INNOGROW Project

A1.1 “Methodology to gather data on new disruptive technologies’ impact on rural economy SMEs’ competitiveness and productivity”

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1 Introduction

The "Regional policies for innovation driven competitiveness and growth of rural SMEs – INNOGROW" is an Interreg Europe project aiming to improve partners' policies on rural economy SMEs competitiveness as regards the integration of new production technologies and business models that lead to innovative products. The project will promote the adoption of innovation by rural economy SMEs, through sharing practices / experiences between regions and actors relevant to rural economy SMEs' competitiveness, and integrating lessons learnt into regional policies and action plans.

This document is an output of the INNOGROW project and constitutes the first part of Activity 1.1 "Investigating innovative technologies' impact on rural economy SMEs competitiveness and productivity", which aims at developing an impact analysis report to provide policy makers of the INNOGROW regions primarily, and of other EU regions / countries secondarily, with an overview of the economic and environmental benefits of the main new technologies on rural economy SMEs' competitiveness and productivity, and promote improvement of own policy instruments' implementation.

The main purpose of the methodology report is to present the scope of the impact analysis, following a preliminary desk research, and to provide Newcastle University (leading this activity) and INNOGROW partners with appropriate and effective research methods and evidence collection tools. The methodology and tools will be used to gather the necessary input as regards the impact derived from the adoption of new technologies, such as innovative production technologies, technologies supporting products' distribution, technologies supporting product's safety, taking into account regional conditions and challenges of partners' areas.

Specifically, the methodology will define the research questions, objectives and policy purposes of the analysis, and will include the methodological tools and techniques to be employed for evidence collection and analysis. It will provide a detailed action time-plan for the timely and effective administration of evidence collection and analysis process.

The report is outlined as follows: section 2 provides information about the context of the project and the interdependencies of the particular activity with other INNOGROW activities; section 3 provides working definitions for the key concepts “productivity”, “competitiveness” and “rural economy SMEs”; section 4emphasizes the importance of analysing factors of the modern rural economy that influence adoption of technological innovations; section 5 describes the areas and type of impact to be investigated; section 6 describes the overall methodology approach, defining the research questions and data collection targets; section 7and 8 provide the tools and techniques to be employed for evidence collection and analysis; section 9 presents a roadmap for the implementation of INNOGROW Activity 1.1.

2 Context of the INNOGROW project

2.1 The INTERREG EUROPE programme

The INTERREG EUROPE programme (www.interregeurope.eu) promotes the exchange of experience on thematic objectives among partners throughout the Union on the identification and dissemination of good practices, to be transferred principally to operational programmes under the Investment for Growth and Jobs goal, but also, where relevant, to programmes under the European Territorial Cooperation (ETC) goal. This will be done via the support and facilitation of policy learning, sharing of knowledge, and transfer of good practices between regional and local authorities and other actors of regional relevance.

INTERREG EUROPE is one of the instruments for the implementation of the EU’s cohesion policy. With this policy, the EU pursues harmonious development across the Union by strengthening its economic, social and territorial cohesion to stimulate growth in the EU regions and Member States. The policy aims to reduce existing disparities between EU regions in terms of their economic and social development and environmental sustainability, taking into account their specific territorial features and opportunities. For the 2014-2020 funding period, cohesion policy concentrates on supporting the goals of the Europe 2020 strategy, which targets to turn the EU into a smart, sustainable and inclusive economy delivering high levels of employment, productivity and social cohesion.

2.2 The INNOGROW project

European regions have an essential role to play in shaping and implementing policies for economic development. The economic and environmental challenges faced by rural economy SMEs are the ones INNOGROW partners focus on, and address with improved policies. Research results and the European Commission agree on the necessity to foster innovation adoption by rural economy SMEs, with the purpose to increase their productivity, competitiveness and internationalisation. The INNOGROW project idea has thus been developed to address these challenges through interregional cooperation, exchange and valorisation of good practices of regions, with the aim to influence policies both at regional and national level for improving the competitiveness of rural economy SMEs.

The "Regional policies for innovation driven competitiveness and growth of rural SMEs – INNOGROW" project aims to improve partners' policies on rural economy SMEs competitiveness regarding the integration of new production technologies and business models that lead to innovative products. The project will promote the adoption of innovation by rural economy SMEs, through sharing practices / experiences between regions and actors relevant to rural economy SMEs competitiveness and integrating lessons learnt into regional policies and action plans.

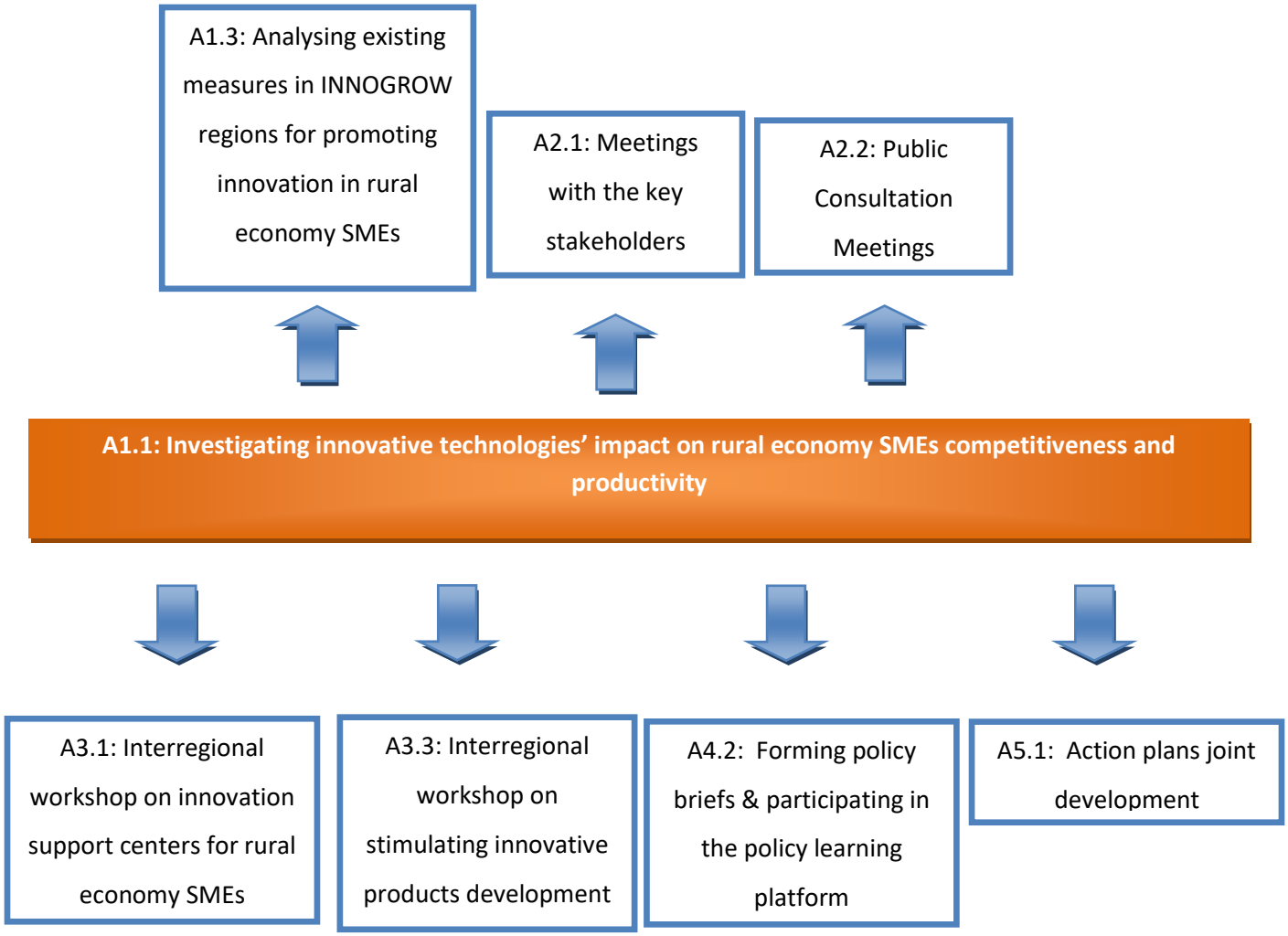
Rural economy SMEs need to remain globally competitive by adopting innovative solutions, new business models and modernisation approaches that will lead to increases in productivity and access to new markets. Territorial capacity building and policy innovation involving all regional actors are critical factors for promoting the diffusion of innovations, to maintain and strengthen SMEs' competiveness and consequently regions' growth. Regions in rural areas can play an important role in the modernisation of existing SMEs and the proliferation of innovative start-ups, providing incentives to promote the adoption of technological innovations, such as organic farming, functional food, crop resistance systems, selective breeding and feeding processes to boost livestock resistance to local conditions. At the management level, incentives need to be provided for mixed production of crops and livestock products, and new business models and coalitions that lead to innovative business ideas.

2.3 INNOGROW activity A1.1

The INNOGROW Activity A1.1 "Investigating innovative technologies' impact on rural economy SMEs competitiveness and productivity" entails the analysis of the impact of new disruptive technologies on the competitiveness and productivity of rural economy SMEs, taking into account regional conditions, challenges and specificities of the INNOGROW partners' territories. In the context of the INNOGROW project, rural economy SMEs are SMEs that operate in rural areas and contribute to the GDP of rural area connected with rural-specific activities. Based on a methodology for impact analysis of new technologies for rural economy SMEs, the partnership will investigate the costs & benefits, environmental impact, productivity scenarios, and enablers and barriers of the adoption of new technologies by rural economy SMEs. All partners will provide input as regards regional conditions and challenges, and cases on the selected new technologies for SMEs in the INNOGROW regions. The analysis of the evidence collected will result in an impact analysis report that will enable partners to realise the economic and environmental benefits occurring from the adoption of new technologies by rural economy SMEs in their regions.

2.4 Interdependencies of Activity A1.1 with other INNOGROW activities

The results of activity A1.1 will provide input and support the implementation of the forthcoming workshop on innovation support centres for rural economy SMEs (Activity A3.1), the stakeholders group meetings (A2.1), the public consultation meetings (Activity A2.2), the development of the policy recommendations report on the improvement of existing policy measures (Activity A1.3), the workshop on stimulating innovative products development (Activity A3.3), the policy briefs to be developed in the second semester (A4.2) and the partners' action plans (A5.1),where relevant.



Activity A1.3 Analysing existing measures in INNOGROW regions for promoting innovation in rural economy SMEs:

Activity A1.3 includes a comparative analysis of existing policies on rural SMEs competitiveness that foster the adoption of innovation by rural economy SMEs in the INNOGROW regions, and the development of policy recommendations for the INNOGROW policy makers. The policy purpose of this activity is to offer a policy overview that will enable policy makers to understand the dynamics and the potential of the existing policy measures in their regions, and enable them to improve the management and implementation of processes of own policy instruments, focusing on innovation support services for

rural economy SMEs. Policy measures may include funding or support for patents expenses and usage, assessment of new products commercial potential, and new technology feasibility assessments, business plans for diversification of production, research on opportunities and marketing plan for new markets, development of support centre informing rural SME's on innovative solutions' exploitation and appropriate financial instruments, consulting on innovative solutions to optimise value chain, consultation for new collaboration opportunities. In this context, the results of the activity A1.1 will be used as an input to facilitate the activity A1.3.

Activity A2.1Meetings with the key stakeholders:

Activity A2.1 includes regional meetings with stakeholder groups identified in the proposal to consult on measures and incentives to support the adoption of innovation by rural economy SMEs in regions of the partnership and to secure their involvement and input on the regional action plans. The results of the activity A1.1 will consist the knowledge basis for the discussions at the stakeholder groups meetings as regards the benefits created from the adoption of new disruptive technologies for rural economy SMEs.

Activity A2.2 Public consultation meetings:

Activity A2.2 entails the organisation of regional meetings in all partners areas (excluding UNEW) with the participation of stakeholders, rural economy SMEs representatives, public authorities and members of the public, with the aim to co-shape a future that will allow diffusion of innovations that disrupt existing business models and changing habits of the public. The policy purpose of this activity is to build consensus and ensure support by a broader regional audience. The results of the activity A1.1 about the impact of new disruptive technologies on the competitiveness and productivity of rural economy SMEs will be used as an input for the discussions at the public consultation meetings.

Activity A3.1 Interregional workshop on innovation support centres for rural economy SMEs:

In the context of activity A3.1, an interregional training workshop for regional authorities' officials will be organised, with the participation of external experts. The workshop will be focused on the implementation of support services for rural economy SMEs, providing incentives and consultation for the adoption and consolidation of new business models and technologies. Indicative innovation support services include the development of business plans for restructuring and diversifying production, search for new markets, marketing plan for new markets, value chain analysis and quantification of problems,

informing SMEs for innovative solutions to optimise value chain etc. The results of activity A1.1 will be used at the workshop to develop ideas on how to provide incentives and innovation consulting services to rural economy SMEs to foster the adoption of new technologies.

Activity A3.3 Interregional workshop on stimulating innovative products development:

Activity A3.3 includes the organisation of interregional study visits to transfer experience on the investments on new technology exploited by rural economy SMEs to modernise their production processes, and on the existing policies that led to these results. The policy purpose of this activity is to transfer experience among the INNOGROW partners, enhance cohesion on the subject of the project, and foster inspiration on how to steer policy implementation towards the modernisation of production processes. The results of activity A1.1, offering details about the impact of the adoption of new technologies by rural economy SMEs, will be used as a knowledge base for the implementation of the workshop.

Activity A4.2 Forming policy briefs & participating in the policy learning platform:

Activity A4.2 entails the adaptation of the lessons learnt from the project into policy briefs for the INNOGROW policy makers and for a European-wide readership, with the aim to contribute to the Interreg Europe relevant policy learning platform and to further disseminate the project's results. Therefore, the lessons learnt from the activity A1.1 will be adapted and included in the policy briefs of the second semester.

Activity A5.1 Action plans joint development:

In the context of activity A5.1, the INNOGROW partners (excl. UNEW) will develop regional action plans to improve the policy instruments addressed by the project, based on the experiences exchanged during the project. The lessons learnt from activity A1.1 will be integrated into action plans of partners that plan to provide incentives to the local rural economy SMEs to adopt new technologies.

3 Key concepts

In order to follow a common approach in the implementation of this activity, it is significant to define the concepts of “rural economy SMEs”, “SMEs productivity” and “SMEs competitiveness”.

3.1 Rural economy SMEs

Small and medium-sized enterprises (SMEs) are considered the backbone of Europe's economy as they represent 99% of all businesses across the EU. In the past five years, SMEs have created around 85% of new jobs and provided two-thirds of the total private sector employment in the Union. The European Commission considers SMEs and entrepreneurship as key to ensuring economic growth, innovation, job creation, and social integration in the EU.

Small and medium-sized enterprises (SMEs) are defined in the EU recommendation 2003/361. The main factors determining whether an enterprise is an SME are a) the staff headcount and b) either the turnover or balance sheet total. According to the European Commission, the category of small and medium-sized enterprises (SMEs) is made up of enterprises, which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million. Within the SME division, a small enterprise is defined as an enterprise, which employs fewer than 50 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 10 million. Respectively, a small enterprise is defined as an enterprise, which employs fewer than 10 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 2 million. Ceilings apply to the figures for individual firms only. A firm that is part of a larger group include staff headcount/turnover/balance sheet data from that group too.

Company category	**Staff headcount**	**Turnover**	**Balance sheet total**
Medium-sized	< 250	≤ € 50 m	≤ € 43 m
Small	< 50	≤ € 10 m	≤ € 10 m
Micro	< 10	≤ € 2 m	≤ € 2 m

In the context of INNOGROW, the term "rural economy SMEs" refers to small and medium businesses, which operate in rural areas and contribute to the GDP of rural areas, connected with rural-specific activities. According to EU Urban-Rural Typology[1], a NUT3 region is classified as "Predominantly rural", if the share of population living in rural areas is higher than 50% and the region does not contain an urban centre of more than 200.000 inhabitants representing at least 25% of the regional population. For the purposes of the INNOGROW project, the definition of "rural economy SMEs" will remain as broad as possible so that the project consortium have more opportunities to discover and exchange best practices that will facilitate regional authorities to implement policies for promoting the adoption of technology innovations by SMEs in rural areas. Therefore, in the context of the INNOGROW project, rural economy SMEs refer to businesses driven by or based on natural capital or environment. This includes farming and forestry but also tourism, leisure, food (where linked to particular forms of natural capital or the environment, e.g. farm tourism, walking holidays) and/or activities of entrepreneurs locate in rural areas for quality of life.

In terms of the NACE classification[2], the following categories are considered relevant to the INNOGROW project:

AGRICULTURE, FORESTRY, ANIMAL HUSBANDRY AND FISHING
MANUFACTURING Manufacture of food products Manufacture of beverages Manufacture of tobacco products
ACCOMMODATION AND FOOD SERVICE ACTIVITIES (AGRO-TOURISM) Accommodation

[1] http://ec.europa.eu/eurostat/statistics-explained/index.php/Urban-rural_typology
[2] http://ec.europa.eu/eurostat/documents/1965800/1978760/CORRESPONDENCETABLENACEREV.2NACE-REV.1.1.pdf/df9cd8a8-0b4a-4197-bad7-727a0b9fd59b

Food and beverage service activities Tourist-oriented transportation or other activities
ENTERTAINMENT AND RECREATION Varied cultural, entertainment and recreational interests of the general public, including live performances, operation of museum sites, gambling, sports and recreation activities.
ENERGY AND RESOURCES
OTHER SECTORS RELATED TO RURAL SPECIFIC ACTIVITIES

3.2 SMEs' competitiveness and productivity

Although several papers investigate **competitiveness** empirically or discuss its merit for social welfare such as living standards improvement, there is no agreement on its definition or on exact methods to measure it. Competitiveness can be defined as the ability and performance of a company or sub-sector to sell and supply goods and services in a given market, in relation to the ability and performance of other companies and sub-sectors in the same market. In this sense, competitiveness is the ability to sell products that meet demand requirements (price, quality, quantity) and, at the same time, ensure profits over time that enable the company to thrive.

Productivity is often cited as indicator or measure of competitiveness, and the European Commission considers it as the most reliable indicator for competitiveness over the long term (European Commission, 2008).Productivity is defined as an average measure of the efficiency of a firm in converting inputs into useful outputs. It can be expressed as the ratio of output to inputs used in the production process, i.e. output per unit of input (capital, energy, material, personnel) consumed in a particular period. Improvements in productivity can stem from a more efficient use of existing technology and/or exploitation of economies of scale as well as technological change. The latter happens when a new and higher performing production or transformation process is implemented, and implies that businesses in the field can produce more, using the same level of input.

4 Technological innovation in modern rural economies

Innovation comprises new technologies, but also new processes, products, markets, services, behaviours, and networks. It can be R&D-based but also driven from within firms and communities. According to the unified theory of acceptance and use of technology (UTAUT)[3], every technology involves socio-technical innovation. The theory holds that there are four key constructs related to technology adoption: 1) performance expectancy, 2) effort expectancy, 3) social influence, and 4) facilitating conditions. The first three are direct determinants of technology usage intention, and the fourth is a direct determinant of technology use behaviour.

In addition to the above, take up of technology is influenced by the design of that technology (e.g. open innovation), by regulatory and institutional conditions, skills and knowledge to put it into practice, the operation of social learning between firms, the effectiveness of advisory and technical assistance, the underlying aspirations, values and preferences of the business owners. Furthermore, according to the Conceptual Framework for Drivers of Economic Growth[4], factors such as physical capital, human capital, competitiveness, investments in infrastructure and innovation, business and sector profile are drivers that can result in increased productivity per worker and increased employment; factors that must be considered in our analysis.

Therefore, technologies must be adapted to local social, environmental and economic contexts. It is important to understand the potential of new technologies on the productivity and competitiveness of rural economy SMEs, taking into account local drivers, opportunities and barriers to rural economy SMEs and economic growth within rural places.

The following section provides a categorisation of new technologies useful for rural economy SMEs, as identified through a preliminary desk research.

[3] Michael D Williams, Nripendra P Rana, Yogesh K Dwivedi (2015) "The unified theory of acceptance and use of technology (UTAUT): a literature review".
[4]HM Treasury (2000), Productivity in the UK: The Evidence and the Government's Approach, HM Treasury, London.

4.1 Categories of new technologies for rural economy SMEs

A preliminary desk research has indicated that several types of new technologies have been adopted by rural economy SMEs to capture value from technological innovation and economies of scale, leading to increased competitiveness and productivity. As a part of an overall strategy, SMEs adopting new technologies aim to: a) increase their economic benefits, b) reduce environmental impact and c) survive in a competitive environment. The following is an indicative list of new technologies that are currently being used by SMEs in rural areas.

Table 1: Categories of new technologies (indicative list)

Innovative production technologies	Technologies supporting products' distribution	Technologies supporting product's safety
• Organic farming, biotechnology • Renewable energy • Precision agriculture • Crop resistance systems • Novel crop • Functional foods	• E-platforms for products' promotion • Online orders and delivery tools • Food traceability systems as marketing tool	• Smart meters and IoT • Internal products traceability systems and traceability as a supply chain management tool • Selective breeding and feeding processes

5 Areas and types of impact to be investigated

Taking into account the context and objectives of INNOGROW project, as well as the policy instruments addressed by the project, the proposed methodology intends to capture the economic, socio-economic and environmental impacts of the adoption of selected new technologies, which can result in improved competiveness and productivity of rural economy SMEs. Specifically:

Socio-economic impact is the potential economic, social and cultural impact of a proposed development on the lives and circumstances of people, their families and their communities.

Environmental impact is any effect on land, water, air or any other component of the environment, as well as on wildlife harvesting, including any effect on the social and cultural environment or on heritage resources.

In the context of INNOGROW project, the following impact areas will be considered, where appropriate:

Economic and Socio-economic impacts:

- SME profitability: costs of production, revenue and gross margin profitability
- Trade flows: imports, exports and impact on prices
- Workforce educational attainment
- Income level
- Affordability / availability of products
- Local and regional cost and quality of living
- Better quality of products
- Health status

Environmental impacts:

- Level of insecticide and herbicide use
- Greenhouse gas emissions
- Resource efficiency (water efficiency, energy efficiency, waste management)
- Water quality
- Soil erosion

6 Methodology overview

6.1 Purpose and research questions

The policy purpose of the Activity A1.1 is to offer inspiration to the policy makers in the INNOGROW areas on the implementation of policy measures that provide incentives to the local rural economy SMEs to integrate new and innovative technologies with the aim to improve their competitiveness.

This methodology will structure, orientate and guide partners on the collection and analysis of the most relevant evidence and cases of new technologies adopted by rural economy SMEs in the partners' areas, which will lead to the development of an impact analysis report in a subsequent step. The purpose of this methodology is to set the criteria and tools to identify the most relevant evidence and cases of new technologies adopted by rural economy SMEs in the partners' areas, so as to orientate and guide the development of the "Impact analysis report on main new technologies" as defined in the application form. The gathering of evidence on cases of new technology adoption aims to provide insights regarding: a) the barriers and enablers for new technologies adoption by rural economy SMEs, b) the socio-economic and environmental impacts of certain types of new technologies, and c) the potential transferability and uptake of new technologies by other SMEs, identifying under which circumstances and conditions these technologies can be transferred in other EU regions (focusing mainly on partners' regions). Research questions entail the following:

1. To what extent has the adoption of new technologies proven successful in improving rural SMEs' competitiveness and productivity?
2. What have been the most effective new technologies in improving the competitiveness and productivity of rural SMEs?
3. What factors lead to the successful adoption of these new technologies? Under which conditions these technologies have been proved successful?
4. What are the benefits/ areas of impact of new technologies for rural economy SMEs?
5. How transferable are these new technologies to other rural SMEs?

6.2 Methodological approach

The methodological approach to analyse the impact of the selected new technologies on the competitiveness and productivity of rural economy SMEs will be based on: a)**desk research** (based on previous related work such as studies, surveys, industry reports, EU projects, and other available data sources such as databases and online resources), and b) **field research** evidence on a case study basis.

Desk research will be the primary mean of information gathering, targeting to produce a knowledge base about the main new disruptive technologies that have considerable impact on the competitiveness and productivity of rural economy SMEs, out of which particular case studies in the partners' areas will be highlighted and further explored.

Structured interviews will be conducted to further explore specific issues and provide insights on experience-based views and opinions referring to the effectiveness and impact of the identified cases, as well as on the local conditions, enablers and barriers to the adoption of particular technological innovations. The interviews will focus on individuals involved in the case studies (rural economy SMEs representatives) and on field experts with knowledge, exposure and experience on the specific technological innovations and cases of rural economy SMEs (policy makers in the field of SMEs competitiveness and innovation, associations of local businesses, business development agents/consultants and funding angels). The experience gained in these cases will be used to predict the economic, socio-economic and environmental effects associated with the proposed action / technology adoption elsewhere. Data through structured interviews will be collected with the contribution of all partners.

All data and evidence gathered will be used as the main knowledge material for the development of the "Impact analysis report of the main new technologies", to be delivered by UNEW (University of Newcastle), and peer reviewed by all partners at the end of the second semester.

6.3 Research and analysis stages and targets

Data collection and analysis will be implemented in three stages including desk research, partners' input, and interviews with stakeholders and analysis of evidence as indicated below.

Table 2: Stages of data collection and analysis

Stage A: Desk Research	1. Preliminary desk research to identify common trends
	2. Identification of initial list of selected new technologies
Stage B: Partners' input	1. Identification of regional case studies and potential interviewees
	2. Finalisation of new technologies list based on the technological innovations adopted in partners' areas
Stage C: Interviews / evidence collection	1. Communication with potential interviewees
	2. Interviewing preparation and execution
	3. Collection of questionnaires
	4. Further literature review on the impact of the selected new technologies
Stage D: Analysis of evidence and case studies	1. Analysis and consolidation of evidence collected though desk research
	2. Analysis of cases collected

Information gathering will focus primarily on the EU countries represented in the partnership (Greece, United Kingdom, Italy, Hungary, Slovenia, Bulgaria, Czech Republic and Latvia) and where relevant / available neighbouring countries and other EU member states that are leaders in rural economy innovation, e.g. the Netherlands, Sweden and Denmark etc. In addition to the evidence collected through desk research, the impact analysis will be implemented on a case study / firm-level basis, which will fit the following criteria:

a) SMEs that use innovative technologies as defined in section 4.1
b) SMEs that are driven by or based on natural capital / rural environment (see section 3.1 for SMEs' profile).

Each partner will collect evidence about at least 2 cases of new technologies adoption in their region to capture the relevant economic, socio-economic and environmental effects. Partners that have access to key actors involved in cases from other EU member states, will pursue collection of evidence from these countries as well. Taking into account the NACE categorisation provided in section 3.1, each partner will collect at least one case from category A - AGRICULTURE, FORESTRY AND FISHING and one case from any of the other 3 categories.

Table 3: Case collection targets

Partner	Country	Target number of cases to be collected
RoT		2
FLA		2
ZPR		2
UNEW		2
SZREDA		2

Partner	Country	Target number of cases to be collected
RRAPK		2
CoC – Molise		2
BSC		2
PANOV		2
<u>Total</u>		**18**

7 Identifying new technologies' impact on rural economy SMEs

7.1 Desk research

Desk research (stages A and C presented in Table 2) will be the primary means of information gathering on new technologies' impact on rural economy SMEs' competitiveness and productivity. Extensive desk research will be conducted, for the collection of data and evidence about technological innovations adopted by rural economy SMEs to foster their competitiveness and productivity.

In order to narrow down the scope of the analysis and ensure that the evidence collected is focused appropriately and reflects up-to-date facts and figures, data collection should have a targeted approach based on the following constraints:

- Evidence gathered should focus primarily on the countries represented in the project consortium (Greece, United Kingdom, Italy, Hungary, Slovenia, Bulgaria, Czech Republic and Latvia), and secondarily for other EU member states.
- Data collection should focus on recent cases and research studies that have been implemented during the last ten years.
- Data collection should focus on the identification of **new / innovative technologies** that have been adopted by SMEs, which **operate in rural areas**, contribute to the GDP of rural area, are connected with rural-specific activities, and **are driven by or based on natural capital / rural environment**.

The data will be gathered from relevant secondary sources of information such as academic journals, corporate websites and websites of agencies or/and bodies responsible for the promotion of innovation in rural areas. Additional, possible sources of information are the outcomes of research conducted in the context of other EU projects and the European Commission, as well as case studies & surveys conducted for other organisations or businesses. Indicatively, possible sources of information can be:

Table 4: Desk research sources

Journals / academic sources	International institutions' research reports	Similar EU projects and EC platforms
Journal of Environmental Management Journal of Computers and Electronics in Agriculture Journal of Food Control Journal of Small Business and Enterprise Development International Journal of Entrepreneurial Behaviour & Research Journal of Business & Economics	OECD The World Bank (Agribusiness Entrepreneurship) International Finance Corporation Food and Agricultural Organisation of the United Nations	BUSINESS TO NATURE - Interregional Approach to SMEs and Entrepreneurship in Natural Areas (www.business2nature.eu) RURALAND - Rural Development Players (www.ruraland.eu) APP4INNO - Establishment and promotion of new approaches and tools for the strengthening of primary sector's competitiveness and innovation in the South East Europe (http://app4inno.com/) EIP-AGRI Service Point (https://ec.europa.eu/eip/agriculture/en)

Examples of relevant academic, business and industry research reports:

- Impact of e-business technologies on public and private organisations: The Agri-food industry and e-landscape https://books.google.gr/books?id=qpyQSiuQMdwC&pg=PA206&lpg=PA206&dq=impact+of+food+traceability+systems&source=bl&ots=K7Pm48RFPz&sig=GZ3nV2SNh_XiG3JdDGOlpe3mU5w&

hl=el&sa=X&ved=0ahUKEwjwv-WYy73NAhVCVxQKHVG9ATIQ6AEIfjAJ#v=onepage&q=impact%20of%20food%20traceability%20systems&f=false)

- Competitiveness, Productivity and Efficiency in the Agricultural and Agri-Food Sectors (http://www.oecd-ilibrary.org/docserver/download/5km91nkdt6d6.pdf?expires=1466672881&id=id&accname=guest&checksum=D7A2610D579859062B2B0934402B767B)
- Food traceability as an integral part of logistics management in food and agricultural supply chain (http://www.sciencedirect.com/science/article/pii/S0956713513000790)
- Measuring the environmental effects of organic farming: A meta-analysis of structural variables in empirical research (http://www.sciencedirect.com/science/article/pii/S0301479715301663)

7.2 List of technologies form and partners' input

Following the 1st stage of desk research, UNEW will develop the initial list of new technologies (Stage A, point 2 of Table 2), and ask for partners' input (Stage Bof Table 2) as regards the adoption of these technologies in their territories, and any additional technologies that have been adopted by local rural economy SMEs to be included in the impact analysis report. The suggested new technologies should fit to the categories defined in Section 4.1. The following template will facilitate the above mentioned procedure:

	New technology	Short description	Expected benefits for SMEs	Technology adopted by at least 1 SME in the following partners' regions
1	e.g. Food traceability system	Tracking any food, feed, food-producing animal or substance that will be used for consumption through all stages of production, processing and distribution.	Enable businesses to respond quickly to food safety/quality incidents thereby ensuring that consumer exposure to the affected product is prevented or minimised. Ensure that products	e.g. Thessaly, Lombardy

			withdrawals/recalls are limited to implicated products, thereby minimising disruption to trade and company finances. Used as a marketing tool, instilling trust to customers.	
2				
….				

7.3 Structured interviews on a case study basis

A survey (Stage C, points 1, 2 and 3 of Table 2) will be conducted as a complementary tool for information gathering on the impact of new technologies on the competitiveness and productivity of rural economy SMEs on a case study / firm-level basis. Representatives of rural economy SMEs will be primarily asked to contribute to the research by reporting their experiences on integrating technological innovations in their organisations. SMEs representatives' knowledge on the matter will be recorded through the questionnaire provided in Annex A, addressing a number of issues including a) the main reasons for adopting a new technology, d) the difficulties and barriers encountered, e) enablers and local conditions favouring technology integration, and g) the types of impact and benefits. Where SMEs' representatives are not available, key persons, field experts or consultants actively involved in the cases will be identified to provide views and perceptions on the new technologies' impact.

7.3.1 Target respondents

According to the objectives of the survey, the target respondents should include owner / managers of rural SMEs who have been involved in the process of decision making within their organisation, concerning the management, administration, and / or leadership as well as strategic orientation. Thus, the main groups that should comprise the target population of the survey are owner / managers of rural SMEs who have integrated any of the new technologies identified at the previous stage. An indicative,

not exhaustive, list of the target groups of respondents from rural SMEs for this survey could involve the following actors:

- Decision-makers
- Owners
- Administrative managers
- Marketing managers
- Operations managers
- Sales administration managers
- Staff of rural economy SMEs with important knowledge and experience on using new technologies.

In addition to representatives of rural economy SMEs, field experts with knowledge, exposure and experience on technological innovations for rural economy SMEs (policy makers in the field of SMEs competitiveness and innovation, associations of local businesses, business development agents/consultants and funding angels) will be contacted to provide insights on particular cases.

The survey will focus on cases from the countries represented in the partnership(Greece, United Kingdom, Italy, Hungary, Slovenia, Bulgaria, Czech Republic and Latvia)..Typically, each respondent should represent a different organisation, since the survey questionnaire inquires the needs and benefits of the respective case.

7.3.2 Structured questionnaire

A structured online questionnaire (Annex A) will be employed for interviewing target respondents, related to cases of new technology adoption by rural economy SMEs. The questionnaire will be used to establish a structured, organised and well documented way to collect evidence and personal views on certain cases. Direct communication (by e-mail or phone) with interviewees should also take place so as to establish an initial contact, to solicit additional evidence or clarifications on certain aspects of the new technologies adoption. To ensure consistency and facilitate data analysis, the questionnaire will be developed, and reported back to UNEW in English. Where communication can only be established in

national language(s), project partners may assume the role of intermediaries and translate both the questionnaire and interviewee responses.

The questionnaire will begin with a short introduction that will include: a) the background and objectives of the INNOGROW project as well as the purpose of the collection of evidence on cases of new technologies adoption by rural economy SMEs, b) assurances regarding anonymity, information disclosure and use of collected data, and c) the benefits of providing information on a specific case as a contribution to shared knowledge in the field.

The questionnaire will focus on aspects related to the kind of technology, the objectives and needs that led to the adoption of the new technology, the local conditions that acted as enablers for success, the main difficulties and barriers encountered, the impacts and benefits derived from the technology integration, as reported by SMEs representatives and key actors. The questionnaire will not be lengthy (not exceeding 20-25 questions) and provide space for interviewees to express their opinions and views by including open-ended questions.

The questionnaire is structured into three main sections as described below:

- Section A: Case identity

  Section A includes information about the case examined, such as country, region and time of implementation, a short description of the case (new technology adopted by the organisation) and information about the SME (industry, number of employees, annual turnover/balance sheet).It also includes personal information of the interviewee such as position in organisation, involvement in the implementation of the case examined and contact details (not mandatory fields).

- Section B: Needs, enablers and barriers of the case

  Section B addresses the needs covered and the objectives met by the case identified, the degree of the difficulties and barriers encountered and the perceived enablers, success factors and local conditions that fostered the adoption on the new technology in this case.

- Section C: Impact and transferability of the case

  Section C focuses on the economic, socio-economic and environmental effects derived from the new technology adoption, the likelihood of the occurrence of these impacts and the degree of technology's transferability to SMEs in other regions.

The online version of the questionnaire to be sent to interviewees can be found at the following link (xxxxx)and in the Annex.

8 Impact analysis of case studies

8.1 Criteria, cases documentation and data processing

A common documentation approach should be applied for the analysis of the evidence and data collected (Stage D of Table 2) to ensure that all cases collected are relevant to the scope of the impact analysis and are documented and presented in a clearly structured and consistent manner in the final impact analysis report.

To this end, the cases documentation form presented in Annex B will guide partners in the identification of the most relevant cases of new technologies' adoption by rural economy SMEs, taking into account the following **criteria**:

1. Cases of rural economy SMEs as defined in section 3.
2. Cases of new technologies as defined in section 4 and based on the final list of new technologies developed by partners.
3. Cases of new technologies associated with economic, socio-economic and environmental impact, as presented in section 5, leading to increased productivity and competitiveness.
4. Recent cases (timeframe of the last five - ten years).

Cases collected that do not comply with the above mentioned criteria will not be included in the final impact analysis report. The fields of the cases documentation form correspond to the sections of the structured questionnaire.

Basic tools of descriptive statistics like counts, means, and percentages (where appropriate) will be employed to extract useful information and conclusions from the replies and identify the degree of the difficulties / barriers encountered, the common enablers and success factors, while adopting a new technology, as well as the level and likelihood of the expected impacts.

9 Action plan and roadmap for data collection

The methodology report, including the structured questionnaire, will be delivered by UNEW at the end of June, 2016. Feedback on the structured questionnaire is expected from project partners within two weeks after delivery of the document. Partners' comments and feedback will be embedded into the final methodology report until the mid of July 2016. The deadline for collecting cases of new technologies adoption by rural economy SMEs through the online questionnaire, and for completing the 1st stage of evidence collection through desk research, is the 30th of September 2016. The responses and the evidence collected at the 2nd stage of the desk research will be analysed and used for the development of the draft version of the impact analysis report on main new technologies, which is to be delivered by 31st January 2017. Peer reviews from project partners are expected within two weeks after delivery of the draft paper. Any comments and feedback will be incorporated in the final version of the impact analysis report by the28th February 2017.

Chart of implementation for the INNOGROW A1.1 "Investigating innovative technologies' impact on rural economy SMEs competitiveness and productivity"										
Steps of activity A1.1	**Months**	June 16	July 16	Aug 16	Sept 16	Oct 16	Nov 16	Dec 16	Jan 17	Feb 17
	Partners									
Methodology for measuring the impact of the main new technologies (draft)	**UNEW**									
Review of the methodology and structured questionnaire	**All partners**									
Final version of methodology and online version of the questionnaire	**UNEW**									
Identification of initial list of selected new technologies though desk research	**UNEW**									
Finalisation of list of technologies based on partners' input, identification of relevant cases, stakeholders, and promotion channels	**All partners**									
Questionnaires forwarded from partners to target respondents	**All partners**									
1st stage of desk research	**UNEW**									
Data collection evidence from questionnaire	**All partners**									
2nd stage of desk research	**UNEW**									
Analysis of cases and evidence collected, and development of impact analysis report (draft)	**UNEW**									
Peer reviews from partners	**All partners**									
Impact analysis report (final version)	**UNEW**									

10 Annex A: Survey questionnaire

What is the purpose of this survey?

To identify the impact of the main new technologies (such as technologies supporting food safety, technologies supporting products' distribution, innovative production technologies)on the competitiveness and productivity of rural economy SMEs.

Who should participate?

Decision-makers / owners of SMEs, Administrative managers, Marketing managers, Sales administration managers, Operations managers, Staff of rural economy SMEs with important knowledge and experience on the use and integration of new technologies.

How long does it take?

The estimated total time completing this questionnaire in is about 15-20 minutes.

Thank you very much in advance for your participation and valuable contribution!

Section A. Case Identity

1. Name of company

2. Please indicate the country and region of the case

3. Please select the core industry of your organisation

- ☐ Agriculture
- ☐ Forestry
- ☐ Fishing
- ☐ Agro-tourism, accommodation
- ☐ Tourism
- ☐ Animal Husbandry
- ☐ Aquaculture
- ☐ Manufacture of food and beverages products
- ☐ Manufacture of tobacco products
- ☐ Cultural and recreation activities
- ☐ Food and beverage service activities
- ☐ Energy and resources
- ☐ Other (please specify).....

4. Please indicate the total number of employees within your organisation/company

- ☐ Less than 10 persons employed
- ☐ 10-49 persons employed
- ☐ 50-249 persons employed
- ☐ 250 or more persons employed

5. Please indicate the annual turnover of your organisation/company:

☐ Less than 2 million EUR

☐ From 2 to 10 million EUR

☐ From 10 to 50 million EUR

☐ More than 50 million EUR

6. Select the type of technology adopted by your organisation:

☐ Internal products' traceability system and traceability as supply chain management tool

☐ Smart-meters and Internet of Things

☐ Selective breeding and feeding processes

☐ E-platforms for marketing products and services

☐ Online orders and delivery tools

☐ Food traceability system as marketing tool

☐ Organic farming, biotechnology

☐ Renewable energy

☐ Novel crop

☐ Precision agriculture

☐ Crop resistance system

☐ Functional foods

☐ Other, please specify…….

7. Please specify the time of new technology adoption:

Year [……]

8. Please provide a brief description of your organisation's profile and application of the new technology adopted:

9. Personal involvement in the case

- ☐ Decision maker
- ☐ Director / Manager / Team Leader
- ☐ Employee
- ☐ Researcher / Field expert / Consultant
- ☐ Other (please specify).....

10. Position in organisation / company

- ☐ Owner / director of company
- ☐ Administrative manager
- ☐ Marketing manager
- ☐ Sales manager
- ☐ Operations manager
- ☐ Other (please specify).....

11. Email

Section B. Needs, enablers and barriers of the case

12. What were the main needs / objectives to adopt the new technology? (Please select all that apply)

- ☐ Reduce production costs
- ☐ Respond to competition
- ☐ Access new markets / identified market opportunity
- ☐ Increase profitability, revenue
- ☐ Satisfy customers' needs
- ☐ Improve environmental impact / resource efficiency
- ☐ Personal interest in the new technology

☐ Meet legislative/policy changes

☐ Other (please specify).....

13. What kind of difficulties / barriers were encountered during the integration / adoption of new technology, and what was the degree of these difficulties?

(where 1 = no such difficulties were encountered during the implementation of the case and 5 = major difficulties were encountered that severely limited implementation of the case)

Difficulties / barriers	1 (no problem)	2	3	4	5 (major problem
Regulation /limited support by local policy makers	◯	◯	◯	◯	◯
Funding, lack of financial resources	◯	◯	◯	◯	◯
Lack of expertise/ skills of existing employees within the firm	◯	◯	◯	◯	◯
Inability to hire new employees with relevant skills / expertise	◯	◯	◯	◯	◯
Lack of customer demand or limited interest from stakeholders	◯	◯	◯	◯	◯
Lack of appropriate external advice / technological skills	◯	◯	◯	◯	◯
High integration costs	◯	◯	◯	◯	◯
Difficulties in establishing effective collaboration with	◯	◯	◯	◯	◯

supply chain partners					
Competition in the industry	◯	◯	◯	◯	◯

14. Please briefly discuss how and to what extent your organisation managed to overcome the barriers selected above:

15. To your knowledge, what are the enablers / local conditions / success factors that supported the adoption of the new technology by your organisation? (Please select all that apply)

☐ Public funding (if yes, what source_____)

☐ Internal capital (from firm and its owners)

☐ Private, external funding (bank, investor, venture capital)

☐ Market potential

☐ Existing employees with relevant knowledge and skills

☐ Hiring new employees with relevant knowledge and skills

☐ Collaboration with other businesses

☐ Advisory service (if yes, what source_____)

☐ Other (please specify).....

16. Please briefly discuss your experience related to the enablers / local conditions / success factors selected above (e.g. local policy measures, info about market growth and local rural environment, collaboration with key actors etc.):

Section C. Impact and transferability of the case

17. What were the economic and socio-economic impacts derived from the adoption of the new technology?

	Strongly negative impact	Minor negative impact	Neither negative nor positive impact	Minor positive impact	Strongly positive impact
Productivity of the firm	○	○	○	○	○
Competitiveness of the firm	○	○	○	○	○
Costs of production	○	○	○	○	○
Product or service quality	○	○	○	○	○
Ability to access to new markets	○	○	○	○	○
Firm exports	○	○	○	○	○
Number of customers	○	○	○	○	○
Prices of product/ service(s)sold	○	○	○	○	○
Firm profitability	○	○	○	○	○

Local cost of living	○	○	○	○	○
Health status of people in the area	○	○	○	○	○
Income levels locally	○	○	○	○	○
Skills of those employed in the firm	○	○	○	○	○
Productivity of workers	○	○	○	○	○
Number of employees	○	○	○	○	○

18. What were the environmental impacts derived from the adoption of the new technology?

	Strongly negative impact	Minor negative impact	Neither negative nor positive impact	Minor positive impact	Strongly positive impact
Energy efficiency	○	○	○	○	○
Water efficiency	○	○	○	○	○
Amount of waste produced	○	○	○	○	○
Use of insecticide and herbicide(s)	○	○	○	○	○
Greenhouse gas emissions	○	○	○	○	○

Water quality	○	○	○	○	○
Level of soil erosion	○	○	○	○	○

19. Please briefly discuss the impacts selected above and/or other relevant socio-economic and environmental impacts(information about company and employees performance, previous situation compared to current, relevant statistics / performance indicators)

20. To your knowledge, have this technology been adopted by rural economy SMEs in other regions / countries?

☐ Yes

☐ No

☐ Do not know

21. If yes, what are the three most significant features of the technology that make it transferable?

☐ Easy to use / no specific skills are required

☐ Needs addressed are common among many rural economy SMEs organizations in different regions/countries.

☐ Achieved benefits / impact outweigh investment costs by far

☐ Low implementation risks

☐ Availability of external financing

☐ Legal requirements

☐ Demand from supply chain partners / requirement for market access

☐ Other (please specify)…….

11 Annex B: Case documentation form

Activity 1.1: Investigating innovative technologies' impact on rural economy SMEs competitiveness and productivity		
Case title:		
A. CASE IDENTITY		
LOCATION	**Organisation:**	
	Country:	
	Region:	
COMPANY PROFILE	**Industry:**	
	Turnover:	
	Number of employees:	
NEW TECHNOLOGY	**Category of technology:**	Innovative production technologies ☐ Technology supporting products' distribution ☐ Technology supporting products' safety ☐
	Type of technology:	☐ Internal products' traceability system and food traceability system as supply chain management tool ☐ Smart-meters and Internet of Things ☐ Selective breeding and feeding processes ☐ E-platforms for marketing products and services ☐ Online orders and delivery tools

		☐ Food traceability system as a marketing tool ☐ Organic farming, biotechnology ☐ Renewable energy ☐ Novel crop ☐ Precision agriculture ☐ Crop resistance system ☐ Functional foods ☐ Other, please specify…….
YEAR OF ADOPTION	**Date of new technology adoption:**	Year [……]

B. CASE DESCRIPTION

Business profile and industry description:

(e.g. key business activities, human and financial capital, competitiveness in the industry, opportunities for investments, skills of employees etc.)

Description of the new technology case:

C. NEEDS, ENABLERS AND BARRIERS TO TECHNOLOGY ADOPTION	
Main needs & objectives to adopt the new technology	☐ Reduce production costs ☐ Respond to competition ☐ Access new markets / identified market opportunity ☐ Increase profitability, revenue ☐ Satisfy customers' needs ☐ Improve environmental impact / resource efficiency ☐ Personal interest in the new technology ☐ Meet legislative/policy changes ☐ Other (please specify)
Main difficulties /barriers / local conditions hindering technology adoption	☐ Regulation / limited support by local policy makers ☐ Funding, lack of financial resources ☐ Lack of expertise / skills of existing employees within the firm ☐ Inability to hire new employees with relevant skills / expertise ☐ Lack of customer demand or limited interest from stakeholders ☐ Lack of appropriate external advice / technological skills ☐ High integration costs ☐ Difficulties in establishing effective collaboration with supply chain partners ☐ Competition in the industry Other relevant info provided: …….

Main enablers / local conditions / success factors supporting technology adoption	☐ Public funding (if yes, what source_____) ☐ Internal capital (from firm and its owners) ☐ Private, external funding (bank, investor, venture capital) ☐ Market potential ☐ Existing employees with relevant knowledge and skills ☐ Hiring new employees with relevant knowledge and skills ☐ Collaboration with other businesses ☐ Advisory service (if yes, what source_____) ☐ Other (please specify)..... Other relevant info provided: …….
D. IMPACT AND TRANSFERABILITY POTENTIAL	
Identified economic and socio-economic impacts	☐ Productivity of the firm ☐ Competitiveness of the firm ☐ Costs of production ☐ Product or service quality ☐ Ability to access to new markets ☐ Firm exports ☐ Number of customers ☐ Prices of product/ service(s) sold ☐ Firm profitability ☐ Local cost of living ☐ Health status of people in the area ☐ Income levels locally ☐ Skills of those employed in the firm ☐ Productivity of workers

	☐ Number of employees Other relevant info provided: ……
Identified environmental impacts	☐ Energy efficiency ☐ Water efficiency ☐ Amount of waste produced ☐ Use of insecticide and herbicide(s) ☐ Greenhouse gas emissions ☐ Water quality ☐ Level of soil erosion Other relevant info provided: …….
Transferability potential	

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