- Analysis of economic strengths and weaknesses - knowledge of the potential, but also of the weaknesses in a given region (or a given sector and entities associated with him) is essential to outline ways and strategies that can enhance the activities of cluster initiatives. The positive aspects on one context may be, for example:
    - The availability of natural resources or other unique local assets that turn that place attractable
    - Geographical proximity between the multiple agents involved
    - The existence of economies of scale
    - Presence of critical mass, qualified human resources/expertise, and R&D skills

  Beyond these aspects, the existence of attractive conditions for a given location to install companies and other entities (schools, hospitals, cultural structures, sports and leisure, transportation access, etc.) is critical for this initiatives success.

- Knowledge of the existing powers - it is very important to collect information on companies and their activities, on R&D entities and their skills and work lines and on other structures that can support all economic activities that develop within the cluster. It is also essential to understand the needs and requirements that companies have in order to trigger the development of partnerships and projects in consortium, with a focus on innovation.

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- Value chain involvement - the involvement of the whole value chain existing in a given context is essential to ensure the success of the cluster initiative.

In addition to ensure that these points are taken into account, cluster initiatives should have its objectives, tasks and activities defined in detail. In a first step, the objectives should be set short, medium and long-term. Next, the tasks and activities to be undertaken should be defined and implemented (Figure 19).

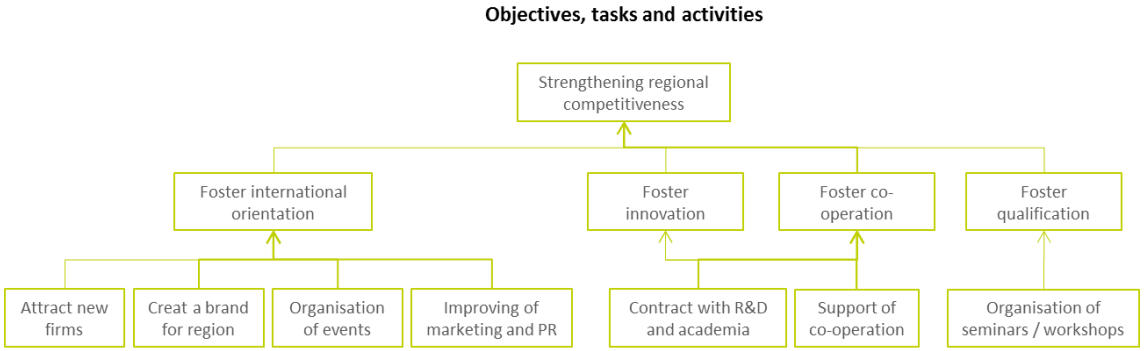

Fig. 19 Objectives, tasks and activities

Another critical factor for cluster initiatives to succeed is the existence of a manager and a management team, capable of carrying out activities that were outlined. It is essential that the choice of the cluster initiative manager is consensus among the members of the cluster, and it has the skills, experience and characteristics required for the post he is delineated. Regarding the size of the management team, this depends on the cluster initiative size, but as in literature and in general, these teams tend to have between three to five people. Again, their skills and capabilities must be examined carefully. Both the initiative manager and its management team should have detailed knowledge of the industry/sectors that support the cluster, but also, management and networking skills. Examples of skills that should be present in the management team are: leadership, integrity, management skills, creativity and dynamism, capacity for interpersonal contact, etc.

On the other hand, the existence of a strategic council/administration board confers some strength to the initiative and should include members' representatives of the cluster initiative, experts/consultants in the cluster activity areas, and personalities with regional impact, etc. This board can support the initiative on the following points:

- Setting of the strategic position that the cluster initiative should have
- Monitoring and support of the networking activities
- Support current and future orientation with respect to target markets, developing projects, technology support, etc.
- Evaluation of completed activities generated impact on cluster members and new forms of cooperation/new activities.

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The strategic council must be informed and receive from the management team the needed documentation to assess this/cluster initiative support. It should meet, preferably three to four times a year.

The cluster initiative funding is also a critical success factor. There are several ways of financing, such totally public financing, where the initiative is always financed by public funds, private financing, in which there isn´t government support for the implementation and management of the cluster initiative throughout the cluster life cycle, or the public-private financing. This last form of financing seems to be the most suitable for these structures sustainability. In this case, funding will be changing over time and, initially, public support plays a key role (design phase, implementation and cluster launch). In later stages, public support tends to decrease (and should), while revenues from private sources tend to increase (member fees, services, etc.). Generally, a cluster initiative is planned and financed by government authorities during a period of 18 months to three years. After this period the cluster initiative should be self-sustaining and generate revenue, no longer needing public funding.

Cluster initiatives management

After the launch of the cluster initiative, it's necessary to efficiently manage it. The manager and management team are responsible for the management and daily activities, and the initiative overall performance is essentially the result of the management team work. As in the previous section, the main tasks for the cluster initiative management are:

1. Information and communication
2. Training and qualification
3. Cooperation
4. Marketing and public relations
5. Internationalization

Information and communication

As described for the cluster initiative development and implementation, communication activities and information are essential for their success. All the cluster members and other companies and entities outside the cluster must be informed about the cluster initiative, its members, developing activities and results. The following communication channels must be used:

- Developing a communication strategy: to boost information, experiences and knowledge exchange, there should be settled a communication strategy. This should be achieved through regular meetings (e.g. a fixed day per month) and forums dedicated to internal cluster members.
- Regular meetings: for regular meetings between the cluster members should be invited companies, R&D organizations and other structures that are part of the cluster initiative. Initially, these meetings may have a 4-6 weeks periodicity. Once the cluster is working fully and successfully, these meetings may now be bimonthly or quarterly.
- Regular visits to companies: it should be organized five to ten businesses visits per month, documented by a visit report. This report should provide an

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overview of the business activities and requirements. This information is important and may be used as a basis for developing consortium projects.

- Regular events: for a successful cluster initiative it is essential to regularly organize events. These events aim to promote the cluster growth, establishment of contacts and exchange experiences with other entities (including other clusters). Examples of such events can be: workshops, round tables with experts on a specific topic, fairs, “cluster days”, etc.
- Newsletter: all cluster members must be kept informed of past and future activities. This task can be streamlined by sending a monthly newsletter (electronic or paper).
- A database of cluster members/suppliers catalogue/industry information: all these points should be kept up to date in a cluster database. The cluster initiative should be in possession of general information about these entities (e.g. address, net income, number of employees), as well as information on its activities/services.
- Web Site: The purpose of the Web page is to inform its users about the content, membership and activities of the cluster initiative. As already mentioned, the Web page should always be kept updated and it´s essential to communicate and inform all the initiative members (and the general public) on what is being developed.

Training and qualification

Human resources represent a critical factor for organizations success. A successful cluster initiative should consider establishing a training program/qualification geared to its member’s needs. The cluster initiative should organize and support the implementation of training/education measures to improve its technicians and companies manager’s skills. In addition, the cluster initiative should enhance networking between companies, academia-industry linkages and promote and encourage companies to wage on human resources training in order to increase their internal competencies. Such training may pass through:

- Advanced training sessions
- Workshops and seminars about specific topics
- Study visits and "field days"
- Learning from businesses through sharing sessions and exchange experiences.

Cooperation

Since the competitiveness between regions is not determined by a single company, but its capacity for industry innovation as a whole, cooperation is essential to improve this ability. With the development of cooperation projects, potential synergies can be explored and, thus, are reinforced not only individual companies but also the entire economy of a given region. Some companies have great interest in integrating consortium projects with other companies or R&D institutions. A very important activity area for cluster initiatives is precisely the enhancement, development and support of projects in consortium. Such projects may consider, for example, the following areas:

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- R&D
- Production
- Marketing
- Logistics
- Qualification
- Organization
- ICT
- Internationalization

For the development of high innovative value projects, it is important to involve R&D institutions as well as qualified service providers in the areas of interest of the project. The cluster initiative should be informed about the support and funding programs for such type of projects, in order to pass this information to companies/entities who are interested to develop consortium projects. The cluster initiative should also be empowered to be able to assist in the structuring and development process/projects implementation.

Marketing and public relations

The marketing and public relations reinforce the cluster member's participation and attracts new companies/entities to join the cluster. These activities should therefore be undertaken regularly and include actions at national and international:

- Strengthening of regional identity
- Information/advertising creation, presentations and newsletters
- Cluster promotion through advertisements and articles in various newspapers and magazines
- Presence at fairs, visits to other companies/clusters, presentations to target-customers

Internationalisation

With the elimination of trade barriers and strengthening of transportation and communication systems, along with the harmonisation of market regulations, it was possible to improve and increase trade and value chains specialisation, nationally and internationally. Currently it is essential that industries and regions are open to new markets and to seek and attract new partners to cooperate. Thus, it is essential that the cluster initiatives support its members in their internationalisation process (particularly in a small country like Portugal). The cluster initiative itself should be open to international expansion. The following activities should be considered:

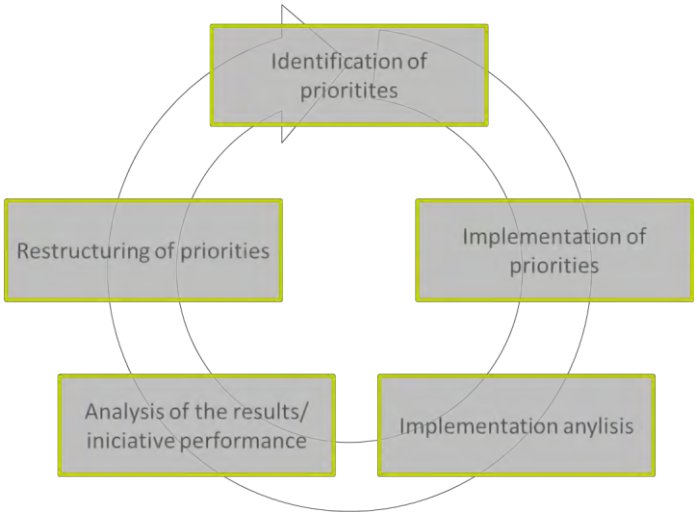
- Access to international events: participation in international events is essential for cluster initiative to keep up to date trends and topics of global interest, to later be able to pass them to its members.
- International projects participation: it is important that the various cluster initiative members participate in international projects to increase their competitiveness through these international activities.
- Establishment of networking activities between different clusters: to remain competitive and highly innovative, cluster initiatives must enhance cooperation with other cluster initiatives and similar structures in other regions/countries. This action can be developed through missions and scheduled visits, or by participating in cooperation projects.

Final Conclusions

This document was initially based on the survey and a wide literature of interest study (see Literature of Interest), later complemented with the implementation of various actions, including international databases search, presence on related events and visits and meetings to/with European cluster initiatives. It was further established a benchmarking questionnaire, and sent to various cluster initiatives (including Cluster Agro-Industrial do Ribatejo) in order to collect more detailed information for the analysis.

The ultimate goal of this paper was to evaluate international cluster initiatives, compare them and determine best practices in terms of its implementation, management and performance. Subsequently, it was performed a comparative analysis between international cluster initiatives and Cluster Agro-Industrial do Ribatejo, to identify differences between the analysed structures and define critical points/success factors that a cluster initiative must meet. Finally, from the critical points/success factors identified, essential priorities were defined to ensure the sustainability and success in the medium/long-term of Cluster Agro-Industrial do Ribatejo.

The priorities identified are those that, based on a study carried out in this document, must be designed in a structured, integrated and systematic way, so that the Cluster Agro-Industrial do Ribatejo Initiative can develop and be successful. This study will thus form the basis for this process, operating as a tool for implementing the identified priorities, particularly at an early stage. Subsequently, and to ensure sustainability and success of this initiative, the Cluster Agro-Industrial do Ribatejo should analyse and monitor periodically the implementation of these priorities and, based on the results, restructure them seeking future targets. Schematically, the Cluster Agro-Industrial do Ribatejo shall precede, continuously and over the next few years, the following steps:



The investment in cluster initiatives in Portugal is recent and done after similar initiatives that have occurred in other European countries. The downside to start later

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is that we have to work harder and more effectively to achieve the level of development from other experienced initiatives. The advantage is that we can avoid many of the mistakes from those that go ahead. The Cluster Agro-Industrial do Ribatejo is a small initiative compared to some of the analysed clusters, but focused both in terms of sectors and region. This study identified priorities and best practices so that Cluster Agro-Industrial do Ribatejo can position itself side by side with what is the best at European level. Nevertheless, what matters is not the analysis but the execution. As stated above, the implementation of best practices and priorities identified, in a systematic and iterative way, may lead the Cluster Agro-Industrial do Ribatejo to be a successful initiative. The focus should therefore be on implementing what is proposed here.

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Appendices

Benchmarking Questionnaire

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QUADRO DE REFERÊNCIA ESTRATÉGICO NACIONAL PORTUGAL 2007/2013

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INTERNATIONAL BENCHMARKING STUDY OF AGRO-FOOD CLUSTERS

- BENCHMARKING QUESTIONNAIRE -

November, 2010

The Cluster Agro-Industrial do Ribatejo – Portugal - was recently created in 2010. It has the mission to increase the collaboration and cooperation among companies and other institutions in the agro-industrial sector in the Ribatejo region of Portugal. With the aim of strengthening its strategy and goals the Cluster decided to undertake a benchmarking study of clusters in the agro-food sector at an international level, learning and acknowledging best practices followed by other, more experienced, clusters. The study is being developed by INOVISA (www.inovisa.pt).

This benchmarking questionnaire is one of the tasks of this International Benchmarking Study of Agro-food Clusters. It was based on a benchmarking questionnaire elaborated by the ABC-Network, in the context of a project funded by the European Commission within the 6th Framework Programme.

The questionnaire takes about ten minutes to answer. In the end, we will analyse the results and the information will be treated and sent to all participants in a consolidated format (no institution will be identified).

Thank you very much for your time! It is extremely important to help us shape our future.

CLUSTER AGROINDUSTRIAL
RIBATEJO

Project co-financed by:

COMPETE
PROGRAMA OPERACIONAL FACTORES DE COMPETITIVIDADE

QUADRO DE REFERÊNCIA ESTRATÉGICO NACIONAL
PORTUGAL 2007.2013

UNIÃO EUROPEIA
Fundo Europeu de Desenvolvimento Regional

1. GENERAL PROFILE OF YOUR CLUSTER

1.1 Cluster details

Cluster's name:
Cluster manager's name:
Address:
Phone: E-mail: Website:

1.2. Level of clustering process and key actors of your cluster

1.2.1. At which "life-stage" is your cluster?

- ☐ starting phase (< 1year)
- ☐ consolidating phase (1-3 years)
- ☐ development phase (3-7 years)
- ☐ re-orienting phase
- ☐ other:

1.2.2 Which are the shareholders* of your cluster?
(number of shareholders per category: e.g. : Universities: 4)

- ☐ a) Universities:
- ☐ b) High schools:
- ☐ c) Research centres:
- ☐ d) Major firms (≥250 persons):
- ☐ e) SME (<250 persons):
- ☐ f) Business support organizations:
- ☐ g) Local authorities:
- ☐ h) Professional organizations:
- ☐ i) Clusters:
- ☐ j) Other (please detail):

* Shareholders = members of the cluster organization.

1.2.3. Is the membership (shareholders) mainly:

- ☐ Local
- ☐ Regional
- ☐ National
- ☐ International
- ☐ Other (please detail):

1.3. Sector-based positioning of your cluster

1.3.1 Which is the main sector/sub-sector of activities within your cluster (theme of your cluster)?

1.3.2 In which sectors/sub-sectors are the companies of your cluster positioned?

1.3.3. In which sectors/sub-sectors are the public R&D organizations of your cluster positioned?

2. STRATEGY OF YOUR CLUSTER

2.1 Origin, strategy and objectives of your cluster

2.1.1. Which is the origin of the cluster creation?

- ☐ Industry
- ☐ Academy (University, ...)
- ☐ Institution
- ☐ Other:

2.1.2. What are the OBJECTIVES of the cluster?

- ☐ Research and networking (establish network among firms and research institutions,…)
- ☐ Policy action (lobby government for subsidies and infrastructures, improve policy…)
- ☐ Commercial cooperation (joint purchasing, export promotion, business assistance…)
- ☐ Education and training (provide technical or management training)
- ☐ Innovation and technology (facilitate higher innovativeness, diffuse technology, intellectual property rights management …)
- ☐ Cluster expansion (promote expansion of existing firms, attract foreign companies, develop a regional "brand image", …)
- ☐ Socioeconomic development (increasing employment, investments, creation of new firms, …)
- ☐ Other:

2.1.3. The STRATEGY of the cluster, cluster managing or supporting organization is mainly…

- ☐ Research oriented (developing research partnerships between cluster's members)
- ☐ Business oriented (developing commercial co-operation between cluster's members)
- ☐ Other:

2.1.4. For the future development of your cluster, what are the geographical targets in term of stakeholders/shareholders?

- ☐ local
- ☐ regional
- ☐ national
- ☐ international

2.2 Cluster's financing

2.2.1. How is the cluster managing or supporting organization financed and in which proportion approximately (percentage)?

- ☐ Regional public funds. Aprox. %:
- ☐ National public funds. Aprox. %:
- ☐ European public funds. Aprox. %:
- ☐ Members fees. Aprox. %:
- ☐ Projects/Services: . Aprox. %:
- ☐ Other: . Aprox. %:

4.2.2. The budget allocated to the cluster managing or supporting organization is sufficient to reach its goals?

Now					In the future				
Totally disagree				Totally agree	Totally disagree				Totally agree
1	2	3	4	5	1	2	3	4	5
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Comments, if any:

3. GOVERNANCE SYSTEM

3.1 Cluster managing body or cluster supporting organization

3.1.1. Does a cluster managing body or a cluster supporting organization exist?

- ☐ YES
- ☐ NO

Comments, if any:

3.1.2. Does the cluster managing organization have its own office?

☐ YES
☐ NO
Comments, if any:

3.1.3. How many people are working in the cluster managing body, if any? Indicate their function.

If possible, please annex your organization chart to this questionnaire.

3.1.4. If applicable, please indicate the functions/services you outsource: e.g.: juridical advice

3.2 Networking

3.2.1. There is a high level of trust and openness between the cluster's members:

Totally disagree			Totally agree	
1	2	3	4	5
☐	☐	☐	☐	☐

3.2.2. How is the networking between stakeholders (target group) organized? By which means?

☐ Working groups
☐ Periodical meetings
☐ Joint projects
☐ Other:
☐ Information Day
☐ Provision of common services
☐ More informal ways

3.2.3. Does the cluster have collaborations with similar clusters (same sector-based positioning) in other regions/countries?

Other regions					Other countries				
Totally disagree			Totally agree		Totally disagree			Totally agree	
1	2	3	4	5	1	2	3	4	5
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Number of collaborating clusters:

4. BARRIERS AND BEST PRACTICES TO INNOVATION AND NETWORKING

4.1. Identification of shortcomings and barriers to innovation and networking

4.1.1. What are the 3 main barriers to INNOVATION in your cluster (in particular for the agro-food sector)?

Possible barriers:

☐ Technological barriers (difficulty to absorb new technologies)
☐ Cultural barriers (cultural gaps amongst the stakeholders)
☐ Managerial barriers (innovation management capacity)
☐ Governance barriers (networking capacity, weakness of the governance system, non-perennial cluster support organization)
☐ Financial barriers (gaps in the financing system)
☐ Other:

4.1.2. What are the 3 main barriers to NETWORKING in your cluster (in particular for the agro-food sector)?

Possible barriers:

- ☐ Technological barriers (difficulty to absorb new technologies)
- ☐ Cultural barriers (cultural gaps amongst the stakeholders)
- ☐ Managerial barriers (innovation management capacity)
- ☐ Governance barriers (networking capacity, weakness of the governance system, non-perennial cluster support organization)
- ☐ Financial barriers (gaps in the financing system)
- ☐ Other:

4.1.3. In your opinion, which are the most important challenges an agro-food cluster has to meet?

4.2 Identification of best practices

2.2.1. In the success of your cluster, what do you identify as a best practice in the following 2 categories? Please explain why (in terms of results):

Management and governance of the cluster:

Networking activities and international positioning of the cluster:

5. RESULTS AND IMPACTS OF YOUR CLUSTER

5.1. Does the cluster have a regular assessment process of its performances (competitiveness of its members, fulfilment of the cluster's goals, growth of the cluster, etc.?)

- ☐ YES. Please detail:
- ☐ NO

5.2. Cluster performance:

	Totally disagree			Totally agree		DK / NA *
The cluster meets its goals	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	- ☐
The cluster members are satisfied by the cluster services	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	- ☐
The cluster has lead to :						
- an extension of the activities/services offered by some of its members	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	- ☐
- closer relationships between industry and academia	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	- ☐
- an increase of the general investments of its members	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	- ☐
- increased employment	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	- ☐
- setting-up new firms	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	- ☐
- a well-established dialogue with policy makers	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	- ☐
- specialized trainings	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	- ☐
The number of cluster's members is raising	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	- ☐
The cluster has attracted new firms in its area	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	- ☐
New technologies have emerged through the cluster	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	- ☐

* DK : "Don't know" / NA: "Not applicable"