Evaluating interactive innovation processes: towards a developmental-oriented analytical framework

Simona Cristiano, Patrizia Proietti

CREA-PB - Agricultural Research and Economics Council - Policy and Bioeconomy,
simona.cristiano@crea.gov.it; patrizia.proietti@crea.gov.it

Abstract: *The novelty and complexity of interactive innovation and multi-actor approaches in European innovation policies asks for a comprehensive framework to analyse co-innovation processes and, particularly, the interactive processes performed by the operational groups (OGs).*

This paper is aimed at raising the discussion on frameworks and practices to analyse and support of innovation processes of OGs in rural development policy.

The analysis highlights an increasing interest of the current evaluation and research practices on interactive innovation processes, collaborative learning and capacity development both at individual, collective and systems levels. Particularly, transformative-oriented frameworks have been developed in view of supporting capacity development in innovation systems.

Supported by previous studies, the paper moves towards a proposal for a developmental-oriented analysis (DOA) framework which is inspired by reflexive and developmental approaches draw up in recent research as well as in evaluative experiences of multi-actor projects.

The DOA framework intends to support the design of evaluation strategies aiming at assessing OGs performances and innovation processes at local level. As well, the DOA could be a reference for policy/programme design aiming at promoting the development of innovative capacities and systems in agriculture.

Keywords: *Interactive Innovation, developmental-oriented analysis, multi-actor approach, agricultural innovation systems.*

Introduction

Over the last twenty years relationships between research and innovation have been affected by an evolution of concepts and principles that have merged in the interactive model, namely a systemic, multi-actor and transdisciplinary approach to innovation.

These theoretical concepts underlay the architecture of European policies for innovation. Under the framework of the EIP-Agri, a variety of tools have been introduced to support multi-actor co-innovation pathways, which are aimed at bridging the gap between researchers and farmers, through better targeting practical needs for innovation and the co-production of focused solutions that are quickly put into practice. In particular, the operational groups (OGs) funded under the rural development programmes 2014-2020 (RDPs), engage a multiplicity of actors (farmers, researchers, advisors, businesses, environmental groups, consumer interest's groups or other NGOs) in developing multi-actor innovations that address specific needs of farmers or grab particular opportunities.

The novelty and complexity of interactive innovation and multi-actor approaches calls for an appropriate analysis framework to assess the performances of innovations at the levels of both processes and results/impacts.

Until the last ten years, research and evaluation practices to assess agricultural innovation were focused on outputs, results and impacts, accordingly to the linear approach to innovation. Recently, a growing interest has been directed to develop new analytical frameworks and complexity-aware impact evaluations aimed at grasping the processes and the capacity development which interactive innovation aims. Process-oriented analysis were specifically addressed to better understand how and at which conditions innovations are effectively applied and scale-up towards the overarching objective of more resilient and sustainable agriculture. As well, a greater emphasis has been directed on the capacity development at individual, organizational and system level.

Inspired by these frameworks, as well as by the Common Monitoring and Evaluation Framework (CMEF) applicable to RDPs, Cristiano and Proietti (2014b) proposed an evaluation strategy for the assessment of interactive processes performed by the OGs. This evaluation strategy, articulated upon a set of dimensions, key questions and assessment criteria, laid on an overall participatory approach, in view of addressing both the complexity of interactive innovation and the issue of capacity development.

In the very last years, the EIP-Agri implementation and the spreading of multi-actor research and innovation projects have led to the development of new holistic analytical pathways, aimed at exploring the complexity of co-innovation processes.

The purpose of this study is to define a possible framework to analyse OGs and their interactive innovations. To this aim, the study presented in this paper addresses the following questions:

- To what extent frameworks, approaches and methods already in use for AISs analyses are well suited to assess multi-actor and co-innovation processes performed by the OGs?
- Which insights and suggestions can be drawn from the application of frameworks, approaches and methods already in use, in view of assessing multi-actor and co-innovation processes performed by the OGs?

The study moves towards a proposal for a developmental-oriented analysis framework which is inspired by reflexive and developmental approaches draw up in recent analyses of multi-actor projects.

This could be used by policy makers and RDPs' evaluators.

After introducing the research questions (introduction), conceptual framework and background of this study are presented in section 2. The description of the methodology framework applied to identify the relevant literature and practices is provided in section 3 and the analysis of the main analytical frameworks applied to the AIS is in section 4. These are then discussed along with the proposal of a development-oriented framework analysis which encompasses approaches and variables not considered in previous integrated frameworks (section 5). Policy and practical implications, limitations and advancements against the state of art are discussed in section 6. The main conclusions are presented in section 7.

Theoretical framework

The Agricultural Innovation System (AIS) approach is widely used as a general theoretical framework to detect the complexity of interactive innovation process and the development of capacities. The AIS approach recognizes innovation as a systemic-oriented (Klerkx et al.,

2012) and co-evolutionary process (Smits and Kuhlmann, 2004), combining technological, social, economic, organisational and institutional change (EU SCAR, 2012; Klerkx et al., 2012). Innovation is achieved through an interactive (social) process, which involves wide networks of actors and occurs within cognitive frames (paradigms, cognitive rules and regimes) that affect its speed and direction (Hermans et al., 2013; Klerkx et al., 2010). The AIS approach emphasizes continuing process of interaction among actors (cyclic learning process), within an enabling environment, aimed at addressing problems, opportunities and challenges which can turn into innovations. This capacity to innovate needs to be developed at individual, organizational, inter-organizational and system dimensions. According to a widely accepted definition, Capacity Development (CD) is related to the process whereby people, organizations and society unleash, strengthen, create, adapt and maintain capacity to manage their affairs successfully over time (OECD 2006, 2008; TAP, 2016). The CD framework is focused on the inter-dimensional, "collective" capacity to learn and inform future practice (OECD, 2006).

A significant body of experimental and theoretical studies approaches innovation concept as a complex social learning process which develops through a progressive aggregation and mutual adjustment of roles and identities among actors of different systems (Arkesteijn et al., 2015; Klerkx et al. 2010; Brunori et al., 2008; Douthwaite, 2016; 2017). Innovation processes take place in complex systems that are shaped by the interaction between bio-physical, ecological, climatic, social, economic and political elements.

A complex system can be defined as a system that consists of parts that are interrelated and from which one cannot deduce the behaviour of that system. The interaction among the parts leads to a continuous re-articulation of resources and power relationships within the network, generating a dynamic balance. The different parts co-evolve, within and as part of the system, and adapt to each other so that what evolves is an ongoing adaptation function between the interacting elements. Therefore, complex systems are characterized by high dynamism, interdependence and non-linear relationships. They are also co-evolutionary and adaptive systems.

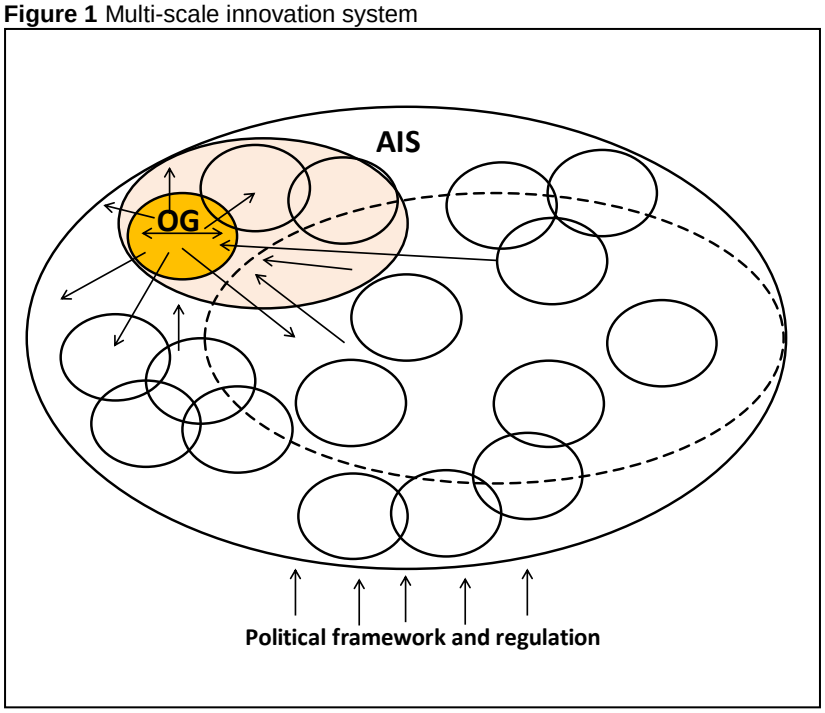
The overall system behaviour is influenced by the existence of different spatial scales (multi-scale dimension): the behaviour at the bottom scale influences behaviour on the larger scale, and reversely. Interdependencies among the parts exist both at the same scale or different spatial scales within the system.

Three main aspects are important to the complexity approach. The first concerns the description of a topic in terms of scale of observation (spatial and temporal). The second deals with the amount of information necessary to describe the topic, which is dependent on the scale of observation of the system. "The amount of information necessary to describe the system" defines the degree of complexity (Bar-Yam, 1997). The third aspect concerns the assessment of the effectiveness of interventions, that might call for a multi-level analysis (Bar-Yam 2004).

OGs can be defined complex adaptive systems, as they're characterised by self-organization, non-linearity, not fully predictable outcomes, variety of actors, continuous feedback loops, dynamic interdependences, and so on.

OGs are local scale innovation systems (LIS) composed by interacting actors, which work in connection with each other to achieve a common goal; at the same time, they are part of broader multi-scale systems, with which they are in dynamic interrelations and within which they realize their goals, choices and actions. This means that the behaviour of each OG is influenced by the behaviour on the larger scale, and reversely (fig. 1).

Figure 1 Multi-scale innovation system



Source: Authors elaboration

Methodology

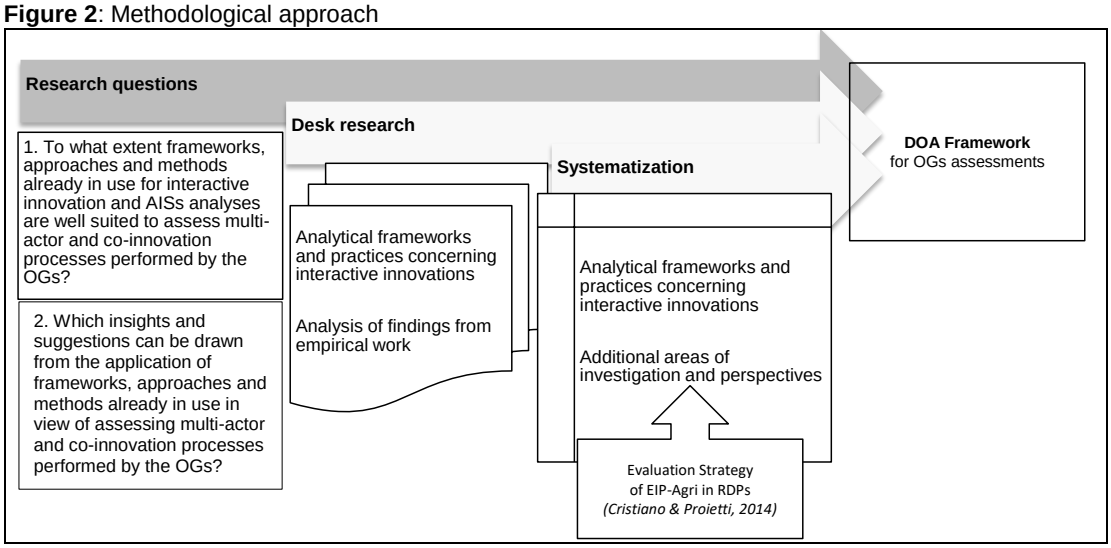
The study was carried out through a desk research aimed at identifying the most useful frameworks and approaches which could be applied to analysing multi-actor and co-innovation processes performed by the OGs (figure 2).

In view of identifying additional areas of investigation and perspectives, other studies and practices already in use to assess and to provide policy advice and insights on AISs and agricultural interactive innovations have been analysed.

The results of these analyses were compared to the evaluation strategy previously defined by the authors for the specific purpose of analysing the EIP-Agri implementation in RDPs (Cristiano and Proietti, 2014b).

Insights emerged from empirical studies conducted by the authors since 2012 (Cristiano and Proietti, 2017; 2014a) on cooperative innovation projects were also taken into consideration.

Figure 2: Methodological approach



Source: Authors elaboration

The insights drawn from the different studies have been then systematized into a possible analytical framework for further perspective analysis of OGs.

Analytical frameworks and practices concerning interactive innovations

In line with the evolution of the conceptual framework, there is an increasing interest of recent research and evaluation on innovation systems' analyses.

Over the years, a relevant body of literature have been directed to develop comprehensive analytical frameworks. As well, a certain number of more recent studies and practices provide a substantial contribution in advancing the traditional analytical frameworks, through focusing on specific issues of innovation systems: setting and enabling the environments for innovation processes, fostering systems' functioning, organizational learning for transformative change and innovation-driven research.

All these studies could be systematized towards more complete and appropriate assessment frameworks for multi-actor approaches and interactive innovations (figure 3).

Analytical frameworks regard three main branches, which are complementary one to each other for comprehensive assessments of the AISs: the structural oriented analysis, the functional analysis and the transformative-oriented analysis (Lamprinopoulou et al., 2014).

The first concerns actors and interactions between them, including the institutions that govern and influence behaviours and relationships of innovation systems (Hall et al., 2006; Wieczorek and Hekkert, 2012), through formal and informal rules.

Functional analysis is process-oriented and focuses on the key functions of structures which directly influence the development, diffusion and use of innovations and the performance of the entire innovation systems (Bergek et al., 2008). The functional analyses are oriented to assess the extent to which (presence, goodness) key functions are fulfilled, to capture their dynamics (virtuous and vicious cycles), and how blocking mechanisms influence the performance of the innovation systems (Bergek et al., 2008; Hekkert et al., 2009).

Lamprinopoulou et al. (2014) provided an extremely well-suited systematization of the current structural, functional and systemic failure analyses into an integrated transformative oriented analytical framework. This addresses the issue of examining strategic challenges (directionality, policy coordination, demand articulation, and reflexivity) which influence the functioning of the innovation systems as a whole. Particularly, systemic failures (and merits) analyses concern, at the micro-level, the functioning of the actors into the innovation processes (interaction, infrastructural, institutional, market, capabilities) and, at the macro-level, the capacity of the system to respond to long-term transformative change (Weber and Rohracher, 2012; Van Mierlo et al., 2010; Klerkx et al. 2010).

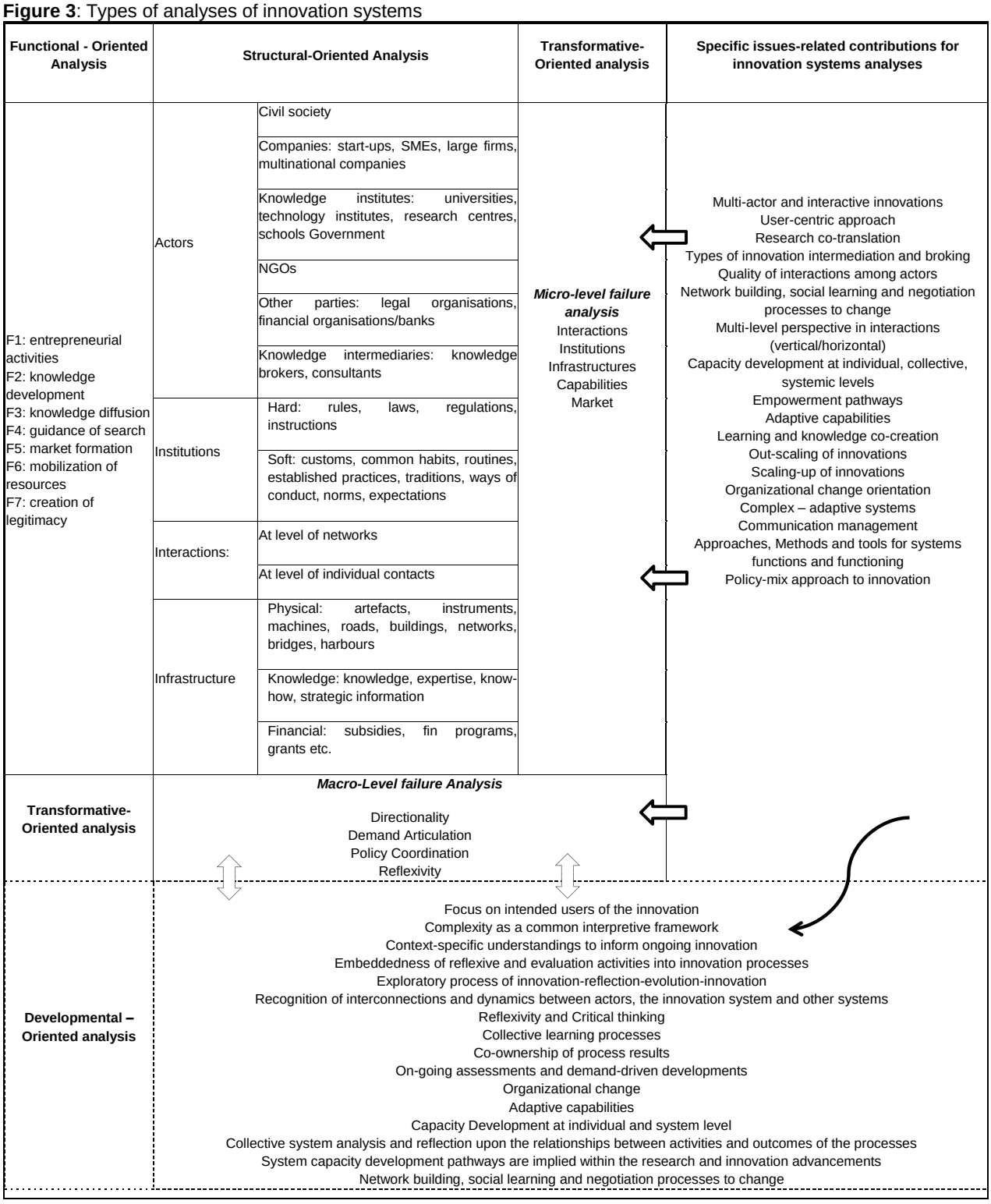
Most of the recent literature is focused on analysing innovation networks' structures, levels and dynamics.

Particularly, multi-level and network perspectives brought advances to functional-oriented analyses, through contributing to disclosure the different levels and the functions of interactions in innovation systems: fast-changing factors at micro level; stabilising mechanisms at meso-level and slow-changing factors at macro level (Lamprinopolou et al., 2014; Hermans et al., 2013; Douthwaite et al., 2003; Klerkx et al. 2010). The multi-level perspective supported complexity-aware analyses on knowledge organization and the scaling-up and scaling-out of innovations at local level (Wigboldus et al., 2016; Hermans et al., 2013; Hermans et al. 2013; Moore and Westley, 2011).

Some authors assess the co-evolutionary process of interactive innovation against an AIS framework (Leeuwis and Aarts, 2011; van Mierlo et al., 2010; Hall and Clark, 2010). Several factors come into play: number and types of actors, relationships, policy design and

implementation, relational dynamics, organizational structure, local context and rules. According to this perspective, innovation systems are understood as complex adaptive systems able to mutate and self-organize (adapt) corresponding to changes, following non-linear dynamics.

Figure 3: Types of analyses of innovation systems



Source: Authors elaboration based on Lamprinopoulou (2014)

Brunori et al. (2011), starting from the actor network theory, propose an evaluation model focused on the analysis of management communication procedures and organization of relationships based on continuous negotiation and adaptation of relations leading to change.

Relevant contributions have been also provided on needs, type and capabilities of innovation systems' intermediaries.

These functions are described in greater details by Howell (2006), who focuses on articulation of innovation needs and network composition, and by Smits and Kuhlmann (2004), who identify intermediary functions in interfacing with different actors and animating groups: innovation process management, demand articulation and network composition (Klerkx et al., 2009; Leeuwis and Aarts 2011; Koutsouris, 2012). Under this perspective, innovation brokers have been understood as facilitators, communication experts or network supporters and they are in need of specific capacity development for stimulating and managing learning processes with different stakeholders (Brunori, 2011; Proietti and Brunori 2014).

The research of the European thematic network AGRISPIN project (www.agrispin.eu) focuses on the role and interplays of different actors in networks, through endorsing the reflexivity approach to support collective learning.

A contribution to the analysis of demand articulation is provided by some recent European studies which, mostly inspired by the responsible research and innovation (RRI) and multiple perspectives approaches, are devoted to reconceptualising research (co)-translation in agricultural innovation through enabling easier access to scientific results, in order to enhance responsiveness of research and facilitating its diffusion and up-takes (Ingram et al., 2018; Joly et al., 2015).

A contribution to transformative macro-level analyses aiming at supporting policy coordination to enable environments for innovations and their effective uptakes, is provided by Flanagan et. al. (2010). They propose a "policy mixes approach which is compatible with a more sophisticated, multi-actor, multilevel and dynamic understanding of the processes by which policies relevant to innovation emerge, interact and have effects".

A *corpus* of literature on AISs inspired by the theory of change, utilization-focused and developmental evaluative approaches is very convincingly coherent to multi-actor approaches and interactive innovation processes. These approaches focus on innovation as the result of the interaction of multiple actors and processes in complex systems and support common understating on programme/project progress and effects, ownership of the evaluation findings and on- going adaptation of innovation processes (Patton and Horton; 2009; Botha et. al, 2017; Hood et al., 2014; Douthwaite, 2016; 2017; Mayne and Stern, 2013; Pawson, 2013). These frameworks generally aim at fostering reflexive processes to enhance learning and change (Klerkx et al., 2010; Horton and Mackay, 2003) following the principle that "much useful learning can be extracted from the evaluation process itself" (Patton, 1997).

Particularly, Reflexive Monitoring in Action (RMA) supports collective system analysis upon the relationships between activities and results of the innovation processes which facilitate network building, social learning and negotiation processes to change (van Mierlo et al., 2010; Arkesteijn et al. 2015).

Theory of change, utilization-focused and developmental approaches have been applied instrumentally to answer evaluative questions which refer both to the technology adoption pathway, that concerns the extent and impact of its adoption, the quality and effectiveness of the innovation process, and the empowerment (or capacity) pathway, that deals with the resulting system capacities that have been developed (Douthwaite, 2017).

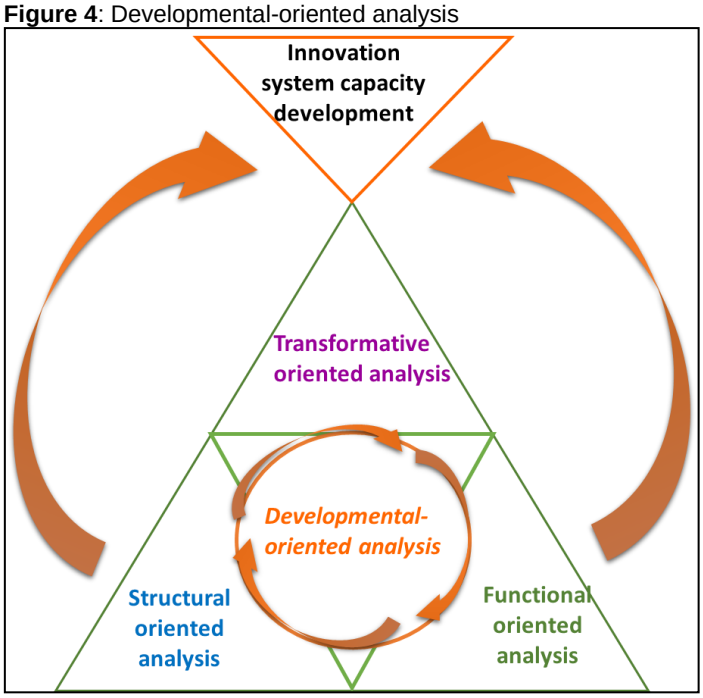
Towards a developmental-oriented analysis of multi-actor innovations

The analysis of the literature highlights a certain number of evaluative practices and meaningful insights applied to multi-actor research and innovation projects which could be used to expand the areas of investigation proposed by Lamprinopolou (2014).

Particularly, the paper proposes a developmental-oriented analytical (DOA) framework to assess OGs performances and their contribution to major long-term goals of rural policy.

This is built by combining the integrated analytical framework with participatory, capacity development and reflexive approaches highlighted by the most recent literature, both scientific and emerging, directly, from multi-actor experiences (figure 4).

Figure 4: Developmental-oriented analysis



Source: Authors' elaboration

The word developmental, inspired by both the CD approach and the principles of developmental evaluation (Patton, 2008), captures the major potential of the DOA framework proposed in this study: the embeddedness of reflexive and evaluative activities, as well as evaluators, into multi-actor innovation processes and systems' dynamics. This would support critical thinking in multi-actor organizations, through collective learning processes and capacity development paths, both at the partnership and system level (e.g. OGs and policy makers).

Also, the integration of reflexive and developmental approaches into already-in-use analytical frameworks is likely to support adaptive capacity development in complex contexts, where real-time critical observation and feedback, course improvements, adaptations and intentional changes along the emergent paths are demanded to achieve the goals of innovation processes (Patton, 2008).

In this sense, developmental and reflexivity approaches could be seen as valuable systemic instruments which can contribute to solve systemic problems and to create enabling environments for innovation system's functions, by stimulating and organising actors' participation, creating space for capabilities development and promoting interactions among heterogeneous actors (Wieczorek and Hekkert 2012).

The DOA framework presented in figure 4 is based on the insights from previous studies aiming at structural, functional and transformative oriented analyses (Lamprinopoulou, 2014; Bergek et al. 2008; Wieczorek and Hekkert 2012) and from the evaluation strategy proposed by Cristiano and Proietti (2014a). The overarching interactive process explains the reflexivity and developmental process proposed for the innovation systems.

The developmental-oriented analytical framework proposes valuable advancements in dealing with very specific challenges of multi-actor projects that, apparently, are less treated

in the reviewed analytical frameworks: micro-level perspective of multi-actor projects and context-related issues; specific goals of innovation (project); presence of actors in multiple projects; interconnections between a multiplicity of multi-actor projects and the local AISs, within a territory; non-linear innovation processes; mutual embeddedness in the environment and uncertainties; co-ownership for project's results by the actors; demand-driven developments of the multi-actor projects; capacity development of actors at system level; interrelationship between productive and research world.

Functionality of different actors in interactive innovations also needs to be adequately considered. in a multi-actor project, the farmer is the key actor of the innovation process because innovation has to be tailored upon his needs or opportunities for development. The participation of the other actors is relevant due to the functions they perform to achieve the project goal, and, in principle, one actor could play different functions in different multi-actor projects.

As an example, previous investigations on field highlighted that the participation of producers' organizations to a certain number of cooperative innovation projects, in Italy, was case-by-case arranged to play different functions (i.e. innovation brokering, advisory service) which they could play effectively in each partnership (Cristiano and Proietti, 2014a).

In this respect, the assessment of the "goodness" of different functional patterns, which is a still pending issue in functional-oriented analyses framework (Bergek et al., 2008), is less relevant in the multi-actor perspective. In the developmental-oriented analyses functions' performances should be assessed for their effectiveness, in terms of presence and adequateness, compared to the goals of the specific project.

The utilization-focused approach at the basis of the DOA framework entails that the primary intended users are engaged in an exploratory process of "innovation-reflection-evolution-innovation" towards transformational changes in complex environments. In line with the multi-actor principles, this iterative process favours farmers' demand-driven developments and co-ownership over the project implementation (Patton, 2008; Gamble, 2008).

Also, for analytical frameworks based on the developmental and reflexive approaches the creation of what Patton calls the "interpretative framework" s a conditionality to fulfil since the very beginning of the innovation processes. This helps organizations recognizing situational complexity and working through differences in perceptions, knowledge, values and expectations, which are typical in complex innovation systems characterized by a multitude of actors at different levels of intervention.

This is particularly relevant for the specific case of the OGs, also because of the novelty of this policy instrument. The involvement of both administrations and rural actors in reflexive and developmental processes would support developing a better and shared understanding the practical implications of such instrument, a major awareness on reciprocal expectations and it could favour on-going adjustments and decision-making.

Ultimately, the introduction of developmental approaches into analytical frameworks for multi-actor projects allows capturing and dealing with connectivity issues, such as the trans-system dynamics (between different projects) and interconnections with the environment, which could bring to synergies, trade-offs and crowding-out effects. Empirical studies let these issues emerge in the narratives of the actors which were involved in participatory approaches for monitoring co-innovation projects. The rising of this tacit knowledge needs to be facilitated by experts, through bringing critical thinking and supporting individual and collective reflexivity on effects of connectivity dynamics (Cristiano and Proietti, 2017).

Discussion

The DOA framework is proposed for the design of evaluation strategies aiming at assessing OGs performances and innovation processes at local level. As well, the DOA could be a

reference for policy/programme design aiming at promoting the development of innovative capacities and systems in agriculture.

In fact, developmental and reflexive approaches to innovation process analyses favour "systematic learning which can improve our understanding of the opportunities and limitations of innovation system analysis and policy making" (Bergek et al. 2008).

The main advancement of developmental-oriented analyses is the continuous involvement of end-users and institutions in research and innovation development, which allows iterative improvements in processes, policy learning and major alignment and coordination of the innovation systems.

Differently from other analyses, where assessments are mostly applied externally to the AISs and in ex post phases, this should allow more timely development of adaptive innovation systems.

The DOA, at least for assessing the OGs performances, is also likely to support collective commitment, of both project and institutional levels, on-going assessments – on structures, roles, functioning and interactions –, as well as organizational change and system capacity development pathways.

The DOA framework is proposed for the evaluation at RDP level. This would imply the assessment on the multitude of OGs supported by each program and, therefore, the possibility to carry out comparative analyses, as well as to store evaluative knowledge and policy learning towards better informed future programming and OGs. However, a feasibility precondition of the proposed DOA framework represents a full outsourcing of evaluation services over certain time and at RDP level, or at least of OGs implementation.

The proposed DOA framework still needs major refinements which will be addressed through further research. Its major limitation lies on the absence of empirical work testing of the proposed framework as a whole. Still, the appropriateness of the DOA for the assessment of the OGs still needs to be tested at different empirical levels (program/project).

Also, both OGs and developmental and reflexive approaches are a novelty for RDPs' evaluators. Thus, the implementation of the DOA framework could encounter boundaries in terms of evaluative capabilities. As well, time-consuming and costs typically associated to developmental exercises could prevent institutions and local actors from commitment.

In terms of practical implications, the DOA framework should be applied at on on-going basis since the very beginning and during the entire implementation of the innovation process. Ex post analyses should also serve assessments on the impacts in terms of capacity development and long-lasting relations among the AIS actors and contribution of OGs to overarching policy goals. This implies awareness of responsible institutions and efforts in terms of governance and resources of evaluation processes.

Conclusions

The study presented in this paper is aimed at supporting the discussion on analytical frameworks and practices to analyse and support of innovation processes of OGs in rural development policy.

This study highlights an increasing interest of the current evaluation and research practices on interactive innovation processes, collaborative learning and capacity development both at individual, collective and systems levels. Particularly, transformative-oriented frameworks have been developed in view of supporting capacity development in innovation systems.

Evaluation practices mostly rely on user-centric approaches and they demonstrate an innovative potential to enhance innovation capacities and institutional change in the context

of complex project/programme, where partnerships and actors are clearly mapped and involved in collective learning and commitment to change.

Participatory and reflexive approaches are particularly applied by international agencies to support institutional and programme change in the context of international programmes. Nevertheless, little evidence has been found on the implementation of such participatory and reflexive evaluative approaches in the context of the European policy for research and innovation (EIP-Agri) and at lower levels of the AISs.

Acknowledgements

This study is part of a pilot of the National Rural Network aimed at supporting the administrations and the evaluators for the setting up of an adequate Monitoring and Evaluation system of RDPs.

References

Arkesteijn M., van Mierlo B., Leeuwis C., 2015. The need for reflexive evaluation approaches in development cooperation. *Evaluation*, 21(1): 99-115. doi: 10.1177/1356389014564719

Bar-Yam, Y, 2004. *Making Things Work; Solving complex problems in a complex world*. NECSI Knowledge Press

Bar-Yam, Y. 1997. *Dynamics of Complex Systems*. Perseus, Reading

Bergek, A., Jacobsson, S., Carlsson, B., Lindmark, S., Rickne, A., 2008. Analyzing the functional dynamics of the technological innovation systems: a scheme of analysis. *Research Policy* 37, 407–429.

Botha N., Coutts J., Turner J., White T., Williams T., 2017. Evaluating for learning and accountability in system innovation: Incorporating reflexivity in a logical framework. *Outlook on Agriculture*, 46(2): 154-160.

Brunori G., Berti G., Klerkx L., Tisenkopf T., Moschitz E., Home R., Barjolle D., Curry N., 2011. *Learning and innovation networks for sustainable agriculture: a conceptual framework*. Deliverable n. 2.1 Eu project SOLINSA

Cristiano S., Proietti P., 2017*. Evaluation of Medium-Long Term Effects of Innovation Interventions in Rural Development Programmes: The Use of FADN*. In 23th ESEE 2017 Proceedings.

Cristiano S., Proietti P., 2014a. *Acting as Agricultural Innovation brokerage in Italy: experiences from the Rural Development Programmes 2007-2013*. In 11th European IFSA Proceedings: 803-812.

Cristiano S., Proietti P., 2014b. *Farm Innovation through Rural Development Programmes 2014-2020: an evaluation model of the EIP*. In 11th European IFSA Proceedings: 141-152

Douthwaite B., Mayne J., McDougall C., Paz-Ybarnegaray R., 2017. Evaluating complex interventions: A theory-driven realist-informed approach. *Evaluation* 23 (3): 294– 311.

Douthwaite B., 2016. Beyond the pipeline model: *New paths for agricultural research to enhance capacity to innovate*. Welt-Sichten. Dossier 7-2016, 9–10.

Douthwaite, B., Kuby, T., van de Fliert, E., Schulz, S., 2003. Impact pathway evaluation: an approach for achieving and attributing impact in complex systems. *Agricultural Systems* 78, 243–265.

Flanagan K., Uyarra E., Laranja M. 2010. The 'policy mix' for innovation: rethinking innovation policy in a multi-level, multi-actor context. *MPRA Paper No. 23567*, posted 10 July 2010 08:39 UTC.

Gamble, J. A. A. (2008). A developmental evaluation primer. *The J.W. McConnell Family Foundation*, Retrieved from website: www.betterevaluation.org/en/resources/guides/developmental_evaluation/primer.

Hall, A., Janssen, W., Pehu, E., Rajalahti, R., 2006. *Enhancing Agricultural Innovation: How to Go Beyond the Strengthening of Research Systems*. World Bank, Washington.

Hall, A., Clark, N., 2010. What do complex adaptive systems look like and what are the implications for innovation policy? *Journal of* International Development. 22, 308–324.

Hekkert M.P., Negro S.O., 2009. Functions of innovation systems as a framework to understand sustainable technological change: Empirical evidence for earlier claims. *Technological Forecasting and Social Change,* Vol. 76, Issue 4: 584-594. https://doi.org/10.1016/j.techfore.2008.04.013.

Hermans F., Stuiver M., Beers P.J., Kok K., 2013. The distribution of roles and functions for upscaling and outscaling innovations in agricultural innovation systems. *Agricultural Systems* 115: 117–128

Hood O., Coutts J., Hamilton G. Jiggins J., 2014. *Analysis of the Role of an Innovation Broker Appointed by an Environmental Innovation Partnership in the Cotton Industry, Queensland, Australia*. IFSA 2014 Proceedings.

Horton D. Mackay R., 2003. Using evaluation to enhance institutional learning and change: recent experiences with agricultural research and development, *Agricultural Systems* 78: 127-142

Ingram J., Dwyer J., Gaskell P., Mills J., De Wolfe P., 2018. Reconceptualising translation in agricultural innovation: A co-translation approach to bring research knowledge and practice closer together. *Land Use Policy* 70: 38–51.

Joly P.B., Gaunand A., Colinet L., Larédo P., Lemarié S., Matt, M., 2015. ASIRPA: A comprehensive theory-based approach to assessing the societal impacts of a research organization. Res. Eval. 24: 440–453.

Klerkx, L., Hall, A., Leeuwis, C., 2009. Strengthening agricultural innovation capacity: are innovation brokers the answer? *International Journal of Agricultural Resources, Governance and Ecology* 8, 409–438

Klerkx L., Aarts N., Leeuwis C., 2010. Adaptive management in agricultural innovation systems: the interactions between innovation networks and their environment. Agricultural Systems 103: 390–400.

Klerkx L., van Mierlo B., Leeuwis C., 2012. Evolution of systems approaches to agricultural innovation: concepts, analysis and interventions. In: Darnhofer I., Gibbon D., Dedieu B. (eds) *Farming Systems Research into the 21st Century: The New Dynamic*. Springer, Dordrecht.

Koutsouris A., 2012. Exploring the emerging facilitation and brokerage roles for agricultural extension education. *AUA Working Paper Series*. Athens, Greece, Agriculture University of Athens: 1-34.

Lamprinopoulou C, Renwick A, Klerkx L, Hermans F, Roep D (2014) Application of an integrated systemic framework for analysing agricultural innovation systems and informing innovation policies: comparing the Dutch and Scottish agrifood sectors. *Agricultural Systems* 129:40–54. doi:10.1016/j.agsy.2014.05.001.

Leeuwis C and Aarts N. 2011. Rethinking communication in innovation processes: Creating spacefor change in complex systems. *Journal of Agricultural Education and Extension* 17(1): 21–36.

Mayne J., and Stern. E., 2013. Impact evaluation of natural resource management research programs: A broader view. *ACIAR Impact Assessment Series Report*. 84. Australian Centre for International Agricultural Research: Canberra. 79 pp.

Moore M.L. and Westley F., 2011. Surmountable chasms: networks and social innovation for resilient systems. *Ecology and Society*, 15 (1).

OECD, 2008. Accra Agenda for Action. *DAC Guidelines and Reference Series*. OECD, Paris, France.

OECD, 2006. The challenge of capacity development: working towards good practice, *DAC Guidelines and Reference Series*. OECD, Paris, France.

Patton, M.Q. 2008. *Utilization-focused evaluation*, 4th edition. Thousand Oaks, CA: Sage.

Patton M.Q.,1997. *Utilization-focused evaluation: the new century text*. Sage publication. Thousand, Oaks, CA

Patton M.Q. Horton D., 2009. Utilization-focused evaluation for agricultural innovation. *ILAC Brief* 22, July 2009. CGIAR.

Pawson R. 2013. *The Science of Evaluation: A Realist Manifesto*. London: SAGE.

Proietti P., Brunori G., 2014. *Become a broker: the metamorphosis of an advisor*,11th European IFSA Proceedings: 813-823

Smits R. and Kuhlmann S., 2004. The rise of systemic instruments in innovation policy. International *Journal of Foresight and Innovation Policy* 1: 4-30

Tropical Agriculture Platform, 2016. *Common Framework on Capacity Development for Agricultural Innovation Systems: Guidance Note on Operationalization*. CAB International, Wallingford, UK.

van Mierlo B., Arkesteijn M., Leeuwis C., 2010. Enhancing the reflexivity of system innovation projects with system analyses. *American Journal of Evaluation* 31 (2), 143–161.

Weber and Rohracher, 2012. Legitimizing research, technology and innovation policies for transformative change; Combining insights from innovation systems and multi-level perspective in a comprehensive 'failures' framework. *Research Policy* 41, 1037–1047.

Wieczorek, A., Hekkert, M., 2012. Systemic instruments for systemic innovation problems: a framework for policy makers and innovation scholars. *Science and Public Policy* 39, 74–87.

Wigboldus, S., Klerkx, L., Leeuwis, C. et al. 2016. Systemic perspectives on scaling agricultural innovations. A review. *Agronomy for Sustainable Development*, 2016, Volume 36, Number 3, Page 1. https://doi.org/10.1007/s13593-016-0380-z

World Bank (2006). *Enhancing Agricultural Innovation: How to Go Beyond the Strengthening of Research Systems*. Washington DC: The World Bank.