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DOCTORAL THESIS

CONTRIBUTIONS REGARDING THE RESEARCH OF THE SUSTAINABLE DEVELOPMENT IN AGRO-TOURISM FROM A CIRCULAR ECONOMY PERSPECTIVE

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SUMMARY

The research background and motivation of this paper is related with the role of agro-tourism impact on environment. Agro-tourism activities impact on the development of rural area represent the reasons for it is strategic support at microeconomic and macroeconomic context.

In the process of developing agro-tourism, significant attention is necessary to the environment, representing the raw material of agro-tourism activity. So, the relation among agro-tourism and environment shows a particular significance. A sustainable development and protection of the environment being the required circumstances for its practice.

It is necessary realizing vital changes regarding the production and consumption of goods and services. In order to preserve our One Planet while taking into consideration economic and social aspects.

Research suggests that agro-tourism sector it is a growing sector. Therefore, the link from agro-tourism and sustainable development are claiming the identification of new models by making the development more sustainable. So, this thesis proposes the approach of the influence of circular economy on the sustainable development of agro-tourism.

To introduce the notion of circular economy in agro-tourism it necessary to establish and apply a sustainable development for agro-tourism structures activities. Adopting a new exemplary of management starts up with promoting new intentions related to production, consumption, ethics, etc.

Circular economy in agro-tourism can lead to a sustainable use of resources for the present and future generations and accomplish sustainable development in this domain.

The present research is a contribution, by questioning present issues and future potentialities, suggest ways in which agro-tourism can embrace a sustainable development with the influence of circular economy. Highlighting to focus agro-tourism structures concerning optimizing the environment by delivering major benefits for local communities and for the economy of Europe.

CONTENTS

PREFACE

The present document consists of eight Chapters and seven Annexes. Details on the contents of each part are available in the Introduction. A list of Figures and Tables, List of abbreviations are used in the paper and presented after the present Preface. References are placed after the last Chapter and after the Annexes.

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List of abbreviations used in the paper

Abbreviation	Explication
ADEME	French Environment and Energy Management Agency
CE	Circular Economy
EEA	Europeanb Environment Agency
EMF	Ellen MacArthur Foundation
EU	European Union
EP	European Parliament
IUCN	World Conservation Union
MDG	Millennium Development Goals
OECD	Organization for Economic Cooperation and Development
SCP	Sustainable consumption and production
SD	Sustainable Development
SDG12	Sustainable Development Goal number twelve
UN	United Nations
UNCED	United Nations Commission on Environment and Development
UNEP	United Nation Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNSD	United Nations Statistics Division
UNWTO	World Tourism Organization
WCED	World Commission on Environment and Development
WEF	World Economic Forum
WRAP	Waste and Resources Action Programme
WWF	World Wide Fund For Nature

1. INTRODUCTION

Among the most important problems that European Union (EU) has been struggle in the past decades has been the differing development of rural and urban regions. Farming and agriculture are considered as a valuable sector of human activity, but their input to the national GDP has constantly decreased. At the EU diverse strategies were designate to stimulate sustainable development of rural areas, to strengthen the self-sustainable economies through strong entrepreneurial rural business solutions.

With the decline of the farm revenues, tourism, as an adjoin activity, has increase rapidly in the rural regions. In this context, agro-tourism sector has newly attained more attention due to the demographic tendency across the Europe, but also worldwide. The most decisive due to the development related changes in the agriculture sector and the use of lands.

Agro-tourism has grown rapidly since 1970 by responding to new markets, new lifestyles and new product development opportunities. What represents the quality criteria for the typical tourist has changed in the past decade. One of the top criteria on every traveler's list is the positive environmental socio-cultural and impact. However, there exists an important paradox: a tourist destroys what he is searching for, while he discovers it.

Therefore, the research background and motivation of this paper is related with the role of agro-tourism impact on environment. The impact of agro-tourism activities on the development of rural regions represent the reasons for it is strategic support at microeconomic and macroeconomic context.

It is necessary realizing vital changes regarding the production and consumption of goods and services. In order to preserve our One Planet while taking into consideration economic and social aspects.

In the process of developing agro-tourism, special attention is required to the environment, which represents the raw material, the object and aim of tourism activity. So, the relation among agro-tourism and environment shows a particular significance. A sustainable development and protection of the environment being the necessary condition for its practice.

Research suggests that agro-tourism sector it is a growing sector. Therefore, the link from agro-tourism and sustainable development are claiming the identification of new models by

making the development more sustainable. So, this thesis proposes the approach of the influence of circular economy on the sustainable development of agro-tourism.

Circular economy in agro-tourism can lead to a sustainable use of resources for the present and future generations and accomplish sustainable development in this domain.

The question is now how to integrate these principles of the Circular Economy concept into a management system based on agro-tourism activities leading to a sustainable development from environmental view? To obtain an answer for this question, this research bridges the gap between Sustainable Development (SD) and Circular Economy (CE). Therefore, underlies the established of agro-tourism activities to unite economic, social and environmental benefits and provide a realistic approach.

The interest on agro-tourism sector is particularly because to its role regarding the development of rural communities in a sustainable way. This sector can constitute a fundamental part of environmentally friendly regarding agro-tourism structures activities. In a context of preserving the environment is a key point by answering to the present of the socio-cultural, economic and environmental changes, technological progress.

The present research is a contribution, by questioning present issues and future potentialities, suggest ways in which agro-tourism can embrace a sustainable development with the influence of circular economy. Highlighting to focus agro-tourism structures concerning optimizing the environment by delivering major benefits for local communities and for the economy of Europe.

The objectives of the doctoral thesis

The main/principal objectives of this thesis are:

- Analysis of the current state of the research in the field of sustainable development, circular economy and the connection of these concepts and the integration and optimization of the specific processes carried out in agro-tourism structures;
- Proposal of a conceptual model achieving sustainable development in agro-tourism structures concerning activities from an environmental view under circular economy perspective;
- Proposal of a research method focusing agro-tourism structures for environmental optimization;

- Realization of a guideline regarding good environmental management practice in agro-tourism. The guideline focusses the activities in an agro-tourism structure regarding waste, energy and water management. Elaborate a management system to guide agro-tourism activities and the participants to a sustainable development under the influence of circular economy;

For an efficient conduct of the research it was necessary to plan this activity, therefore to the principal objectives of this work were identified specific objectives.

The specific objectives are:

- Analysis of the current state of research in the field of sustainable development and circular economy in order to connect these concepts and to integrate and optimize the specific activities carried out in an agro-tourism structures;
- Defining the concepts and terminology used in conducting this research;
- Carrying out a comparative study in the waste, energy, water sector in E.U., Romania and Italy.

The expected outcomes of this thesis are to provide by:

- Increasing farmers and tourists awareness regarding the impact of agro-tourism activities from economic, social and environmental point of view. All those three parts being key opportunity for the sustainable development of agro-tourism structures, local communities and landscape-area;
- Encourage the use of a sustainable development by managing agro-tourism activities from a circular economy perspective by presenting the benefits of it;
- Developing an environmentally friendly approach for agro-tourism activities by rising the quality standing of the agro-tourism products and services. Considering the actions on the environment, agro-tourism can have a significant part in order to protect and preserve it;
- Setting up a framework of information to achieve a sustainable development in agro-tourism from circular economy perspective for the farmers and tourists;

Increasing at the local, regional and international level the development of good practices in agro-tourism activities from a circular economy perspective.

Recommendations aim to tackle the problems noted in this study and provide information to guide future investment policies in agro-tourism. Along with develop means to guide the

agro-tourism entrepreneurship, provide effective governance systems to help partnerships and networking. All those but also to create ways to develop the social, economic and environmental performance of agro-tourism sector.

Agro-tourism structures are the most suitable to set up initiatives with the aim of improving the sustainability of the sector, involving also the tourists directly.

Research methodology

In this paper there was a structured approach of the research methodology starting from data collection and reaching to the validation of the research. In order to achieve the proposed objectives, a number of research methods, techniques and tools have been applied:

- the study and analysis of bibliography, which mainly involved identifying the definitions of the concepts and terms used, interpreted and concluded in a personal manner;
- mathematical modeling represents the attributes of the integrated model proposed through mathematical relationships. This modeling was chosen because it is an easy and inexpensive method (in the present case) and because it favors the symbolic manipulation of the proposed model;
- quantitative analysis of the data was done in accordance with the proposed objectives. the data being presented in the form of data summaries, tables, graphs and narrative text and analyzed starting from identification the object of study, to the collection of data until their registration and presentation;
- qualitative data analysis is in fact the strategy chosen to ensure that the data obtained and used during this research are up-to-date and accurate;
- methods of data representation and interpretation: tables, diagrams, graphs, etc. are methods used in this work because in comparison with the narrative description, those methods have a better understanding of the structure and relationships in and between processes presented and researched;
- specialized software for editing, image processing, modeling (Microsoft Word, Microsoft PowerPoint, Microsoft Excel).

The structure of the paper

The paper is structured on 7 main chapters, to which is added an introductory chapter, a chapter of conclusions and the bibliography, as follows:

1. INTRODUCTION

The chapter presents the general context of the doctoral thesis, describes the research theme. This chapter illustrates the principal and specific objectives of doctoral thesis, the research methods and tools used and summarizes the content of the thesis.

2. STATE OF THE ART

The chapter illustrates a list of definitions of terms and concepts used in this paper,

the concepts of sustainable development and circular economy and the connection of these concepts and the integration and optimization of the specific processes carried out in agro-tourism.

3. COMPARATIVE CRITICAL ASPECTS IN AGRO-TOURISM IN ROMANIA AND ITALY

Within the chapter 3 is presented the role of the selection of case studies Trentino and Sibiu County, with an overview on agro-tourism sector regarding waste, energy and water consumption in the two case studies selected, as well the legislation at European, National and Regional level in agro-tourism, waste, water and energy sector.

4. CONCEPTUAL MODEL FOR THE SUSTAINABLE DEVELOPMENT OF AGRO-TOURISM STRUCTURES ACTIVITIES FROM AN ENVIROMENTAL VIEW UNDER CIRCULAR ECONOMY PERSPECTIVE

In Chapter 4 are illustrated agro-tourism in a context of sustainable development concerning the environmental view. Also, in this chapter are the conceptual model of sustainable development in agro-tourism from the perspective of circular economy and a method focusing agro-tourism structures for environmental optimization.

5. SUSTAINABLE AGRO-TOURISM STRUCTURES DEVELOPMENTS UNDER A CIRCULAR ECONOMY PERSPECTIVE

In this chapter is presented a guideline regarding good environmental management practice in agro-tourism. The guideline focusses the activities in an agro-tourism structure

regarding waste management, energy use optimization and consumption and water management. As well, the management communication in agro-tourism structures.

6. Final conclusions, original contributions and future research directions

The final conclusions of the doctoral thesis are presented in accordance with the proposed objectives. Within the chapter are presented the conclusions of the doctoral thesis, the theoretical and practical contributions are highlighted, and the future directions of research are identified.

7. Annexes

Attached to annexes are presented example of information documents associated with agro-tourism structures in order to analyses the information obtained.

8. Bibliography

In the bibliography there are listed approximative 150 bibliographic titles used during the doctoral stage to prepare the research reports and the doctoral thesis.

2. STATE OF THE ART

2.1. Definition of terms and concepts

For a to better understanding of the terms and concepts of this paper, below are presented a series of definitions and approaches. Were used various sources, with the aim to contain a wider range of use of these words. Starting with the keywords used in the title of the paper, as follow:

a) Tourism, rural tourism and agro-tourism

Throughout time, different definitions and rankings have been used to study tourism, going thru difficulties because of the statistic comparison at international level between countries. The aim of this comparative analysis is to have a better approach and vision used in this paper regarding agro-tourism. Below, in Table 2-1 are presented various approaches and definitions of the term "tourism".

Table 2-1 Defining the notion of "tourism", "rural tourism" and "agro-tourism" from the specific literature.

Notion	Author	Definition/Approach
Tourism	DEX	• relationships and phenomena resulting from the movement and sojourn of persons outside of their place of residence (such as holiday or rest leave, participation in various events, etc.). (Academia Română, 1998)
	Oxford Dictionary	• traveling for leisure or business. Also, the theory and practicing touring, the attraction business, accommodation and entertainment of tourists, as well as the activity of operating tours. (University Oxford, 2005)
	Eurostat	• the activity of visitors taking a trip to a main destination outside the usual environment, for less than a year, for any main purpose, including business, leisure or other personal purpose, other than to be employed by a resident entity in the place visited. (Methodological manual for tourism statistics, 2014)

Notion	Author	Definition/Approach
	EU, OECD, UNWTO, UNSD	• comprises the activities of individuals who travel and stay in places outside to their usual environment. With the mention of not passing one-year consecutive. The aim of travel are pleasure, business and other scopes not associated to any kind of activity remunerated from the place visited. (EU, OECD, UNWTO, UNSD, 2010)
	Smith, S. L. J.	• the total of all businesses that in direct way delivers goods or services supporting business, leisure activities far away from home. (Smith, S. L. J., 1988)
	Page J. Stephen	• emerge from the movement of millions of persons leading to the development of numerous and multifaceted activities, opportunities and approaches related to this industry (e.g. transport, food, etc.) (Stephen P. J., 2014)
	Goeldner C. R.,	• the processes, activities, and outcomes arising from the relationships and the interactions among tourists, tourism suppliers, host governments, host communities, and surrounding environments that are involved in the attracting and hosting of visitors. (Goeldner C. R. et. al., 2009)
Rural Tourism	EU	• is a broad concept which covers not only farm tourism or agritourism - i.e. accommodation provided by farmers - but all tourist activities in rural areas. (EU, 1986)
	OECD	• tourism which takes place in the countryside. (OECD, 1994)
	Daugstad K.	• a refuge from urban life. (Daugstad K., 2008)
Agro-tourism	Sharon P. et. al.	• subset of rural tourism. (Sharon P. et al., 2008)
	Hall D. et. al.	• has the origin on the utilization of the resources from the rural areas. (Hall D. et. al., 2003)
	Ceccaci G.,et. al.	• welcoming and hospitality activity accomplished by individual agricultural entrepreneurs or associations, as well as by their families utilizing their own establishments (houses, exploitations). (Ceccaci G. et. al. 1999)

Notion	Author	Definition/Approach
	EP	• includes various tourist activities: accommodation (bed and breakfast, rural lodgings, farm campsite); catering (evening meals); leisure activities (pedagogical farms, sports, horse-riding, farm visits). Gives the opportunity for farmers to promote their propriety and the geographical locations. Along with increasing the sales regarding the local products and add value to their agricultural production. (European Parliament, 2016)
	Wicks B., et. al.	• it is a mix between two industries: agriculture and tourism • it opens alternative income sources for the farmers and for surrounding community (Wicks B. et. al., 2003)

Therefore, the concept of agro-tourism and rural tourism are not similarly. Agro-tourism it can be comprehend as a partition to rural tourism (Wilson S., et. al., 2001). Rural tourism is tourism which takes place in the countryside. Agro-tourism is rural tourism that takes place on farms (European Parliament, 2003). Rural tourism is represented by the tourism products and services, including activities associated with the rural region and residents. Agro-tourism adds up the farming element to the tourism facilities and services.

In this context, tourists are implicated in the rural activities of the rural accommodation facility as: agriculture activities, animal husbandry etc. (Fagioli, et al., 2014). Standing in a rural accommodation unit, involves various leisure activities connected with the local gastronomy, cultural and natural heritage. Agro-tourism activities are linked overall to the agriculture environment (Fleischer, et al., 2018).

In point of the agro-tourism categorization, Phillip S. et al. (Phillip, et al., 2010) (Figure 2-1), explicit review of theoretical and practical documentation. Summing up this categorization is setting up five-step classification were agro-tourism is a:

1. Non-working farm were the places of residence was a farm specific to rural activities and presently is not linked anymore with the farming element;
2. Working farm and passive contact of tourists were the working farm provides exclusive the framework for tourism;

3. Working farm and indirect contact of tourists - the products and services from the region are incorporated in the process of the consumption;
4. Working farm and with direct connection but indirect participation of the tourists (e.g. demonstration of farming concerning different aspects of rural life);
5. Working farm with connection of the tourists by participating in different rural activities developed within the farm.

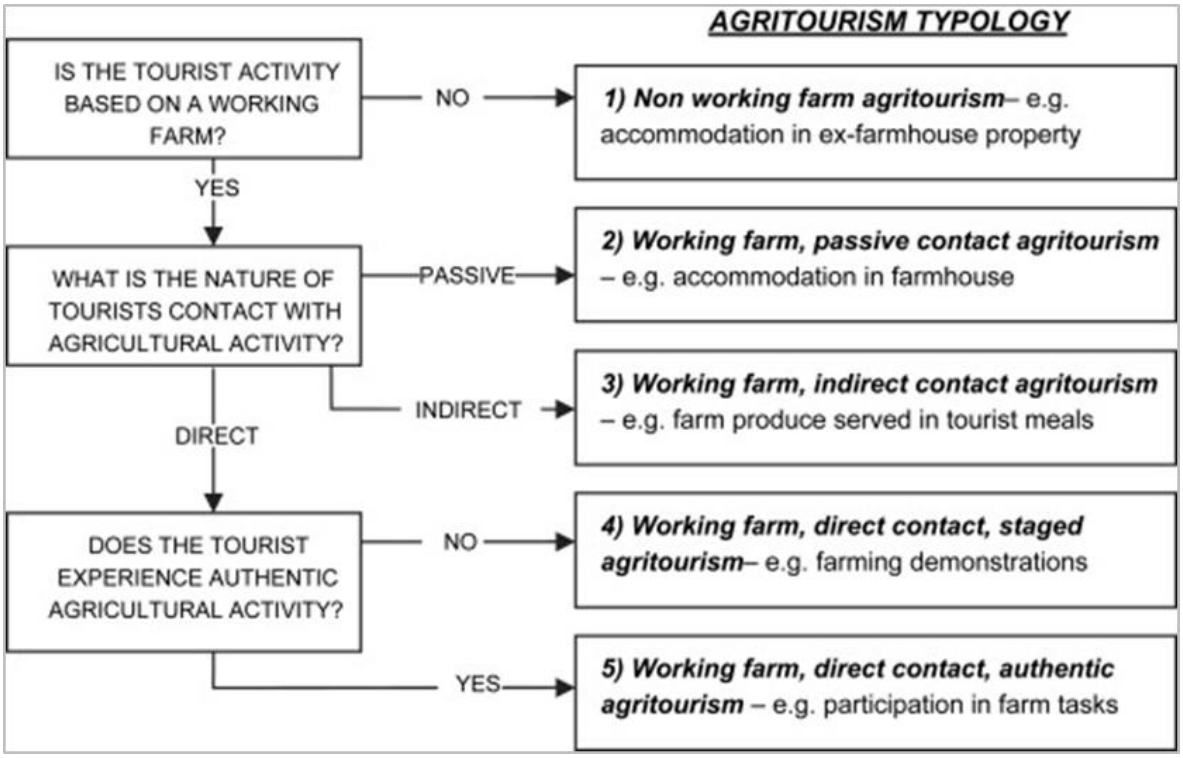

Figure 2-1 A typology for defining agro-tourism

More exactly, agro-tourism can adopt combined types of activities, with various union between them. Below are examples of agro-tourism shapes: (Rich, et al., 2010):

- u-pick operation or pick your own (PYO): operations for harvesting fresh fruits and vegetables;
- on-farm produce stand: retailing already harvested fresh fruits, vegetables and value-added farm products (jams, salsa, etc.);
- on-farm restaurant, dinners, bakery;
- instructive/educational farm tours and interactive demonstrations;

- on-farm activities for children/kids and adults; animal exhibits;
- on-farm bed and breakfast, pension, agro-tourism boarding house (ABH), cottage or campground;
- hands-on farm task as milking cows, feeding farm animals, collecting eggs, etc.;
- vineyards and wineries;
- on-farm festivals and events; viewing and photography.

The main characteristics of agro-tourism am rural tourism types of tourism presented above are summarized in Table 2-2.

Table 2-2 Main characteristics of rural tourism, agro-tourism, author's contribution

Agro-tourism	Rural Tourism
Tourism activities directly related to agriculture.	All forms of tourism that take place in rural areas or rural communities.
Practiced in a farm or household as a secondary source of income.	Practiced in small family owned establishments.
Educational activities are undertaken, aiming at highlighting and explaining aspects of agricultural lifestyle.	Highlights natural areas, local practices, culture and gastronomy
Often referred to as "farm-based tourism", "rural tourism" and "village tourism".	Often referred to as "agro-tourism", "nature-based tourism", "farm-based tourism" and "village tourism".
Entirely integrate within rural tourism.	Independent activity integrated in the tertiary sector of the economy, alternative/complementary form of mass-tourism.
Potential customers are interested in farming, crafting, folklore, natural agricultural products and gastronomy.	Potential customers are nature-lovers.

All things considered, agro-tourism and rural tourism have common points. For example, in what regards the type of tourists who choose this kind of holidays, the quality of time they aspire to. But also, in terms of trends, conditions and principles the bodies and communities involved tend to be guided by.

The expression “agro-tourism structures” will be utilized to cover all the signification for “farm locations” identified by (Phillip, et al., 2010) and “agro-tourist boarding houses”. Underlining those accommodation facilities in witch tourists are implicated direct and active in agricultural activities, rural housing and crafting activities. All those, without destroying the natural environment.

b) Sustainable development

In this paper, following a quantitative and qualitative analysis of data on the concept of "sustainable development" stands for a process through which the system tries to achieve "sustainability" as a goal. Therefore, the concept of sustainable development is unfolding the development in close connection with managerial performance.

With the specification of using the same mining in English language for sustainability, sustainable and sustainable development.

Below, in Table 2-3 are presented various approaches and definitions of the term "sustainable development".

Table 2-3 Defining the notion of "sustainabale development" in specialized literature

Author	**Definition/Approach**
WCED	• is the development that come across with the needs of the present. In the context of finding a balance in regard with the capability of next generations to satisfy their needs. Is carrying on two key points: "needs" and the view of restriction enforce by the position of technology. (WCED, 1987)
DEX	• the quality of an anthropic activity to unfold without exhaustion the resources available and without destroying the environment, so without compromising the possibilities of filling the needs of the next generations. (Academia Română, 2016)
Gilman R.	• refers to the capacity of a society, ecosystem, or any such system to function continuously in an undefined future without ending up with the depletion of key resources. (Gilman R., 1992)

Author	Definition/Approach
Stoddart H.	• the key point of sustainable development is the incorporation of economic, socio-cultural and environmental interests regarding the viewpoint of decision making. (Stoddart H. , 2011)
EU	• the development of EU covers economic, environmental and social dimensions and being part of the EU Sustainable Development Strategy. (EU, 2006)
IUCN, UNEP, WWF	• guideline valued by the individuals about caring the Earth. • people must take from the nature what nature can replenish. • meaning follow a lifestyles and development way in respect with the limits of the nature. (IUCN, UNEP, WWF, 1991)
Muscoe M.	• sustainable word has roots in Latin: subtenir" and means " to hold or "support from below". • a community must be supported from below by its inhabitants from present and future. • some places, through the specific combination of physical, cultural and spiritual characteristics, inspire people to take care of their community. These are the places where sustainability has the highest chances of subsistence (maintenance). (Muscoe M., 1995)
Strange T.	• harmonizing the three key elements: the environmental conservation and protection, social inclusion and the economic increase. Those key elements are interconnected and are the wellbeing of people. (Strange T., 2008)
Jefferson T.	• the Earth belongs to each generation during its lifetime, which is fully in it is own right. No generation can make bigger debts than they can be paid during their lifetime. (Jefferson T., 1907)

Summed up involves three ‘pillars’ or three aspects: ‘bottom-lines’ of sustainability: economic, social and environmental. The notion of sustainable development has reach significance and also acceptance in recent years. Optimistically, in the future, it will go through all points of economic development and agro-tourism development, from local to worldwide.

Therefore, the popularity of the notion “sustainable development” is coming up from the context in which is promoting the support of a standard of living identical nowadays while acknowledge that it cannot keeping up to exploit the global environment as in the past.

The management of sustainable development involves, in addition to setting long-term objectives, compatibility with short and medium-term objectives and applying a set of validated principles and criteria.

For example: improving processes, the effective use of resources, the creation of opportunities for innovation and technological progress, the improvement of the supply mechanism and the obligation to promote personal interaction, the continuous assessment of the organization and technological trends, etc.

c) Circular economy

The concept of circular economy (CE) is currently promoted by the EU, by several national governments and by several business organizations around the world. The concept has been created mainly by practitioners, the business community and policy-makers.

Below in Table 2-4, are presented various approaches and definitions of the concept "circular economy" found in the literature:

Table 2-4 Defining the notion of "circular economy" in specialized literature

Author	Definition/Approach
EMF	• an industrial economy that is restored by intention; the goals id to lean on renewable energy, minimizes, pursue and remove the use of toxic chemicals, and eliminate waste by careful design; (EMF, 2013) • the economy that delivers the possibility of value creation thru reduction of the consumption of finite resources. By a circular economy progress comes by adding value to the existent resources as economic structures, products and materials. (EMF, 2013)
EU	• the value of products and materials is maintained for as long as possible; waste and resource use are minimized, and when a product reaches the end of its life, it is used again to create further value; in reference with waste cycle. (EU, 2015a, 2015b)
EEA	• this economy gives possibilities to generate well-being and jobs, at the same time reducing environmental pressures. be applied to a variety of natural resources water, land, etc. (EEA, 2016)

Author	Definition/Approach
ADEME	• the aim is to diminish the environmental impact of resources consumption and enhance social well-being. (ADEME, 2014)
Geissdoerfe M.	• a regenerating frame were resource input and waste, emission, and energy leakage are minimized. By slowing, closing, and narrowing energy and material loop. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, recycling, upcycling. (Geissdoerfe M., 2017)
Preston F.	• approach to maximized in an efficient way the use of resources along with recycle and minimize waste and emissions. A perspective to transform the role of resources in economy. In this idea the waste should become a valuable input to another process and products should be repaired, reused or upgraded rather than thrown away. (Preston F., 2012)
WRAP	• alternative to the linear economy (make, use and dispose). The resources are in use as it is possible, extracting the maximum value from them while is in use, then recuperate a regenerate at the end of life cycle the materials and products. (WRAP, 2016)
WEF	• an industrial model that disconnects the income from material input. (WEF, 2014)

In this paper, the circular economy concept is considered in scientific terms. The circular economy vision is here constructed from the viewpoint of the definition of sustainable development.

At the present, the EU is promoting and supporting the circular economy concept. The circular economy concept shows that in Europe the production and consumption framework needs converting fundamentally. The goal is to reach the 2050 EU's vision is to live well in the limits of the planet. (European Commission, 2013).

2.2. General aspects regarding sustainable development

Reported by the United Nations Commission on Environment and Development (UNCED), thru the Brundtland Report, highlights three primordial elements to sustainable development: economic expansion, environmental control and social equity (WCED , 1987). Taking a better attention to the term "sustainable", it is defined as something that is "able to be upheld or defended", “able to be maintained at a certain rate or level” (Oxford Dictionary of English, 2006).

The notion of sustainable development is conceived on three pillars: economic, social progress and protecting the environment with the aim of keeping a balance between them.

Below in Figure 2-2, is represented the concept of sustainable development in the context of this paper.

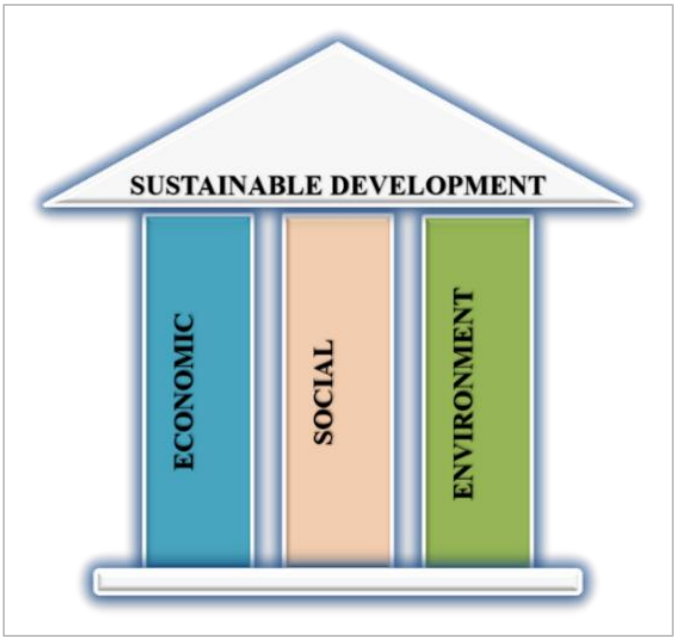

Figure 2-2 The three pillars perspective regarding sustainable development

Sustainable development is the base for the present-day guidance of global setting for international collaboration. In 2016, 17 Sustainable Development Goals (SDGs) from the Agenda for Sustainable Development (UN, 2017) are adopted in 2015 at an UN Summit (UN, 2015). The next fifteen years working on new Goals that general implements to all countries

Mobilizing the force work to end the poverty, inequality and action to approach climate change, in the same time assurance that all are taking into consideration.

Sustainable Development Goals (SDG) are made on the triumph of the millennium development goals (UN- MDG, 2015). The aim is to go forwards with the aim of ending of shapes of poverty.

The additional goals are particular for appeal to all countries that are poor or rich, in order to stimulate prosperity and in the time safeguarding the planet. The recognition of stopping the poverty must take the same direction to the strategies apply for the growth of economy. Also involves various social necessities as the education, the opportunity of having a job, support for education, social security. In the same time not neglecting the environmental protection.

Those aims mentioned above are generally transmitted for all the countries on the world (poor or rich). By achieving those aims it involves key players as: government, civil society, businesses, etc.

The United Nations (UN) thru Division for Sustainable Development (DSD) reported that one of the scopes is to guarantee a sustainable consumption and production. The path is reducing the use of the resources and the pollution and taking an overview on using products on life cycle (UN, 2017).

2.2.1. Consideration regarding sustainable development in tourism

The grow of mass tourism in the 1970 produce a worldwide concern about the economic, socio-cultural and environmental impact in tourism. Therefore, the concern regarding the establishment of more sustainable forms of tourism became visible. The notion of sustainable tourism is linked to the ascension of the general interest concerning sustainable development and the pioneering studies of the Brundtland Commission (European Parliament, 2013).

There are many approaches concerning sustainable tourism. United Nations Environment Programme and World Tourism Organization, affirm that (UNEP, UNWTO, 2005):

- an ideal use of environmental resources being a key element regarding the development in tourism. By continuing vital ecological processes and supporting conserve natural resources and biodiversity;

- respecting the socio-cultural authenticity of local communities, preserve natural and cultural heritage and ensure to cultural understanding and tolerance;
- assurance viable, on the long-term economic operators, ensuring socio-economic well-being to all stakeholders that are distributed. As examples: secure employment and the opportunity of earning income, social services for local communities and be partly responsible for the diminish of poverty.

UNWTO is also defining the notion of sustainable tourism. That tourism taking into consideration the present and future economic, social and environmental impacts, connected with the needs of visitors, industry, environment and host communities (UNWTO, 2017).

UNESCO defines Sustainable Tourism as tourism that respects local community and the tourists, cultural heritage and the environment (UNESCO, 2017).

A significant approach of sustainable tourism is made by Bramwell et. al. (Bramwell B., 1993) view as a positive intention. The reduction of the pressures and misunderstanding produce by the interactions between the tourism sector, tourists, environment and the communities that are the host.

The approach of the sustainable tourism is established by the fact that tourism is a sector that must to be involved in worldwide sustainable development. Tourism must be seen as an industry of resources, dependent on the natural and cultural heritage and human potential.

It is primordial for tourism industry to be active concerning problems that sustainable development is facing. And also, cooperating with other industries by delivering quality resources for all the tourism activities (Nistoreanu P. et. al., 2011).

So, the aim of a sustainable tourism is to reduce its impact and keep a balance in terms of environmental, socio-cultural and economic impacts. Any rural tourist destination can be harmed by the tourist without an effective management. If the tourist rural areas are deteriorating or destroyed, for the future generation will not be no longer available. This is where circular economy concept in tourism comes in.

2.2.2. Consideration regarding sustainable development in agro-tourism

Connecting the economic, socio-cultural and environmental parts of sustainability, agro-tourism connects all parts by adding their mutual improvement. Agro-tourism is an economic work connected with the presents of rural communities and environment.

So, this sector is linked to the requirements of socio-cultural and environmental impacts. (Email S. A., et al., 2017).

The research on the conservation and preservation of natural and cultural heritage is necessary to develop a sustainable agro-tourism sector. Specific projects to promote the notion of sustainability in this sector should be supported by the public authorities, specifically in order to enhance the knowledge on this topic both of the managers and of the users of the structures.

The existence of real advantages and limitations of developing sustainable agro-tourism in the European countries is visible. The main advantages consist in the fact that the keystone of agro-tourism is agriculture. This can set up a fundamental role in sustaining rural regions (including their natural and cultural heritage, local communities, etc.) towards a harmonious development.

Other important advantages regarding a sustainable development in agro-tourism can be summarized as follows:

- As an economic activity, agro-tourism induces a significant impact on economic growth, employment and social development. By contributing to the income of farmers and simultaneously to the outliving and growth of agriculture and farming;
- The countryside landscape is an added value to the diversity of architectural styles (houses, farms, villages, etc.). Therefore, the conservation and preservation of natural, cultural and historical heritage is fundamental;
- The agro-tourism sector gives the opportunity to farmers to promote their proprieties and their geographical location. And also, increase the sales regarding the natural local products or typical crafts of the region and add value to their local production.

- Standing in a rural accommodation unit involves various leisure activities connected with the rural local gastronomy, cultural, natural and historical heritage;
- In the agro-tourism sector, a particular consideration is necessary to the environment, being raw material for agro-tourism. So, the relation between agro-tourism and environment denote a distinct significance.

Regardless to the notion of agro-tourism, should be included the following four directions: mixt of the tourism and agriculture industries, attracts members of the public to visit agricultural and animal husbandry activities, designed to increase farm income, provides recreation, entertainment and educational experiences to tourists.

2.3. General aspects regarding circular economy

The concept of Circular Economy is promoted by the European Union (EU) and starting with 2014, European Commission (EC) initiated a Circular Economy Package. Forwarded to the businesses and consumers from Europe, to facilitate the transition from the Linear Economy to a Circular Economy.

Within this context, the waste is identifying as a resource and it can be recycled, re-used or re-fabricated. With the feature leading to an economic growth without increasing the consumption of resources with a sustainable development from economic and environmental point of view (European Commission, 2014).

In 2015 the European Commission is already setting up an EU action plan for the Circular Economy. This plan it consists by a set of general and specific material actions addressed to the Member States of the European Union (EU).

The set of measures and targets are related with: food waste, water waste, waste-to-energy, recycling targets, etc. But also, eco-design rules for the products to make them easier to be recycled. By promoting economic instruments to cut down the landfilling and banning the storage of waste collected separately put all together (European Commission, 2015).

In 2017, European Commission is adding and setting up two other directives, the role of waste to energy in the circular economy and the role of eco-innovation (European Commission, 2017a, 2017b). EU confirmed that biogas generation from anaerobic digestion plants is compatible with the concept of circular economy. However, home composting should be

promoted in the agro-tourism structure for its lower cost and the avoiding of environmental impact from food waste collection. And the role of eco-innovation by stimulating circular economy, being the instrument of circular economy.

2.3.1. Consideration regarding circular economy in tourism

Tourism have a significant role in the European Union (EU). Due to the economic and employment potential, but also the social-cultural and environmental inference. Eurostat reports that in 2014 one enterprises from ten are from tourism industry. Those 2,3 million businesses have employed approximately 12.3 million (Eurostat, 2017).

In general, tourism is conditioned by the attractions of the tourism destination and its natural resources. Although, it is fundamental to underline that tourism has a crucial environmental impact and can produce tension on local resources.

Tourism involves land use and resources as food, water and energy. Furthermore, tourism activities cause a larger generation of waste (solid waste and waste water), also noise and air pollution.

The problem related with the resources can aggravate by the growth of tourist arrivals. Mixed with circumstance of some destinations that are not oriented to resist to such pressures.

The tourism industry is identified by the linear model take-make-use-dispose. Nevertheless, the resources are limited, and the linear economy pattern is not suitable anymore. This paper set the aim by supporting the transition to a more circular tourism economy by setting up some conceptual models of use of natural resources.

The important actions proposed by the European Commission through Circular Economy Package are to contribute to "closing the cycle" of product life cycles. The direction is to increase recycling and re-use by bringing benefits for the environment and the economy.

In this framework tourism can contribute to decouple growth from the use of natural resources while avoiding compromising the environment. And also, assurance sustainable development growth for society.

A fundamental approach of this circular economy is the one linked with the view of moving from the linear economy thru sustainable consumption and production patterns.

The circular concept is promoting closed material loops and improve the resource efficiency by reducing the pollution as approaching the climate change decrease with a large approach by sectoral value chains and across the traditional sectors.

The concept of circular economy involves strong measurement and monitoring. It is followed the sustainable development effects on the economic activities and a permanent optimization of performance by using eco-innovation and technologies with cost-effective.

2.3.2. Consideration regarding circular economy in agro-tourism

The concept of Circular Economy is an approach to an economic development with the aims of an environmental harmonious and a coordinated development. This approach being rarely set up and applied in tourism with the aim of a sustainable development.

Taking into account that agro-tourism activities depends on natural resources, the efficient use of them is fundamental. Living in a world with finite resources is vital to approach new models of production and consumption.

Therefore, the start points of ensuring a sustainable development in agro-tourism it is the transition from a linear economy -take, make, use, dispose - to a circular one. In this way the dependence of materials and energy is reduce.

In this paper the framework of circular economy in agro-tourism is related to the ideal to consume as many resources as they can be regenerated.

Observing agro-tourism activities from a circular economy perspective there are multiple benefits. Environmental by the decreasing resource consumption, economic by enhancing the productivity and socio-cultural by conserving the identity of the rural area and increasing employment rate.

The knowledge and analysis of tourism requirement and supply is significant because of the effect on the policies development. Those marks an impact on agro-tourism economic activities, socio-cultural identity and also to environment.

A strong component in agro-tourism regarding the transition to circular economy is increase awareness. To train farmers and tourist is high-priority being a delicate aspect. The tourist consumption tracks particular models that have to be changed thru the marketing instruments, accentuate the values, not the consumption itself.

So, the outcomes of agro-tourism activities involve a suitable monitoring, evaluation and feed-back tools through proper indicators. It is fundamental to have knowledge, information and to start applying actions to diminish negative impacts.

Achieving a sustainable development in agro-tourism from a circular economy perspective is a continuous process. This necessitates a constant monitored of both positive and negative impacts. All by contributing to the development of good practice to make agro-tourism a system reaching sustainable development goals.

2.4. The link between sustainable development and circular economy in agro-tourism

The concept of circular economy links to the United Nations with regard of Sustainable Development Goal number twelve. This concern sustainable consumption and production. This objective aim is to reduce resource consumption and pollution and analyses the use of goods throughout their life cycle (UN Economic and Social Council, 2017).

A sustainable consumption and production in agro-tourism requires use of resources and energy efficiency. Sustainable consumption and production (SCP) are defined by Oslo Symposium in 1994 (Oslo, 1994). The main framework is to use services/products by fulfilling the needs and ensuring quality of life. While reducing using natural resources and emissions of waste and pollutants through life cycle of the service/product to not endanger the needs of future generations.

Agro-tourism can contribute to achievement almost all the sustainable development goals in a directly or indirectly way. Considering the Sustainable Development Goal number twelve (SDG 12) related with, agro-tourism can produce a set of universal goals. That means the urgent environmental, social and economic challenges facing our world.

To introduce the notion of circular economy in agro-tourism it necessary setting out and apply a sustainable development concerning agro-tourism activities. Adopting a new exemplary of management starts up with promoting new intentions related to production, consumption, ethics, etc.

To accomplish those objectives, it is primordial the cooperation from farmers, tourists and the experts in the field by setting up policy makers. This will lead to benefits on agro-

tourism development sector in an environmentally friendly way by reaching the sustainable development of circular economy in agro-tourism sector.

Nevertheless, by promoting and developing a circular economy in agro-tourism, can be a framework of reference. This can lead to: a sustainable use of the resources, development in agro-tourism and improve efficiency in the agro-tourism activities.

For all that it is problematic to realize a circular economy in agro-tourism outside of a suitable legislation and policy being essential for supporting it.

In agro-tourism, the development thru circular economy linked to the United Nations Sustainable Development Goal number twelve. It is view as a model that's carrying the environmental direction.

With the assist of a regulation and a proper infrastructure development, agro-tourism sector can embolden and stimulate the energy efficiency and recycling. With the aim of reducing and stopping the contamination of the environment and the generation of waste.

With reference to a circular economy, is more than an eco-friendly form of tourism. Represents the connection of redesigning the concept of consumption and producing waste and of non-renewable energy sources. The scope is to track the agro-tourism activities through a sustainable resource management. The key points are reusing, recovering, redevelopment, regeneration and valorification of resources. In a framework taking as reference sustainability and circular economy in agro-tourism.

3. COMPARATIVE CRITICAL ASPECTS IN AGRO-TOURISM IN ROMANIA AND ITALY

3.1. Role of the selection of case studies Trentino and Sibiu County

Agro-tourism sector constitutes a great opportunity for the policy makers of the European Union. Stands as a pilot for the future policies concerning the development of the rural regions. This paper regarding the two case studies selected is to provide an overview and a review in agro-tourism in the context of a sustainable development regarding the environment from circular economy perspective. Below is the presentation related to demonstrate a fit to both case studies in the context of the research.

Many researches present different elements influencing the sustainable development of agro-tourism among theoretical frame works and/or empirical research from different regions in the world, in special Italy and Romania due to three reasons. Next is the presentation related to demonstrate a fit to both case studies in the context of the research.

The research is mainly concentrated on Romania and Italy because of the strong similarity with other countries from the European Union. And its characteristics concerning the cultural and spirit side, countries dominated by democracy. Both countries selected for the study of this research are situated in Europe and both are Member States of the European Union (EU) (EU - Member states, 2017).

The first reason is the one related with the international tourist arrivals. In relation with the two case studies selected for the paper it shows a grew in both countries. Italy reported a +3% growth, while Romania +11% according with World Tourism Organization UNWTO (UNWTO - Tourism Highlights, 2017).

The second reason is the spread of rural regions in both countries. As reported by the OECD classification and the new urban-rural typology regarding the share of land predominantly rural land indicates that Italy has 45,5 % rural land and Romania 59,8 % rural land (Eurostat, 2016).

And the third reason is that the both countries, Italy as well as Romania are Member States of the European Union, therefore EU law affect direct or indirect the national law and

becomes part of the legal system of each Member State. The European Union is a source of law and Italy and Romania are under the same legal order (European Parilament, 2016).

3.2. Overview on agro-tourism sector regarding the case studies

With the decreasing of farm income, tourism has growth quickly in the rural areas as an adjoin activity to agriculture. In those circumstances, agro-tourism has newly attained increasing consideration because of the demographic tendency above Europe but also worldwide. And due to the development-related changes in the agriculture sector and in the use of land.

The agro-tourism sector gives the opportunity for farmers to promote their propriety and the geographical locations. Also increase the sales regarding the local products and add value to their agricultural production (European Parliament Research Service (EPRS), 2016).

This paper is concentrating on Romania and Italy. The main aspect is the accentuated similitude with other countries of the EU. But also due to the common cultural and spirit side. It can be found in both countries tourism for winter and summer seasons because of the present clime in both countries, architectonic inheritance and geographic development.

The spread of tourism as an adjacent activity to agriculture has increase rapidly in rural areas. So, the tendency across the Europe is visible.

Appropriately, the expansion of rural regions in both countries has a significant potential for their development as the presence of rural regions, natural and cultural heritage, geographic place, climate. Eurostat indicates that in Italy a percent of 45.5% is rural land and in Romania 59.8% (European Commission - Eurostat, 2016.)

The tourism (as well agro-tourism) from Romania and Italy can influence in a positive way the environment protection. By decreasing production of waste and polluting emissions through proper and suitable management of the sectors of waste, water and energy resources (European Parliament's Committee on Transport and Tourism, 2016; Ezio, et al., 2017; Qian X., et.al., 2016).

For a better approach of the research two case studies have been selected. From Italy the Providence of Trento (Trentino) and from Romania is Sibiu County. Both regions are well-known as a tourist destinations at national and international level. The population is about

540,000 (Trentino) and 450,000 (Sibiu County) and the size of the regions about 6,200 (Trentino) respectively 5,400 km2 (Sibiu County) and orography (Martini, et al., 2017; Sidali, et al., 2017; Dulau A.V., et. al. 2009).

In Romania, ABHs must have no more than eight rooms dedicated to tourists. In Italy, the maximum allowed number of tourists/rooms is regulated by regional laws and varies region by region. In both countries Romania agro-tourism structures provide for the tourists adequately accommodation, meal and practice different locally specific activities. For example, processing the wood for obtaining different art objects.

The classification of agro-tourism structures it is represented by several daisies and it is characterized to a scale from 1 to 5 daisies. The specific feature of agro-tourism structures of receiving a number of daisies is according to the law (Ministerul Turismului, 2010; Trentino Agricoltura, 2016).

Agro-tourism structures are receiving a particular number of daisies by some criteria. The requirements of the calculation of the points are related with landscape contexts of the agro-tourism structure. The general quality of management of the farm regarding the accommodation services and commodities, the catering services, the presence and the level of recreational activities, the agricultural activities and the typical products of the farm.

In Italy and Romania, the number of ABHs is increasing year by year. In Italy, the regions of Tuscany and Trentino-Alto Adige have the highest density of ABHs. In Romania, the highest density of ABHs is in the districts of Brasov (ABHs>200). In the Province of Trento a number of 441 classified agro-tourisms and in the Sibiu County are classified 118 structures (Trentino Agricoltura, 2016; INSSE, 2016).

In agro-tourism, generally, the tourism reception structure is set out as “agro-tourist boarding house” (ABH). In this research, the concept of ABH (agro-tourist boarding house) it is use to cover all the significations of „farm locations“ identified by Phillip et al. (Phillip, et al., 2010) .With a particular accent on those accommodation structures where tourists are in a direct and active way involved in various rural activities.

3.3. Data collection and processing for the case studies

In this research two organizations were implicated in the case studies: Ufficio di Economia e Politica Agraria Provincia Autonoma di Trento (Italy) and the Sibiu County Tourism Association (Sibiu). Both the local administrations supported the present research by making information available on the structures of the two territories and on the approach used to disseminate sustainable criteria of management.

The information that has been accessed were available in form of raw databases and printed dissemination documents and participation to conference in the field of tourism taking direct contact with the players from agro-tourism sector.

The possibility of having information, also from the point of view of the environmental sustainability of the structures (See Annexes 7.1), is useful for different purposes, both to identify the impacts that this growing sector entails for the territory but also to gather information on the environmental side that is always greater importance in the choice of a destination for tourism or recreational purposes.

3.3.1. Collection of information from agro-tourism structures

Necessary for the purposes of the objectives set out in this work is the knowledge of the agro-tourism structures located in Trentino and Sibiu County regarding the sectors of analysis which are energy, water and waste (See Annexes). The questionnaire is oriented to outline a framework in the different areas of analysis, in particular:

- Characterization of waste sector with reference to traditional methods implemented after the production of different waste fractions;
- Characterization of water sector in relation to the adoption of technologies for the containment of waste and the waste water treatment systems adopted;
- Characterization of energy sector on the use of renewable sources for electric or thermal purposes, types of fuels used for various purposes, type of insulation thermal systems, activities and practices promoted and carried out at the facility and future intention to adopt energy efficiency measures.

The empirical data is collected is and the questionnaire was self-administered. Selection of participants in this study was done on a voluntary basis. Sending questionnaires to agro-tourism was made by e-mail and was followed by a letter from the Trento Provincial Agriculture

Service in Trentino and Sibiu County Tourism Association to promote data collection in the agro-tourism sector and stimulate the response to the questionnaires.

In terms of research methods, was chose the questionnaire based on investigation method. The questionnaire was sent to the subjects with the propose to conduct the research to the objectives pursued. The methodological tool used to gather information was the opinion questionnaire. It has the advantage of providing complex information and the objective possibility of correlating the indicators, making it possible to achieve credible and easy-to-interpret results.

For the study, an anonymous questionnaire was applied. The anonymity of the questionnaire was ensured, but they were requested some data necessary for statistical processing relating to: agro-tourism structure's name, address, telephone/fax, website, e-mail, position respondent in the agro-tourism enterprise.

The questionnaire contains open and closed questions. The open questions are those followed in the questionnaire by a free space where the response will be recorded, the subject being the one who completes the questionnaire as he thinks fit, that is, the subject can either make a large comment on the issue, or a brief summary of a few words. Closed questions are accompanied by possible variants, the subject being constraint to choose the right option. Answering closed questions is done by marking the chosen response.

3.3.2. Processing data from questionnaires

The questionnaires were sent to agro-tourism farms, corresponding to Trentino and Sibiu County. The reason for this is because it was not realizable to send to the remaining agro-tourism structures as they were not found e-mail addresses being absent on the database held by the Ufficio di Economia e Politica Agraria Provincia Autonoma di Trento (Trentino) and the Sibiu County Tourism Association (Sibiu) and have not been identified even through online searches.

The structures not involved in this data collection do not have a website dedicated to them and are often not present on pages dedicated to the advertising of hospitality facilities managed for example by Trentino Marketing, Agriturismo Trentino, Sibiu County Tourism Association (pensiuni agroturistice) or association or on portals dedicated to bookings and exchange of views on the structures.

Replies to the questionnaires were obtained, corresponding to 56.9% of the requests sent in Trentino and in Sibiu County, corresponding to 51%. Although some farms have not provided an answer declaring that they are impossible due to time issues or considering too many questions to be answered, the information collected has allowed to outline the environmental and energy situation of a large part of the Trentino farm structures involved in investigation.

Below are presented critical aspects of the agro-tourism sector regarding waste, energy and water consumption.

- Waste generation and disposal

The quantity of the waste produced by the agro-tourism structures primarily depends on the dimension. In terms of receptivity or available number of beds and seating for the catering service. This amount is also strongly correlate with the number of days in which the agro-tourism structure is open during the year. The waste generated can be treated as domestic one because it is mainly composed of organic fraction, packaging, plastic, paper, paperboard, glass, cans, pharmaceutical and undifferentiated waste/residual waste.

In the tourist areas of Trentino, the generation of residual municipal solid waste varies from a minimum of about 0.5 kg/day in the low season to about 1.0 kg/day in the high season (July and August), while the respective selective collection rates measured in a touristic valley are 61% and 54%. Waste are separately collected as light packaging, glass, paper and cardboard, food waste and residual waste, with slight differences among municipalities.

In the Sibiu county, with regard to the seasonal population (sum of inhabitants and tourists, but also the number of tourists/residents) one tourist generates 0.9-1.3 kg/day, while a resident generates 0.4 kg/day. A resident collects on average 50% more than a tourist. For waste infrastructure planning and waste collection services in tourist areas, a 1% increase in the tourist population leads to an increase of about 0.2% of recyclables collected separately.

In Sibiu County the collection is selective on the following fractions:

- metal and plastic (yellow bin);
- paper and cardboard (blue bin);
- mixed fraction - household waste (black bin);
- compostable biowaste (brown stump - or composting directly in households).

Concerning the waste collection system from Trentino, the selective collection functions by road container collection changed to door-to-door system as follow:

- paper (yellow bin);
- organic (brown bin);
- glass (green light bin);
- residual waste (green dark);
- plastic (bags-lightweight packaging).

There are individual garbage can/bins and islands for the selective collection (the green container for glass collection is only here). However, from the high mountain area waste transport is very difficult and therefore the waste is mixed up.

A substantial dissimilarity that appear between the two case studies, Romania and Italy, are the mode of calculating the fee for waste management. In Trentino, method is based on a punctual tariff calculated depending on the amount of non-differentiated waste delivered by a user. Fines are applied if the differentiated streams are of bad quality. By this way, the better a user makes selective collection the lower pays. The system works as demonstrated by the percentage of selective collection reached in 2017 in the province (around 80%) and the good quality of the separated streams. On the contrary, the Sibiu case study is not related to the concept of punctual tariff. The lower selective collection efficiency can be explained also by that.

- Energy consumption

The energy sector of agro-tourism structures has been also investigated by evaluating mainly the presence of technologies such as solar thermal and photovoltaic systems, the type of heat generators installed and the characteristics of the relative plants.

Almost all the agro-tourism structures considered, are connected to the electricity grid in both regions. In many cases, integration with the electrical consumption of the structures is done with photovoltaic panels, a technology that is widespread.

The consumption of electricity and heat contributes most to the impacts of agro-tourism structures. The use of fossil fuels causes the problem of air pollution (mainly due to the emissions of particulate matter, nitrogen oxides and sulphur oxides) and global warming (due to greenhouse gases emissions).

In Trentino, the majority of agro-tourism structures are connected to the national grid, although almost half of them integrate their electric energy consumption with photovoltaic panels and more than 40% uses solar thermal power to integrate thermal energy consumption. The average electric energy consumption in Trentino is about 2.5 kWh/person/day (Istituto Nazionale di Statistica - ISTAT, 2017). Thermal energy is provided by natural-gas heaters (when agro-tourism structures are reached by the gas grid), liquefied petroleum gas and gasoil-fuelled boilers, and, in 70% of cases, totally or partially by wood/pellet stoves.

In the Sibiu county the use of photovoltaic panels is very rare in the mountain area (possibly in isolated areas), so that power mainly comes from the national grid. The average consumption is 5-6 kWh/room/day. In the agro-tourism structures the main source of thermal energy is the gasification boiler for wood fuel - wood fuel boiler plant with a power of 30-90 kW. In such gasifiers, wood logs are brought to gasification - the process in which light hydrocarbons are released from wood and participate in combustion - and yields increase by 10-15% compared to traditional solid fuel boilers. The average consumption is 0.01 m3 wood/room/day.

For farms with large accommodation capacity with swimming pools, terraces or greenhouses, natural gas (propane) heating is also common. Natural gas allows for very low maintenance expenditures of consuming equipment (thermal power stations, aerotherms, boilers). For isolated or hard-to-reach areas, wood-burning stoves are used.

In both regions on a constructive level, in the most frequent cases, the prevailing material with which the perimeter walls of the structures have been built turns out to be stone, next while self-supporting bricks were used in the most situations, wood and reinforced concrete.

The presence of perimeter walls in stone is particularly problematic in case of absence of thermal insulation as it involves the high energy requirements resulting from the significant thermal flows for transmission through the walls.

In both case studies the use of wood as a predominant material is widespread above all among the most recently constructed structures.

Particular attention has been given to the degree of thermal insulation of buildings both in reference to the covering and to the opaque and transparent vertical closures. The data obtained showed that 51.5% (Trentino) and 40.9% (Sibiu) of the cases both external insulation and insulated cover are adopted.

Agro-tourism structures are in most cases not connected to the pipeline, this is due to the fact that companies often place themselves in contexts isolated from inhabited centers but also because not all areas of Trentino have been involved in methanisation. The connection to methane significantly conditions the use of this fuel for the supply of domestic cookers and boilers.

Also, in reference to the energy sector, the presence of wood stoves was analyzed. The use of wood-fired biomass stoves is widespread in the most agro-tourism structures. The mainly widespread appliances are the traditional economic kitchens and the stoves, although the presence of fireplaces, is not negligible.

For the supply of biomass appliances, most of agro-tourism structures declare to use wood produced solely through self-procurement practices, with planned cuts of plants identified and reported in order to guarantee sustainable forest management; only a few of the cases purchased wood.

While in the case of the autonomous cutting and logging practices, wood is used from various species, especially depending on the varieties most present in the area but also using wood derived from fruit plants grown by the agro-tourism structures, when replacing the plantations, in the case of the purchase of wood it is declared to resort only to the beech and fir varieties.

- Water consumption

Agro-tourism structures are usually characterized by important consumption of drinking water, due to the domestic household withdrawals in kitchens, for cleaning and washing, but mainly for sanitary facilities. The irrigation water for gardens and crops adds up to the standard water consumption.

In 90 % of the cases in both case studies, agro-tourism structures are connected to municipal aqueducts or private (their own) consortia for the supply of drinking water.

In Trentino most of agro-tourism structures appear to be attentive to water consumption, that installed flow reducers on taps or air filters in mixers and that use drip irrigation systems; these technologies are all aimed at limiting consumption without compromising the purposes and functionality of the appliances.

In Sibiu County the owners of agro-tourism structures are at the incipient phase of the transition to limiting consumption of water with special systems.

The agro-tourism structures of Trentino and of the Sibiu county are characterized by similar water consumptions, which can be estimated as 0.15 m3/room/day.

With regard to the treatment of wastewater produced in agro-tourism structures in Trentino and Sibiu, a large majority, is connected to the municipal sewage system and to the treatment plant.

Achieving a sustainable development thru a proper management in an agro-tourism structure is a continuous process. This requires a constant monitoring of the positive and negative impacts. By contributing to the development of good practices to give agro-tourism a frame of reaching sustainable development goals. Thus, an important aspect is to reduce the impacts of agro-tourism activities and keep a balance in terms of environmental impacts. The two regions can be harmed by tourists without an effective management.

Organizations in charge in the regions regarding the two case studies, Trentino and Sibiu County, demonstrated a lack of integrated vision from the environmental view. This in spite of the enhanced management of the environment in one of the two regions implicated.

The issue “environment” is close to be absent in the classification of agro-tourism structures represented of a number of daisies (a scale from 1 to 5) (Cioca, et al., 2018). However, all the tourist structures in Trentino as well as in the Sibiu County have to comply with the instructions of the local authorities that are responsible for the local waste, energy and water management service.

The consumption produced depends mainly on the size of the structure in terms of accommodation capacity (namely number of beds and seats at table for the restaurant service). The quantity of produced waste must be linked to the number of days per year during which the accommodation is open. Various types of services can be available depending on the specific structure lodging in apartments or rooms, camping activities, breakfast or restaurant service, recreational, cultural and educational activities can be offered to the customers.

3.4. Legislation at European, National and Regional level in agro-tourism, waste, water and energy sector

This paper highlights on overview for agro-tourism sector that has seen a significant increase in Italy and Romania in the past few years in terms of the number of structures in the area. Therefore, dealing with the rural development, multi-functionality of rural areas has gained increasing attention. Some preliminary aspects suitable for a comparison between the sectors of agro-tourism in Italy and Romania, considering the main topics that can affect their sustainability in the context of circular economy: waste, water and energy sector.

3.4.1. Sectoral regulation in agro-tourism

- European framework on agro-tourism sector

Although there is no specific community legislation on agro-tourism, the European Union (EU) thru the Commission Department Agriculture and Rural Development has adopted a rural development policy on agriculture and rural development; the mission is to promote and to ensure the wellbeing of Europe's rural areas from economic, environmental and social point of view (EC - Agriculture and rural development, 2016).

In 2010, the EC arrogate a new methodology for the classification of the territory being characterized by the strong presence of rural areas (Eurostat - Urban-rural typology, 2016). In Europe 23.6% of the EU-28's land area was covered by urban areas (cities, towns and suburbs) and around 44 % was covered by intermediate and predominantly rural regions (Eurostat - Territorial typologies, 2016).

The strong presents and of rural regions and their extending are a fact and as reported by the European Parliament, the significance in the economic framework of agriculture of the European Union is declining. Therefore, in this context the development of agro-tourism is an important opportunity concerning the potential growth for rural regions. The economic, social and environment development of these rural areas plays a significant role and the objective of European policy in this filed is to increase this development of these rural areas by valuing their potential (EC - Agriculture and landscape, 2016).

This type of policy is funded by the european fund (EAFRD) and the member states of the European Union receive a financial contribution. Manly priorities are concerned with the

promotion of the agricultural, forestry and rural sectors by improving profitability and competitiveness, but paying attention to sustainability and the enhancement of ecosystems, favouring the efficient use of resources (EC- Rural Development Programmes 2014-2020, 2016).

Within the framework of programmes to support rural development, the role of agro-tourism becomes significant. Presently, this type of tourism is one of the most compelling practiced in most of the European countries, inducing/stimulating economic development through capitalization of local resources from the rural environment. In Europe, the agro-tourism sector is a highly competitive business, facilitating the creation of associations and organizations to promote the rural tourism (European Centre for Ecological and Agricultural Tourism - ECEAT, 2016).

- National framework on agro-tourism in Italy and Romania

In Italy agro-tourism is a special form of tourism characterized by a farm that can provide to the tourists an alternative holiday in contact with nature. By the Law no. 96 of 20 February 2006 establishes the rules of the agro-tourism, is presented as "defines agro-tourism activities as those exercised by agricultural entrepreneurs [...] through the use of his own farm house in connection relationship with activities of cultivating the land, silviculture and animal husbandry" (Lege 20 febbraio 2006, n.96 , 2006).

In Romania, according with the OG. no. 58 21/08/1998 regarding the organization and development of tourism activity, tourism is defined as: "the branch of the national economy with complex functions, which brings together a set of goods and services offered for consumption to people who travel outside their usual environment for a period of less than a year and whose main reason is other than the exercise of remunerated activity inside the visited site" (Ordonanţă privind Organizarea şi Desfăşurarea Activităţii de Turism în România, 1998).

3.4.2. Waste sector

- European framework on waste sector

The European Environment Agency proposes, to encourage waste recovery and preserve natural resources. The directives aim is to control the entire waste management cycle through sustainable solutions. Eurostat figures show that waste production at European Union level has been declining slightly in recent years (Eurostat - Municipal Waste Statistics, 2016), but the European Sustainable Development Strategy aims to disassociate waste generation from the

aspect of economic growth and to achieve a reduction in waste produced through prevention initiatives and more sustainable consumption patterns.

The Waste Framework Directive 2008/98/EC governs the program of the entire waste management cycle with attention to the prevention of production, recycling, recovery and finally waste disposal. It also identifies obligations for the activation of differentiated collections and for the preparation of management plans for state territory by the Member States (EC, Directive on waste and repealing certain, 2018).

- National framework on waste sector in Italy and Romania

In Italy the legislative Decree 152/2006 with subsequent amendments and transposition, are establish regional waste management plans and in Romania, the Order no. 1.364 from 2006 is also approving the regional waste management plans and later the law no. 211/2011 on waste regime as arrogate and retaken in 2014. Thie law is settinf up the mandatory nature of selective waste collection for large producers of waste and was a major step forward. In both countries the state must identify the criteria for developing such plans as provided.

The regions are responsible for the preparation of regional management plans, but according to sector planning waste management must be coordinated and integrated between national and regional levels. For the approval of the plans, the Environmental Strategic Assessment process should be carried out to take account of the likely environmental impacts resulting from the plans. Approval of the plan is crucial to accessing national funding (Decreto Legislativo n. 152, 2006; Lege nr. 211, privind regimul deşeurilor, 2011).

- Regional framework on waste sector in Trentino and Sibiu County

In Trentino, has been set the foundations for the organization of an integrated waste management system with the approval of the Provincial Waste Disposal Plan in 1993. This plan was subsequently updated. Later with L.p. 5/1998, through waste collection, a waste management based on reduction and recovery is re-launched. Art.63 of the provincial legislative source states that in the Trentino waste management is regulated by Legislative Decree no. 152/2006 (Provincia Autonoma di Trento, 2014).

In Sibiu County there was several programs on waste management have been implemented over the years. Since 2016 regarding selective waste collection, Sibiu has a waste management system which, besides selective collection, involves setting up new platforms for

the placement of igloos and eco-containers, as well as changes in the payment of this service (Primaria Sibiu, 2016).

3.4.3. Water and Wastewater sector

- European framework on water and wastewater sector

At the European level, in 2000 the European Commission has introduced an innovative approach to the Community water legislation by setting up a EU Water Framework Directive. Among the objectives of the directive are the improvement of the state of water quality and the sustainable development of these waters. Directive 2000/60/EC also stipulates that the Member States should deal with the protection of water at the watershed level (EC-Directive in the field of water policy, 2000).

- National framework on water and wastewater sector in Italy and Romania

This Directive was transposed in Italy by the Legislative Decree no. 3/04/2006, no. 152 or the Environmental Code. This Legislative Decree has repealed the Law 36/94 (Galli law) and has reorganized, coordinated and integrated environmental legislation. This contains what concerns legislation on water governance, in particular the protection of these from pollution and water management. This decree divided the national territory into eight river basin districts, each of which must prepare a management plan (Attuazione Direttiva Quadrosulle Aque, 2000).

Regarding in Waste Water Sector in Italy, the legislation of waste water or purified in water bodies is contained in Part III of the Environmental Code, as it is the protection of water from pollution. The goal is indeed the water reactor, purification is just a tool to protect the waters (Provincia Autonoma di Trento , 2006).

In Romania, through the Law no. 310/2004 and the Law no. 112/2006 were amended and supplemented the Water Law no. 107/1996, so that it fully takes over the dispositions of the European Parliament and Council Directive 2000/60/EC establishing a framework for Community action in the field of water policy (Lege nr. 112 pentru modificarea si completarea Legii apelor, 2006). The water management activity complies with the requirements of the Directive Water Framework Directive 60/2000/EEC and other EU Water Directives.

The quality of the water in Romania is monitored according to the structure and methodological principles of the Integrated Monitoring System of the Romanian Waters, restructured in accordance with the requirements of the European Directives. The legislation

regarding waste water or purified in water bodies is present in the law and by the Normative from 2002 on the conditions of waste water evacuation in the sewerage networks of the localities and directly in the treatment plants being.

For joining the Union European, the obligations assumed by Romania through the Accession Treaty GD 188/2002 has been supplemented and amended by the Decision Government no. 352/21.04.2005. This included the compliance requirements the negotiated transition periods for collection systems and treatment plants (Ordin nr. 31 din 13/01/2006, nr. 234 din 15/03/2006 privind aprobarea Manualului pentru modernizarea şi dezvoltarea Sistemului de Monitoring Integrat al Apelor din România (SMIAR), 2006; (Hotarare nr. 352 privind modificarea conditiilor de descarcare in mediul acvatic a apelor uzate, 2005).

- Regional framework on water and wastewater sector in Trentino and Sibiu County

At the provincial level in Trentino, the water sector is standardized through the Water Quality Plan approved in 2015, the General Plan for the Use of Public Waters and the Provincial Water Rehabilitation Plan. The Water Protection Plan is the planning tool for water bodies in the province. This plan shows the quality of water bodies and the measures to be taken to remedy those unsuitable or maintain the quality of those already good or high, according to the Code of the Environment. The General Plan for the Use of Public Waters is the water management and it aims is leading to a sustainable resource management, centred on water conservation and the protection of aquatic ecosystems (Provincia Autonoma di Trento, Agenzia provinciale per la protezione dell'ambiente, 2016).

In Sibiu County, the Water Management System Sibiu are fulfilling the main objectives as: support a sustainable management of water resources, the implementation of European Directives to achieve good water status, defending against floods, warning of water users about the danger of accidental pollution, quantitative and qualitative monitoring of water sources, informing the public about water problems and those related to environmental protection, etc. (Administraţia Naţională „Apele Române", Sistemul de Gospodărire a Apelor Sibiu, 2016).

3.4.4. Energy sector

- European framework on energy sector

In 2002, Directive 91/EC EPBD: Energy Performance of Buildings Directive of the European Parliament and of the Council on energy performance in construction proposed energy certification. The aim is to improve energy efficiency in the construction sector, which consumes about 40% of energy in Europe (Directive on the energy performance of buildings, 2010).

Subsequently, the European Directive 2010/31/EC EPBD recasts on energy performance in construction. The objectives of the new directive are to improve the energy performance of buildings; in particular, proposed to adopt a calculation method for energy performance, to establish basic performance conditions and to use requirements for new buildings aiming at the construction of nZEB: Nearly zero-energy buildings. The law of stability in 2016 had extended the facilitation of the 65% tax deduction for energy redevelopment (EC - Towards nearly zero-energy buildings, 2015).

- National framework on Energy Sector in Italy and Romania

The first Italian law on energy is No.373 of 30/04/1976 referring to the energy consumption for thermal purposes of buildings, in relation to the new constructions or in case of renovation. Even though 373/1976 began discussing about energy-saving obligations, these are explained in a more detailed way only through Law 10/1991. This is followed by DPR 412/1993 with the rules for the design, installation, operation and maintenance of thermal plants for the purpose of containment of energy consumption (Legge 10/1991, Norme per l'attuazione del Piano energetico nazionale; Agenzia delle Entrate, 2016).

In Romania, the law 325/2005 regarding the energy performance of buildings, fully transposing the Directive 2002/91/EC of the European Union. The purpose of this law is to promote the increase of the energy performance of buildings, considering the external climatic and site conditions, the requirements of indoor temperature and economic efficiency (Lege nr. 325 serviciul public de alimentare cu energie termică, 2006).

Also, Romania is interesting this Directive from the EU regarding nZEB thru HG nr.122/25.02.2015 containing the approval on a plan for energy efficiency called the National Action Plan for Energy Efficiency. This plan were the Agency for Energy Efficiency shall be responsible, and the main objective is to define and implement the economic development

policies in line with the European Union (EU) policies, which allows concerted efforts to modernize the Romanian economy and society and supports economic and social convergence with the other EU member states (Hotărârea nr. 122 privind aprobarea Planului național de acțiune în domeniul eficienței energetice, 2015).

- Regional framework on energy sector in Trentino and Sibiu County

The Autonomous Province of Trento has started since the early 1980s, with the L.p. 14/1980, a policy in support of initiatives for efficiency, energy saving and the use of renewable sources. Over the years, the law has been amended and supplemented. In 2013, Trentino has approved the Provincial Energy and Environmental Plan (PEAP) 2013-2020, which is linked to other provincial instruments such as the Transport Plan and the Air Quality Plan. The goals are to contribute to the European 2020 plan. By focuses on energy efficiency and the promotion of the use of renewable sources, enhancing the local wood supply chain (Provincia autonoma di Trento, Agenzia provinciale per le risorse idriche e l'energia, 2013).

For Sibiu there is a Sustainable Energy Action Plan of Sibiu that proposes new reforms, derived from the specific objectives of the Europe 2020 Strategy relating to the other regional aspects such as the Transport Plan, the and the Air Quality Plan, Infrastructure and the Air Quality (Agenţia pentru Protecţia Mediului Sibiu, 2014).

For the waste, energy and water sectors, European Union, thru the Europe 2020 targets, propose targets for Italy and Romania regarding many sectors as: waste, water, energy sectors (EC-Europe 2020 targets for Italy, 2016; (EC-Europe 2020 targets for Romania, 2016.).

4. CONCEPTUAL MODEL FOR THE SUSTAINABLE DEVELOPMENT OF AGRO-TOURISM STRUCTURES ACTIVITIES FROM AN ENVIROMENTAL VIEW UNDER CIRCULAR ECONOMY PERSPECTIVE

Agro-tourism structures can enhance a sustainable development by a lower waste flow by minimalize the use of resources by changing with renewables.

A model as circular economy can have an important part in in achieving Sustainable Development Goal number twelve. It can make the production and consumption process more sustainable and cooperative by going to low use of resources, highlighting existing ones.

4.1. Agro-tourism in a context of sustainable development: environmental view

Agro-tourism is bind with various environmental impacts produce by the elements of this sector: accommodation, catering, agro-tourism activities, local transport. The important environmental issues connected with agro-tourism are: land-use and the impact are the imagine of the landscape, climate change linked with energy consumption, waste and food, and health.

Agro-tourism can be considering the intersection of tourism and agriculture. Therefore, it is a form of enterprise connected with commerce and links agricultural production with tourism. With the aim of attracting tourism into an agro-tourism structure offering entertainment, generating income for the farm/business owners.

This sector has grown rapidly and interferes to new markets, lifestyles and new product development opportunities. The quality criteria for the typical tourist has changed in the past decade.

One of the top criteria on every tourist list is the positive environmental impact. However, there exists an important paradox: a tourist destroys what he is searching for, while he discovers it by consumption.

In agro-tourism a special attention is required to the environment which constitutes the raw material, the subject and the aim of tourism activity. In this context, the relationship between agro-tourism structures and environment involves a important significance. The development and protection of the environment being the necessary condition for its practice.

Therefore, it is significant setting a view regarding consumption and production in agro-tourism because we live in a world with finite resources. Is vital to take into consideration a sustainable use of resources, enhance the efficiency of the agro-tourism and achieve the sustainable development of agro-tourism.

The way in which the resources are consume will have a real impact regarding the prosperity for the present and future generations. Those approaches are represented in Sustainable Development Goal number twelve (SDG 12).

Some of the key challenges regarding sustainable consumption and production patterns. For example: sustainable management from an ecological point of view the efficient use of natural resources; reduce food waste worldwide, treatment and effects of ordinary and hazardous waste; reduce waste generation by re-use, re-cycling and prevention; monitoring the impacts of sustainable tourism, consolidated the scientific and technological contribution to models of sustainable consumption and production; to ensure that people from everywhere can have information and the perception linked sustainable development and living in harmony with nature; necessity to reduce inefficient fossil fuel subsidies that encourage wasteful consumption (UN-Agenda for Sustainable Development 2030, 2015).

4.2. Conceptual model of sustainable development in agro-tourism from the perspective of circular economy

A transparent approach to a Circular Economy is when the resources is use efficiently by obtaining maximum value from them. With what it is left over at the end of a product life, to be recycled or reused to reduce waste. The goals are an attempt to combat problems as: over consumption and the continued demand for resources and their reduction.

The concept of a traditional linear economy is where the products after being used are throw apart. Newly established, Circular Economy concept supports the idea of reusing and repairing of the products and also promoting the idea of saving energy. The main aim is to reach an equilibrium between economic, social and environmental growth (EC-Sustainability and Circular Economy, 2017).

The United Nations Sustainable Development Goal twelve, in this paper represents the roots for the construction of the conceptual model. A model concerning the plan and the design process for sustainable development in agro-tourism from circular economy perspective: environmental view. This conceptual model is view as a Circular Economy solution for the Sustainable Development Goal number twelve.

Shows how circular economy solutions in the tourism construction sector can accelerate the shift to sustainable consumption and production and the implementation of Sustainable Development Goal number twelve while contributing to sustainable and resilient societies.

While approaching the economic and social part of a sustainable development in agro-tourism, the environment part needs to make fundamental changes of models of consuming goods and services for the preservation of our planet.

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Table 4-1 Matrix model of the planning and design process for sustainable development in agro-tourism from circular economy perspective: environmental pillar

Requirements	Activities	Objectives	Performance indicator
RESPONSIBLE CONSUMPTION AND PRODUCTION (Ensure sustainable consumption and production patterns)	1. to achieve sustainable management and efficient use of natural resources.	Introduction of a management from an ecological point of view in agro-tourism structure regarding the efficient use of natural resources.	$\frac{\text{sustainable management efficient use of natural resources}}{\text{agro} - \text{tourism activities}} = 1$
	2. halving per capita of global food waste at the retail and consumer levels and reduce food losses along production and supply chains.	Keeping a balance concerning food waste streams, collection problems in agro-tourism structure by reducing food waste.	$\frac{\text{food waste in agro} - \text{tourism structure}}{\text{food waste streams meeting the requierment}} = 1$
	3. achieving a management system for chemicals and all wastes to reduce their release to air, water and soil to minimize their adverse impacts on human health and the environment.	Introduction of a management system regarding all wastes to minimize their adverse impacts on human health and the environment.	$\frac{\text{total number of young employed}}{\text{legal requirements}} = 1$
	4. reduce waste generation by preventing, reducting, recycling and reusing.	implementing a system in the agro-tourism structure concerning waste generation through prevention, reduction, recycling and reuse	$\frac{\text{waste management system}}{\text{agro} - \text{tourism activities}} = 1$
	5.to reduce inefficient fossil fuel subsidies that encourage wasteful consumption	energy saving in agro-tourism structures by responsible use of energy and by choosing renewable energy sources.	$\frac{\text{energy saving}}{\text{renewable energy source}} = 1$
	6. ensure that people have the relevant information and awareness for sustainable development and lifestyles in harmony with nature.	To actively involve tourists in the sustainable management of the agro-tourism structure, it is important that the staff is properly trained in the field of environmental issues and strives to disseminate and promote responsible and sustainable awareness through the education of good practices implemented by agro-tourism structure.	$\frac{\text{management communication}}{\text{good practices in agro} - \text{tourism structure}} = 1$
	7. strengthen of the scientific and technological capacity to move towards more sustainable models of consumption and production	the use of technological equipment in agro-tourism structure to realize sustainable patterns of consumption and production (e.g. regarding the use of water, energy, etc.).	$\frac{\text{technological capacity}}{\text{patterns of consumption and production}} = 1$

Expressed mathematically this conceptual model of sustainable development under a circular economy perspective is presented in the form of the following model:

$$M_{CI} = \sum_{i=1}^{7} A_i r_i$$

In which:

$$\sum_{i=1}^{7} A_i = \sum_{a=1}^{k} I_a + \sum_{b=\eta}^{k} I_b + \cdots + \sum_{g=\eta}^{k} I_g$$

$$M_{CI} = \left(\sum_{a=1}^{k} I_a\right) r_1 + \left(\sum_{b=1}^{k} I_b\right) r_2 + \cdots + \left(\sum_{g=1}^{k} I_g\right) r_n$$

Were:

CM- conceptual model

Ai - the activity of the model

k - objectives of the model

I a, b, c, d, e, f, g - performance indicator

ri - risk coefficient (risk factor), risk coefficients may vary from one agro-tourism structure to another depending on various factors. For example: moment priorities, organizational policy, etc.

Below it is presented diagram model for sustainable development in agro-tourism under a circular economy perspective: environmental view.

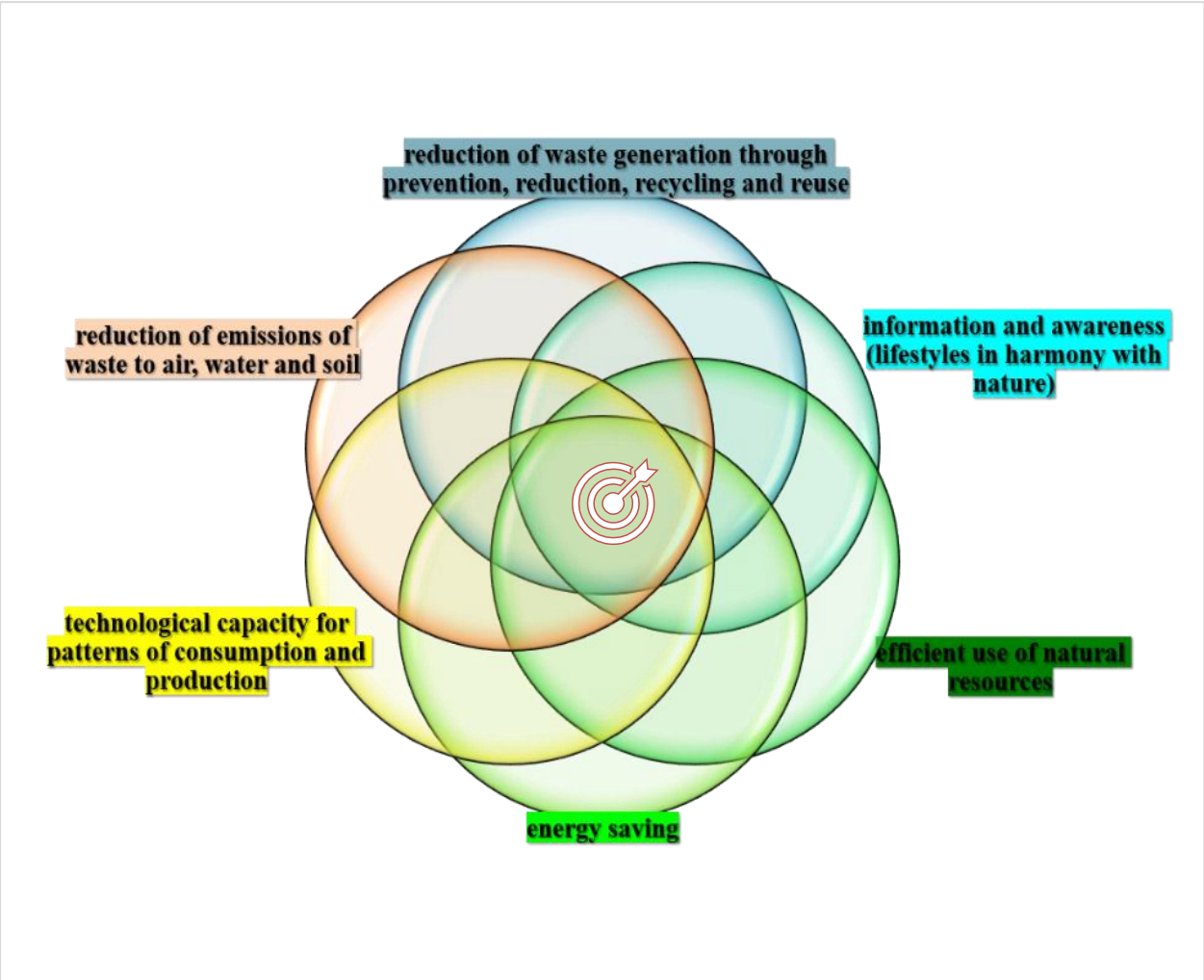

Figure 4-1 Diagram model for sustainable development in agro-tourism under a circular economy perspective: environmental view

As it can see above, in the context when all elements interfere with it, it is possible to achieve by a management been sustainable in agro-tourism structures from a circular economy view.

It is, in fact, desirable to turn into quality tourism aimed to protect rural regions and contracting the impact of anthropogenic presence. Therefore, the identify a management model that is able to combine the tourist and economic use of a certain area with respect for nature and the landscape.

4.3. Method regarding agro-tourism structures on environmental optimization

In this chapter is presented a proposal of a research method focusing agro-tourism structures for environmental optimization.

Deriving from the results of this investigation, research and information collecting, the paper will give some answers to the question: are agro-tourism structures environmentally friendly?

Thru this will be identified possible causes of polluting the environment due to agro-tourism structures and certain resources possible to be wisely used..

It has been used the methodology in this chapter inspired from a model named DMAIC. This model is used in the six-sigma projects in organizations (Kifor C.V., 2006).

The main aspect is to develop and propose a healthy agro-tourism development strategy for both regions. It is also important to know that the regional governments can lead the development of agro-tourism sustainability by framing their policy instruments.

In this paper it is presented a conceptual model that is meant to facilitate the purpose defined by the agro-tourism structure activities impact on environment (Giurea, et al., 2017).

To conform with the environment requirements at international level, it is recommending in order to improve to environmental aspects in the agro-tourism structures, tools and contemporary methods of control, monitoring and improvement.

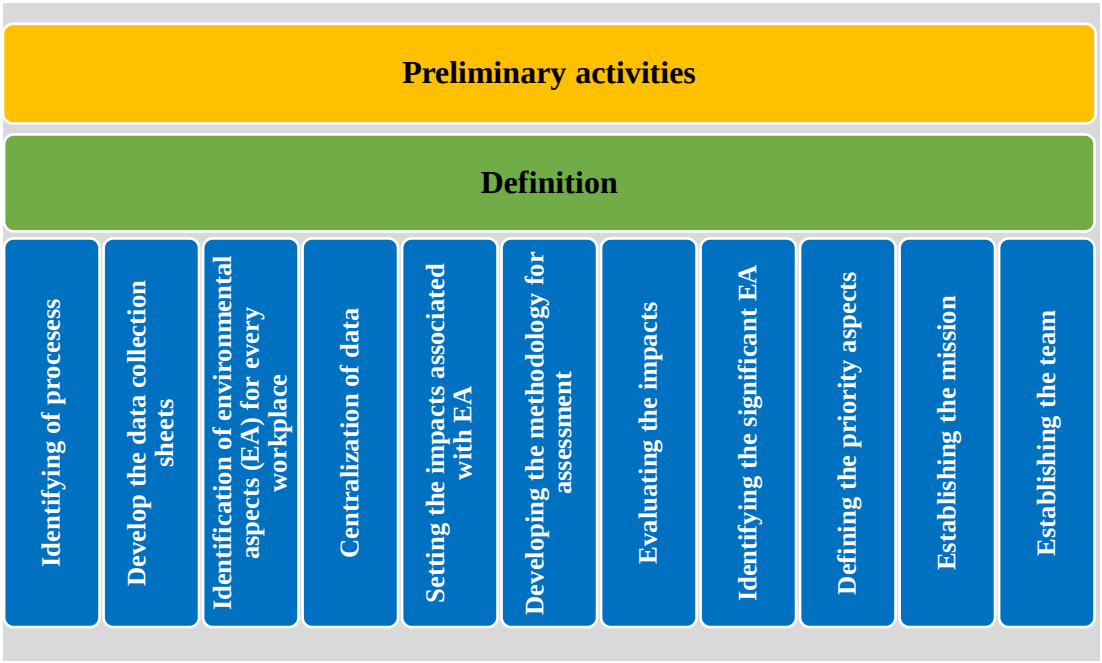

Figure 4-2 Steps for proposed model DMAIC - Introductory activities

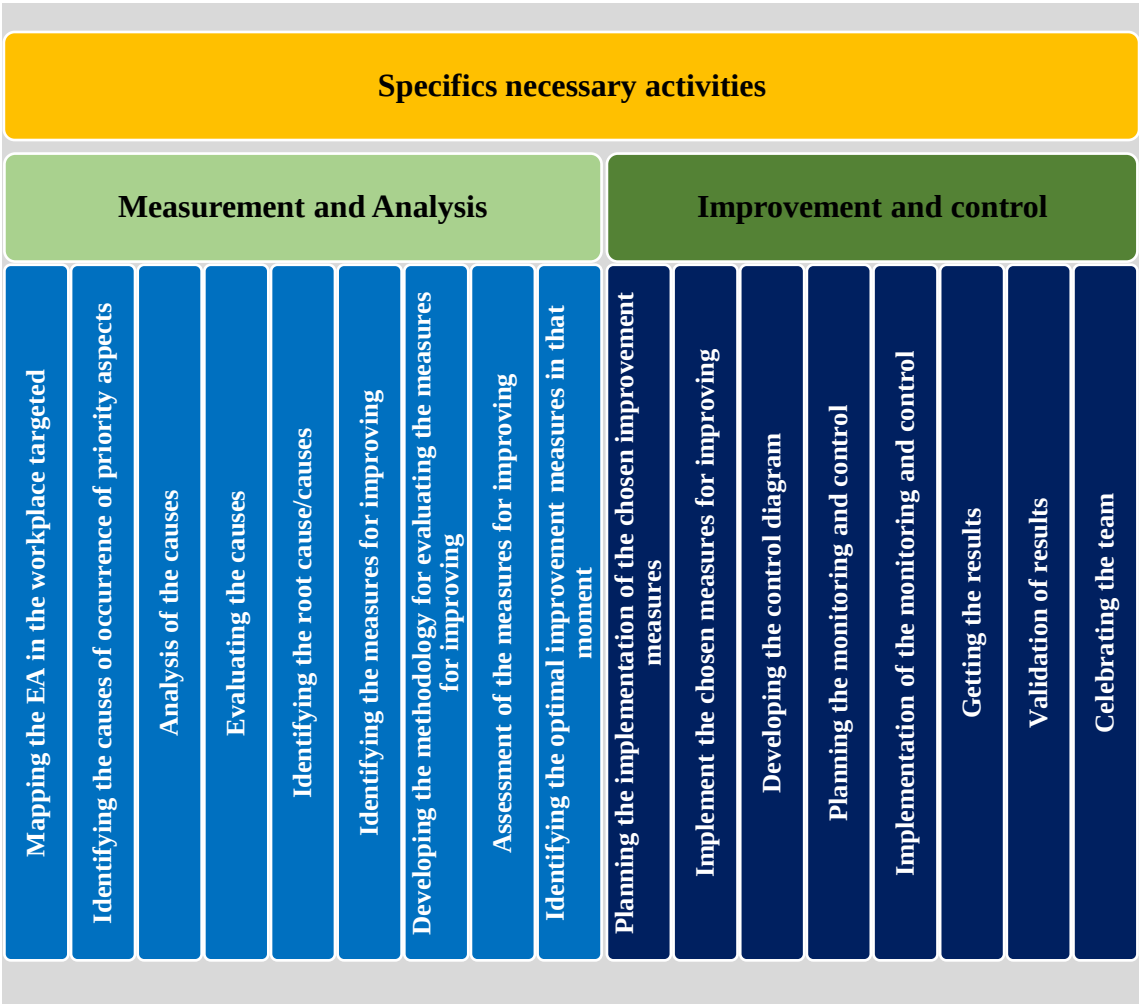

Figure 4-3 Steps for proposed model DMAIC - Fundamental feature activities

For the implementation of the proposed model, it was taking into consideration the principal activities in the agro-tourism structures, summarized in Table 4-2.

Table 4-2 Principal process in the agro-tourism structures

Process		**Included activities**		**Input**	**Output**	**Code**
Name	**Code**	**Name**	**Code**			
Transportation	T	Gas supply	**gs**	Gas	Fuelled automobile	TGF
		Carrying out documents	**cd**	Documents	Documents completed	TDD
		Transport	**tr**	Gas	Transportation	TGT
		Maintenance	**me**	Documents, Inspect. equipment	Automobile maintained	TIA
Check in/out	C	Carrying out documents	**cd**	Personal documents. Specific formulation	Check in/out	CPC
		Delivery keys	**dk**	Keys	Check in/out	CKC
Accommodation	A	Takeover room	**tr**	Check in	Check out	ACC
Meal	M	Meal preparation	**mp**	Equipment and products	Food prepared	MEF
		Serving food	**sf**	Meal prepared	Meal served	MPS
		Cleaning table	**dm**	Disposal meals	Release tables	MDR
		Cleaning dishes	**cm**	Dirty dishes	Clean dishes	MDC
Leisure activities	L	Hike	**hk**	Transport	Visit	LTV
		Equipment	**ha**	Equipment	Household cared	LEH
Hygiene/ cleaning	H	Common space	**cs**	Equipment and cleaning solutions	Common space cleaned	HEC
		Kitchen and bathrooms	**kb**	Equipment and cleaning solutions	Kitchen and bathrooms cleaned	HEK
		Guest rooms	**gr**	Equipment and cleaning solutions	Guest rooms cleaned	HEG
		Household	**hh**	Equipment and cleaning solutions	Household cleaned	HEH
Acquisition/ purchases	P	Analysis and drafting documents	**ad**	Documents	Documents completed	PDD
		Transport	**tt**	Gas	Transportation	PGD
		Reception	**re**	Documents	Documents completed, Product reception	PDP
		Storage	**st**	Documents	Storage products	PDS

Process		Included activities		Input	Output	Code
Name	**Code**	**Name**	**Code**			
Maintenance work	W	Maintenance equipment	**me**	Documents, Inspection equipment	Equipment maintained	MDE
		Automobile	**at**	Documents, Inspection equipment	Automobile maintained	MDA
		Equipment and installations household	**ei**	Documents, Inspection equipment	Equipment and installations maintained	MDI
Agriculture/ farming	F	Mechanized works	**mw**	Specific equipment	Tillage	FST
		Manual/handiwork works	**mh**	Specific equipment	Tillage	FSH
Zootechnics	Z	Caring	**ca**	Specific equipment	Groomed animals	ZSG
		Feeding	**fe**	Specific equipment	Fed up animals	ZSF
		Slaughtering	**sl**	Specific equipment	Meat, fur	ZSM
Pomiculture	P	Other manual works	**om**	Specific equipment	Fruit growing	PSF
		Spraying	**sp**	Specific equipment	Splash trees	PSS
		Pruning work	**pw**	Specific equipment	Fruit growing	PSP

In order to achieve an environmental optimization, the start point is to identify the main environmental aspects. And, the impacts associated with them.

In this way, the data about the identification and analysis of the aspects are highlighted in Table 4-3.

Table 4-3 Identification and impacts assessment of environmental aspects

Process	Included activities	Input/ Output	Environment aspect	OC*	EI	Impact assessment					Impact classification	
						L	F	N	C	TS	I	S
T	**gs**	TGF	Exhaust emissions	N	AP	5	3	1	3	45	**I**	-
	cd	TDD	Waste paper	N	SP	3	5	1	1	15	**I**	-
	tr	TGT	Exhaust emissions	N	AP	3	3	1	3	27	**I**	-
	me	TIA	Waste paper	N	SP	3	1	3	3	27	**I**	-
C	**cd**	CPC	Waste paper	N	AP, SP	3	5	1	3	45	**I**	-
	dk	CKC	Waste paper	N	AP, SP	3	5	1	3	45	**I**	-
A	**tr**	ACC	Waste paper, organic paper	N	AP, SP	1	5	3	3	45	**I**	-
M	**mp**	MEF	Organic waste	N	SP, WP	3	5	1	5	75	-	**S**
	sf	MPS	Organic waste	N	SP, WP	3	3	3	1	27	**I**	-
	dm	MDR	Organic waste	N	SP, WP	3	3	3	1	27	**I**	-
	cm	MDC	Organic, chemical waste	N	AP, SP, WP	3	3	1	3	27	**I**	-
L	**hk**	LTV	Exhaust emissions	N	AP	5	3	3	1	45	**I**	-
	ha	LEH	Organic, paper waste	N	SP, WP	5	3	1	1	15	**I**	-
H	**cs**	HEC	Chemical waste	N	AP, SP, W	1	3	5	3	45	**I**	-
	kb	HEK	Chemical waste	N	AP, SP, WP	1	3	5	3	45	**I**	-
	gr	HEG	Chemical waste	N	AP, SP, WP	1	3	5	3	45	**I**	-
	hh	HEH	Organic, chemical waste	N	AP, SP, WP	5	3	3	1	45	**I**	-
P	**ad**	PDD	Paper waste	N	SP, WP	3	3	1	1	9	**I**	-
	tt	PGD	Exhaust emissions	N	AP, SP, WP	3	1	3	3	27	**I**	-
	re	PDP	Paper waste	N	SP, WP	3	3	1	1	9	**I**	-

Process	Included activities	Input/ Output	Environment aspect	OC*	EI	Impact assessment					Impact classification	
						L	F	N	C	TS	I	S
	st	PDS	Organic, Paper waste	N	SP, WP	3	3	1	3	27	**I**	-
W	**me**	MDE	Paper waste	N	SP, WP	3	1	1		3	**I**	-
	at	MDA	Paper waste,	N	SP, WP	3	1	3		9	**I**	-
	ei	MDI	Paper waste, electronics and electrical waste	N	AP, SP, WP	5	1	3		15	**I**	-
F	**mw**	FST	Organic waste	N	SP, WP	3	3	5	3	135	-	**S**
	mh	FSH	Organic waste	N	SP, WP	3	3	5	3	135	-	**S**
Z	**ca**	ZSG	Organic waste	N	SP, WP	3	3	1	5	45	**I**	-
	fe	ZSF	Organic waste	N	SP, WP	3	3	1	5	45	**I**	-
	sl	ZSM	Organic waste	N	SP, WP	3	3	1	5	45	**I**	-
P	**om**	PSF	Organic waste	N	SP, WP	3	3	1	5	45	**I**	-
	sp	PSS	Organic waste	N	SP, WP	3	3	1	5	45	**I**	-
	pw	PSP	Organic waste	N	SP, WP	3	5	1	5	75	-	**S**

The legend is above:

WP-water pollution, AP-air pollution, SP-sol pollution; OC-Operating condition;

EI-Environment impact;

L-Existing of the legal requirements and other environmental requirements regulating environmental impact;

F-Frequency of occurring environmental impact;

N-The nature of the natural resource/the pollutant /the waste to which it relates those impacts;

C-Data on the amount of natural resource/pollutant /waste implied by those impacts;

I-Insignificant; S-Significant

The values obtained in Table 4-3 were analyzed using Pareto diagram as follows:

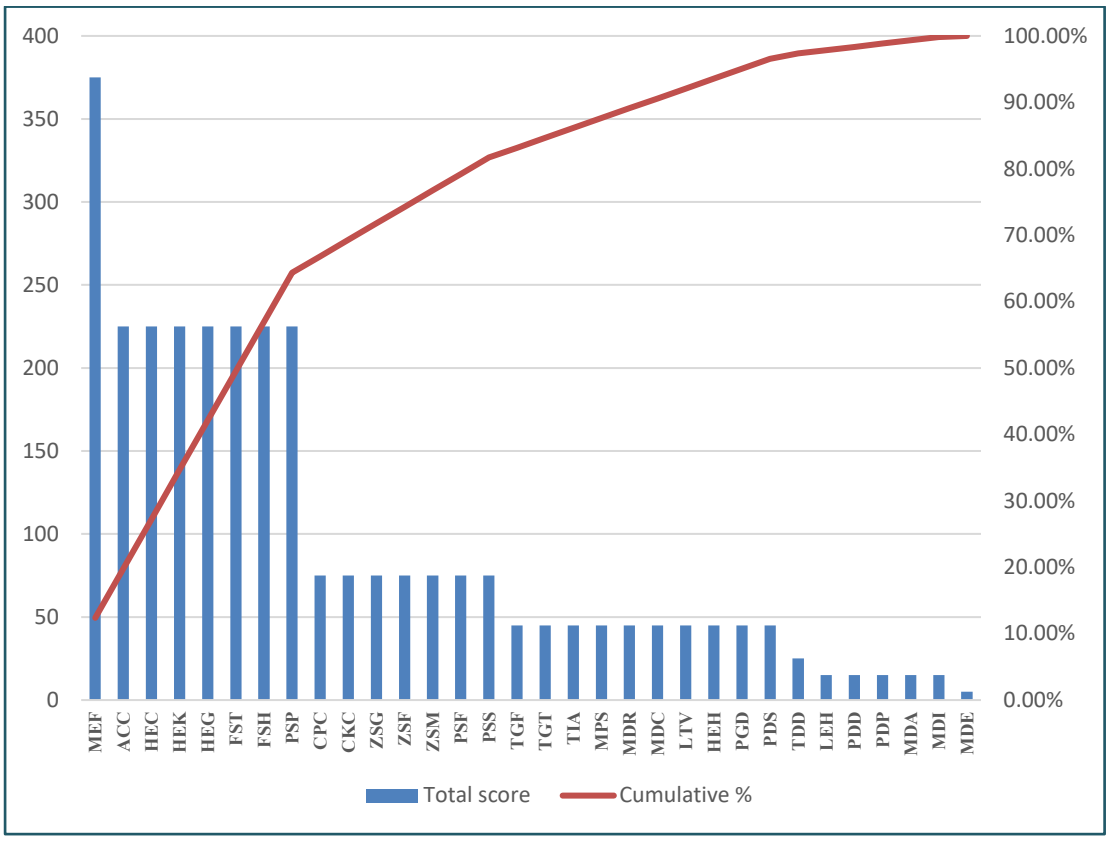

Figure 4-4 General view on analysed values through Pareto diagram

As shown in the chart, 25% of cases generates about 70% of the problem. To exemplify the way how these cases are are addressed, the analysis of the first three causes is presented.

So, Table 4-4 it is showing the identification of the alternative improvements presented.

Table 4-4 Presentation of alternatives regarding the first three causes

Cause	Alternative 1	Alternative 2	Alternative 3
MFE Meal preparation Equipment and products Food prepared	Outsourcing services through catering	Removal of the meal by providing the kitchen. The tourist will prepare his own meal	Increasing the consumption of their own products by prohibiting the consumption of products from outside the agro-touristic structure
ACC Takeover room Check in Check out	Creating a special zone for selective collection of waste in agro-touristic structures	Creating a special zone, serving the meal in agro-touristic structures	Optimizing water consumption and electricity by implementing sensors for light and water
HEC Equipment and cleaning solutions Common space cleaned	Acquisition of eco cleaning products	Some alert rules for dirty clothes through posters with environmental protection	Outsourcing services through specialized firms. Traditional cleaning

The alternatives identified will be evaluated using matrix for selecting the alternatives. To apply this tool is necessary to define a number of criteria as below.

The evaluation criteria previously developed alternatives are:

a) total cost;
b) impact on the problem;
c) relation the cost benefits;
d) resistance/impact to change;
e) time of implementation;
f) the uncertainty about the effectiveness.

To evaluate alternatives to improve relative to these criteria the authors used as an instrument of quality matrix (Table 4-4) for selecting the alternatives where used the following notations:

- 3 - very favorable impact;
- 2 - medium favorable impact;
- 1 - weak favorable impact.

Table 4-5 The matrix regarding the selection of the alternatives

Cause	Alternative for improving	Criteria selection						Total
		a	b	c	d	e	f	
MFE Meal preparation Equipment and products Food prepared	Outsourcing services through catering	2	3	2	2	3	1	14
	Removal of the meal by providing the kitchen The tourist will prepare his own meal.	3	1	2	2	2	3	13
	Increasing the consumption of their own products by prohibiting the consumption of products from outside the agro-touristic structure	**2**	**3**	**2**	**3**	**3**	**2**	**15**
ACC Takeover room Check in Check out	Creating a special zone for selective collection of waste in agro-touristic structures.	2	3	2	2	3	1	14
	Controlling serving the meal in the room by creating a special zone.	2	2	3	2	2	1	12
	Optimizing water consumption and electricity by implementing sensors for light and water.	**1**	**3**	**3**	**3**	**2**	**1**	**13**
HEC Equipment and cleaning solutions Common space cleaned	Acquisition of eco cleaning products.	1	3	2	3	2	1	12
	Some alert rules for dirty clothes through posters with environmental protection.	**3**	**2**	**3**	**3**	**2**	**2**	**15**
	Outsourcing services through specialized firms.	2	3	2	3	2	1	13

After identifying suitable options, using matrix for selecting the alternatives, a plan of measures will be developed to improve compliance with the requirements of Table 4-6.

Table 4-6 Measures plan regarding the improving compliance

No.	Cause	Corrective action	Resources needed	Responsible	Term
1.	MFE Meal preparation Equipment and products Food prepared	Increasing the consumption of their own products by prohibiting the consumption of products from outside the agro-touristic structure	M: preparing from the own products U: The chef	The owner	**Daily**
2.	ACC Takeover room Check in Check out	Optimizing water consumption and electricity by implementing sensors for light and water	M: sensors for light and water U: the electrician, the plumber	The owner	**2 months**
3.	HEC Equipment and cleaning solutions Common space cleaned	Some alert rules for dirty clothes through posters with environmental protection	M: posters with environmental protection U: the staff	The owner	**1 day**

The Legend is: M – material resources, U – humane resource.

With the control elements must be ensured that the corrective actions planned are used and maintained as required in Table 6, highlighting those items graphed control.

Below are presented the corrective actions planned.

Table 4-7 Corrective actions planned

Variable	Increasing the consumption of their own products by prohibiting the consumption of products from outside the agro-tourism structure	Optimizing water consumption and electricity by implementing sensors for light and water	Some alert rules for dirty clothes through posters with environmental protection
How to measure	Tracking stock	Tracking consumption	Visual
Were	Storage area	At the electric and water counter	Rooms
Reference	Sheet Storage	The bill	The amount of washing
Who measures	The chef	The owner	The staff
Who decides	The chef	The owner	The owner
What makes	Remake stock	Checking the sensors	Checking the posters
Who checks	The owner	The owner	The staff
Frequency	Dailey	Monthly	Dailey
Were records	Register	Register	Register

5. SUSTAINABLE DEVELOPMENT OF AGRO-TOURISM STRUCTURES FROM A CIRCULAR ECONOMY VIEW

The study starts from a deeper analysis of agro-tourism structures distributed throughout the Province of Trento and Sibiu County with the aim of obtaining data and information on the sectors that primarily affect the environmental sustainability in agro-tourism.

The knowledge of the agro-tourism structures and the particularity of the context in which they are introduce, are the starting points for identifying the improvement proposals aimed to achieve the optimization of the environment in this sector.

This optimization for the agro-tourism sector is realized through common actions also for other sectors and essentially concern the containment of consumption, emissions, using as much as possible renewable sources, together with the proper disposal of the various waste produced. This is possible after identifying any critical issues present in various agro-tourism structures thru insufficiently management practices.

The intent is to reduce the negative impact of agro-tourism structures on environment and local communities and increase the awareness of the owners and tourists and to assume attitudes of responsibility and cautious towards the environment and also involve tourists in the various initiatives aimed at reducing environmental impacts.

The sustainability of this sector is in fact realized through concrete interventions, installation technology (active energy-saving) but also eco-friendly management practices. It is therefore essential that the choices and actions implemented within the agro-tourism structure as well knowing the close link between these activities and territory, being explained and disseminated to the tourists, so as to encourage virtuous behavior.

It is expected that the highlighting of critical issues in some agro-tourism structures and the proposal of consequent corrective solutions, may encourage some farmers and tourists to adopt the best management practices and to refurbish the structures with the possibility of reducing consumption.

Proposals for interventions applicable in the various sectors of analysis, considered in this study, can also be replicated in the case of hotels and various accommodation facilities, in order

to minimize the impact on the environment deriving from tourism, without decreasing from the quality of the service offered.

The interventions addressed for the improvement in some sectors are simple to implement and do not involve large economic investments; it's mainly about modifying behavioral practices, often habitual, of the tourists and staff.

5.1. Guideline regarding Good Environmental Management Practice in agro-tourism

Agro-tourism can be considered as an instrument that can produce both positive and negative effects:

- positive effects on environment related to landscape, biodiversity and on local economies (Skowronek, et al., 2018; Sinatra F. et. al. 2017; Sadikin, et al., 2017; Giurea, et al., 2017; SeoHee, 2018);
- negative impacts on environment as pollution and degradation of the landscape; the lack of clear consequences and the cost implications in a time of an economic uncertainty can lead to incertitude regarding the climate change policies and strategies (Ranieri E. et. al., 2014; Siwek J. P. et. al., 2016).

There are many ways in which agro-tourism activities can be moved from the linear economy context, into the circular economy context (Isik, et al., 2017; Girard L.F. et. al., 2017). Such as: an efficient waste management, the optimization of the energy, efficiency and water supply, the use of green energy sources, the establishment of targets for waste disposal, all by making the agro-tourism structures self-sustain and reduce significantly the impact on the environment (Zhang Y., Tian L., 2014) (Rada E.C. et. al, 2017; D'Amato D. et. al., 2017; Cioca L.I., Giurea R., Moise I.A., Precazzini I., Ragazzi M., Rada E.C., 2018).

To this concern, the adoption circular economy waste management indices at structure scale could help to accelerate this pathway.

The proposed model of good practices for two case studies Italy and Romania. This could drive direct to agro-tourism planning in other countries, particularly those countries with similar economic, socio-cultural and environmental development with similar backgrounds.

Agro-tourism is an economic activity that depends on the existence of environment, cultures and rural communities. The benefits being positive to be in a context of eco-friendly environment with a sustainable management of resources (Wearne S., 2018; Fodness D., 2017).

In order to reach those objectives, the rural residents' perception, relationship between farmers, tourists and the specialists to set up a framework policy are crucial (Abdollahzadeh G., Sharifzadeh A., 2014; Zou T. et. al., 2014; Schilar H. et. al., 2017).

The current chapter is focusing on several aspects regarding management of waste, water and energy from agro-tourism structures and their management.

Through the answers obtained through the survey carried out by sending the questionnaires it has been possible to outline the situation agro-tourism structures from Trentino and Sibiu County. Information obtain in reference to the sectors concerning electric and thermal energy, management of water resources and waste.

Adding also a knowledge of the characterization of the structures in terms of actions taken to reduce the impact of agro-tourism activities on environment. This by resulting ways thru new models of production and consumption, prevention and protection of environment. And also concerning management resources in a manner that has the ability to provide the resources of an agro-tourism structures on long-term. The circular economy comes with models to consume so many resources can be generated.

After being highlighted by data collection, technology solutions and strategies have been developed capable to combine the technical feasibility of the intervention with the expected benefits after adopting different solutions in order to improve agro-tourism structures in the direction of environmentally friendly by respecting the environment.

For each sector of analysis, the main issues identified by the current situation are analyzed, proposing improvement solutions, with the aim of limiting the impacts that the activity exerts on these agro-tourism structures that determines on the environment. All this is proposed paying particular attention to energy efficiency and resource saving.

This is illustrated in the following chapters.

The management of waste the produced occupies chapter 5.1.1 illustrating the initiatives and the attention to be dedicated to improving separation and separate collection in the sector.

Chapter 5.1.2 illustrates how to improve the insulation of the building in order to provide the necessary energy needs. The chapter it is also dedicated to electrical and thermal energy with particular attention to the possibility of production from renewable sources/generation.

Then follows the chapter 5.1.3 in which it is treated water resource management with specific regard to the reduction of waste.

Finally, with chapter 5.2., the management methods of the agro-tourism structures are underlined, with due consideration, considering it essential to associate the responsible behavior of tourists and staff with the efficiency of the technologies and systems.

5.1.1. Sustainable waste management in agro-tourism structures

- Characterization of waste produced by agro-tourism structures

Currently, one of the important challenges for the tourism industry is Municipal Solid Waste management (MSW) [27]. Evaluations report that in Europe, an international tourist generates on average approximately 1 kg MSW/day. According to the United Nations Environment Programme's assessment, international tourists of Europe generate around 2.8 million tons of MSW. Moreover, domestic and international tourists' MSW production will rise to about 8.4 million tons yearly in 2020 (with an increase of more than 60% in two decades) (European Parliament's Committee on Transport and Tourism, 2016).

The MSW produced depends mainly on the size of the structure in terms of accommodation capacity (namely number of beds and seats at table for the restaurant service). The quantity of produced waste must be linked to the number of days per year during which the accommodation is open.

Various types of services can be available depending on the specific structure lodging in apartments or rooms, camping activities, breakfast or restaurant service, recreational, cultural and educational activities can be offered to the tourists.

The waste generated in these ambits can be assimilated to domestic urban waste as it mainly concerns organic fraction, packaging, plastic, paper, cardboard, glass, tins and undifferentiated waste.

The Trentino territory is divided into 13 collection basins that identify optimal territorial areas in each one of which the collection of waste is organized according to what established

by the managing bodies, in accordance with the provincial directives regarding the Provincial Plan for the Disposal of Waste (Piano provinciale di Gestione dei Rifiuti, 2014). Therefore, the Trentino agro-tourism structures must follow the instructions of the competent bodies responsible for carrying out the local waste management service.

In Sibiu County there was several programs on waste management have been implemented over the years. Since 2016 regarding selective waste collection, Sibiu has a waste management system which, besides selective collection, involves setting up new platforms for the placement of igloos and eco-containers, as well as changes in the payment of this service (Primaria Sibiu, 2016).

In order to perform improvements of waste production in the agro-tourism structures, the first aspect aims at identifying and carrying out good practices and actions, in order to promote waste reduction's actions as much as possible. They should be accomplished before dealing with the problems connected to proper and efficient waste differentiation and disposal. These objectives can be achieved diffusing a consciousness attitude about the various consequences of consumption style among workers and tourists.

- Strategies to reduce waste production in agro-tourism structures

The areas of the accommodation in which it is possible to intervene to contain the production of waste are mainly the restaurant and breakfast room, the rooms or the lodgings, the kitchen of the structure and the sector concerning the cleaning management and the maintenance of the building.

According to what was learnt in the two case studies, the possibility of reducing the amount of waste generated in the agro-tourism structures can be put into practice through reasonable choices concerning, first of all, the structure's supplies; this regards the restaurant service as well as the different services that can be offered to tourists during the stay. They are possible improvements in many areas that result in a lower production of waste without compromising the quality of service.

Numerous and simple actions can be obtained in the restaurant, breakfast or bar service. These include, for example, the offer of bulk products (or with less packaging) and the removal of disposable products and food samples such as jams, honey, butter, cereals and sugar, by replacing them with, bulk products stored in dispensers.

It is also advisable to avoid the sale of plastic water bottles and drink bottles, single dose juices and tins, offering alternatively on fountain drinks, returnable bottle drinks or at least family or large packs.

In catering, the use of loose products, through the adoption of appropriate dispensers, does not entail in fact hygienic failures; just as it is no less safe to consume the water of the aqueduct, given the excellent quality of drinking water. The measuring devices must make the contained product recognizable and prevent it from coming into contact with the external environment.

In addition to this, it is better to limit packaged food items by replacing with homemade products, especially for breakfast service.

Moreover, the European directives, with regard to this type of structures, establishes that a minimum percentage of the offered food must be produced by the agro-tourism structure itself. Concerning this, in Trentino, Italy, regulations of the agro-tourism's sector state that a minimum percentage of the owned products, as a way of reducing the required packaging from items acquired outside of the region (Trentino Agricoltura, 2017).

Producing on-site food reduces packaging or cassettes needed for transportation. The serving of meals implies that most of the waste produced in the kitchen is organic. To avoid wastefulness, it is important to allow and encourage the take-away of leftovers by the tourists. Concerning non-locally produced food, the use of short-chain products is a way to reduce transportation and packaging costs, as well as to support nearby suppliers and the local economy.

Concerning the consumption of water, it is advisable to propose tap water to the tourists (possibly using gasification systems) if the quality of potable water is good.

The choice of using tap water, bulk products or those in large packs is an advantageous solution from the environmental point of view as well as from the economic side. Furthermore, the use of short food supply chain products is a way to reduce transport costs and the necessary packaging as well as to support the local economy with the relative suppliers.

The predominant use of fruit, vegetables and meat of own production or coming from other regional business, means that the most of the waste produced by the kitchen is organic; In general, however, in the catering sector the greater volumes of waste produced are attributable to food waste.

In this regard, in order to avoid having to allocate to the organic fraction the leftover food not consumed by the tourists and staff, it is important to allow and encourage the removal of this so as not to waste it and be able to finish it at home.

Measures to reduce the waste production can also be adopted in rooms and bathrooms; personal hygiene products in packet samples should be avoided and rechargeable dispensers should be alternatively proposed. Moreover, disposable plastic glasses should be replaced with those in glass and it is preferable to limit courtesy products that are offered to tourists through gadgets and to provide the same services through centralized systems.

Concerning the routine maintenance of the various areas (as example: kitchen, bathrooms), it is advisable to gradually replace traditional batteries with rechargeable ones in order to minimize hazardous waste generation.

The choice of the alternative products has to be careful and oriented to the reduction of the amount of waste produced; choices have also to be supported by a service that shares the same goals. Some examples can be the use of re-usable items for the breakfast and restaurant service as well as in the rooms: disposable paper tablecloths and napkins should be replaced by durable products: cloth kitchen cloths, glass and porcelain dishes; if this is not possible, eco-friendly compostable, biodegradable disposable dishes can be used according to the specification EN13432 (EN 13432:2000).

For the cleaning activities, it is better to use bulk detergents that can be bought from bulk detergents from distributors offering automatic bottle or tank dispensers; these large quantities can then be poured in case of need.

Carrying out the proposed solutions, it is possible to achieve a significant reduction of waste; this is especially true for the amount of packaging and plastic waste; in any case it is fundamental to educate tourists and workers on the correct choice or use of products.

In addition to traditional waste, workers or tourists may have to get rid of hazardous or uncommon waste such as batteries, expired medicines, spray cans, printer cartridges, energy-saving light bulbs. For these types of waste, considering the particular features and the infrequent production, it is preferable to hand them over to the staff that directly deals with the proper delivery to the collection centers.

Within the ambit of agro-tourism structures, a significant contribution to waste separation and disposal can be given by adopting home composting for the organic fraction (OF) of

produced MSW (Benyam A. et. al., 2018; Neugebauer M., et.al., 2017;Vázquez M.A., Soto M., 2017).

Domestic food waste or green and woody organic substances like pruning residues can be used for this practice. The autonomous composting enables also to have economic benefits reducing the fee for waste disposal. Instead of composting, part of the kitchen waste can be used to feed farmyard animals.

If the agro-tourism structure is far from the built-up areas, additional complications may arise. In some cases, for example, workers must carry personally separate and undifferentiated waste to the nearest waste collection center. This may correspond with the road waste containers in the nearest built-up area or directly with the recycling center belonging to the municipality.

Products that are generally used in accommodation facilities are summarized in Table 5-1 along with some practices and actions that can help to reduce waste production.

Table 5-1 Practices and actions to reduce waste production in agro-tourism structures

Main consumer goods	Practices	Actions
Food and drink	Setting up separate collection for packaging waste; Including home composting in waste management options	Preferring local products Choosing bulk products Preferring glass to plastic Reducing the volume of waste Avoiding sample packs and disposable products Using re-usable bottles, dishes and containers Allowing and encouraging the taking away of leftover food Implementing home composting Implementing separate collection for packaging waste
Paper	Setting up separate collection for paper waste	Implementing separate collection for paper waste
Hygiene products		Avoiding sample packs
Detergents		Preferring bulk products with refillable containers

Main consumer goods	Practices	Actions
Special products (e.g. batteries, toner, medicines, light bulbs, etc.)	Implementing recycling centers for direct delivery of these products	Storing products in suitable rooms Periodic conferring of these products to the recycling center Preferring rechargeable batteries.
Breakfast and restaurant service		Using cloth kitchen cloths Avoiding disposable dishes

In many cases the agro-tourism from rural regions are located in areas at high altitude or very isolated from population centers. In these situations, compared to the management of traditional waste, organized according to the provisions of the managing bodies of the service, the collection of the various fractions can become more complex.

The location of the agro-tourism structure being far away from population centers can lead to additional complications requiring, for example, that the staff of the structure personally confer the waste produced at the nearest area used for collection.

This may coincide with the road bins in the nearest village or directly with the material collection center of the Municipality to which it belongs.

In some cases, therefore, it is not possible to exploit the emptying service at the facility for reasons of economic disadvantage, given the distance, or strictly environmental restrictions such as strict road traffic or problematic circulation in winter.

- Separate collection

In addition to the measures that allow reducing waste production, agro-tourism structures have to carry out waste separation and a proper selective collection (SC).

Alongside the measures to reduce the production of waste, the structure must implement the separation of these and their proper separate collection as required by the managing bodies of the collection and disposal service located in the Trentino area and Sibiu County.

In addition to the correct separation of waste by owners, employees and collaborators of the agro-tourism structure, also tourists must be involved and rendered participate in these actions both inside and outside the building, underlining the importance of never abandoning waste in the environment.

The legislation of the Italian proposed case study asks for a high SC of MSW on the entire provincial territory (Rada E.C., Zatelli C., Mattolin P., 2014). In Romania even if the EU legislation regarding MSW management and SC implementation is enforced, for many reasons (lack of knowledge, lack of treatment plants, etc.) the SC efficiency in the tourism structures is still very low (Benyam A., Kinnear S., Rolfe J., 2018). A reason is the fact that Romania entered into the European Union (EU) only in 2007.

Selective collection is a widespread (compulsory) practice in the EU territories although some countries turn out to be less virtuous than others in terms of separation. Even if most tourists know this habit, it is good that tourist structures emphasize the importance of these practices both when tourists are welcomed to the accommodation facilities and through multi-language paper and digital information, in order to illustrate clearly the different fractions that have to be separated. Thus, tourists can personally differentiate their waste products. These actions contribute to the aim of reducing the production of undifferentiated waste.

Although most Italian and Romanian population are familiar with this practice, it is important that the agro-tourism structures emphasize the importance of informing at the time of reception and through paper and digital information in various languages, by clearly and directly illustrating the various fractions to be separated. In this way the tourists and staff can contribute and carry out the differentiation of the waste.

These actions contribute to the objective of reducing the production of undifferentiated waste and allowing the exploitation of recyclable fractions such as aluminum, glass, plastic and paper.

These actions contribute to the goal of reducing the production of undifferentiated waste and to allow for the recycling of recyclable fractions such as aluminum, glass, plastic and paper. Waste separation should be made possible both in common areas and in the rooms.

The practice of carrying out separate collection has long been widespread in Trentino, recently in Sibiu, although some regions prove to be much less virtuous than others in separations at the national level in both countries.

- Measures concerning the separate collection of waste

To facilitate the correct differentiation of waste it is necessary to introduce and present this practice to the tourists and staff, in a clear and direct way, to make sure that these take on

an attitude of awareness of the problem and consequently responsible behaviors that are translated into concrete actions as a correct separation of their waste products.

The management of the entire agro-tourism structure must take place by pursuing the objectives set. In this regard, it is advisable to make available in the common areas, in the rooms, as well as in the lodgings the explanations in several languages to correctly perform the separate collection and the colored containers used to collect the various separate materials, of different sizes depending on what they must contain.

Without adequate information and involvement of tourists there is the risk that they pay little attention in the differentiation of waste with the result that the staff must do a job of control and sorting to avoid annulment of the objectives of the agro-tourism structure. It is preferable, in fact, to separate the waste at the time of production.

As established by the bodies responsible for the waste management service, the various fractions are separated on the provincial territory but, depending on the area in question, there may be differences regarding the method of conferment and the type of separation (Piano provinciale di Gestione dei Rifiuti, 2014; Primaria Sibiu, 2016)

Alongside traditional waste, the staff and tourists may have to dispose of hazardous or special waste such as batteries, expired medicines, spray cans, printer cartridges, energy-saving light bulbs. For these types of waste, given the particularity and the not frequent production, it is preferable to deliver them to the personnel who deal directly with the correct conferment as they must be brought to the collection centers.

- Support for the separate collection

Although most of the tourists of the agro-tourism structures come from another national territory, it is important that all are used to perform as a customary practice, the separation of waste at their homes or in general in any context in which it must undo something.

The need to communicate to the tourists the objectives of the structure regarding a correct separation of the waste is therefore clear not only for customers coming from the two case studies or foreign, in which it is not usual to differentiate, or it is done differently from Trentino and Sibiu County. But also, to illustrate the specific conventions and collection methods adopted by the structure agro-tourism structure.

Staying in an agro-tourism structure ensures that similar waste is produced to urban ones but above all belonging to the categories of organic waste, paper-board, glass, cans, plastic or

packaging and undifferentiated waste. The production of waste belonging to other categories is quite rare, especially from tourists.

With regards to the most frequent types of waste produced, it is useful to assist tourists and provide them with clear and precise information regarding correct separation.

In this way they can be communicated correctly the conventions of the various colors of the containers and associated with these, the typical waste that tourists usually produce in the context of the living room and which can be given in the specific container.

These clarifications are not excessive or redundant considering above all the fact that, on the national territory and even more foreign, the separate collection, where carried out, is often done by adopting different colors associated with the various fractions or separating different types of materials.

This assisted mode of separation and conferment of waste it can be done with specific printed instructions, graphic elaborations and signs placed near the containers but it can also become an interactive possibility with which the tourist has the opportunity, by connecting to the web page of the farm, to find a section dedicated to instructions in merit of separate collection in the specific structure, to know for sure where it should be placed a certain type of waste.

The good practices regarding waste management in an agro-tourism structures are also presented in some published studies by the author of this paper (Giurea, et al., 2018).

5.1.2. Electricity and thermal energy use optimization in agro-tourism structures

- Overview of the consumption of electricity and heat in agro-tourism structures

The consumption of electrical and thermal energy is one that involves the greatest contribution to the impacts produced by agro-tourism structure. The high use of fossil fuels makes it possible the issue of environmental pollution to become more and more strict. In fact, combustion primarily produces chemical pollution, in particular carbon, sulfur, nitrogen and particulate emissions;

To this is added the thermal pollution resulting from the emission of carbon dioxide in the atmosphere, which, being a greenhouse gas, implies, on a long-term a serious risk on a global scale of increasing the equilibrium temperature, with a difficult growth entity to be provided.

It is important that during the construction of new buildings, major renovations or replacement of equipment or systems, make choices that take into account the energy aspect and not just the decorative aspect of the interventions.

An improvement in the agro-tourism structure of energy savings can be achieved in various ways, both structurally and through more responsible behavior. The level of consumption and the energy supply of a building are basically what demonstrates the practices in order to make a agro-tourism structure sustainable and innovative.

The progress of technology over the years offers many possibilities to limit the energy needs necessary to ensure the conditions of well-being in buildings and to exploit renewable sources as much as possible. If it is intended to intervene in a agro-tourism structure, it is helpful to first know the energy situation of the building in order to identify the most critical issues and in which area appears the most relevant energy costs.

Once the most significant problems have been highlighted and quantified, it is therefore better to focus on interventions that limits the energy requirements. In fact, concrete actions on the buildings are often necessary before thinking of solutions to improve energy production.

Concerning the aspects regarding renewable energies in agro-tourism structures, eenewable sources are those sources of energy which, regenerating themselves, result in an inexhaustible human scale when the rate at which they regenerate is equal or greater than that

of consumption. The Solar, geothermal, wind, water and biomass energy are the main renewable sources used for energy purposes.

Solar, geothermal, wind, water and biomass energy are the main renewable sources used for energy purposes. At global level, renewable energies in 2014 contributed to 19.2% of the energy globally consumed, while fossil sources still supply most of required energy (REN21, 2017).

At European Union level, Member States establish mandatory objectives a concerning the increase of renewable energy production. In the civil field, the possibility of using renewable sources is mainly linked to solar thermal, photovoltaic and biomass combustion technologies.

Biomasses are substances of biological origin in a non-fossil form, they can be agricultural or forest products, processing waste from agri-food or wood industries and can be used for energy purposes to supply boilers or stoves of various types.

- Space heating and domestic hot water production

Energy requirements that allow satisfying the heating of the agro-tourism structures depend heavily on the climatic conditions of the location where the agro-tourism is located. Moreover, exposure to the direct sunlight and the thermal insulation of the building have a significant role. Energy load requested for the preparation of hot water is mainly determined by users habits the value of this can undergo strong oscillations.

As in residential buildings, in agro-tourism structures heating the rooms and the production of hot water represent the most important energy requirements of the structure.

Heating and hot water production in agro-tourism structures are guaranteed in most of the cases by boilers. In Italy and Romania, the old gas boilers with atmospheric burner, on/off control and the presence of pilot flame had a low average yield (60%).

Wood combustion for energetic purposes is a still widespread practice. Woody biomass as fuel is diffused above all in rural and mountain areas with conifer and broad-leaved forests. This type of biomass is used to feed various types of appliances. It can be used in simple and ancient stoves as well as in modern and advanced technologies including also boilers.

In rural and mountain contexts, in Italy as well as in Romania, heating is guaranteed mainly through boilers or heat pumps. The energy load can be integrated with solar thermal

panels. This solution is diffused particularly in recently built or refurbished structures with low temperature heating systems. In addition to the previously mentioned technologies, the use of wood-based biomass stoves is very widespread, these are positioned especially in kitchens and common areas.

Energy needs are significant, especially in case of agro-tourism structures with poor thermal insulation. It is essential to use measures in order to minimize dispersions such as giving specific instructions to those people working in the accommodation.

These recommendations concern the switching off-on heating or cooling devices when rooms are empty. And telling tourists to put lower and close shutters to limit thermal dispersions during evening and night. And also, to reduce, during the winter season, windows opening to the sufficient time in order to ensure the change of air. Therefore, installation of automatic deactivation systems that turn off heating or cooling devices when windows are open, would ensure greater security.

In order to guarantee the best comfort conditions, depending on tourists demands, it is preferable that rooms or accommodations are provided with independent thermostats. And thermostatic valves applied to the radiators, so as to regulate the heating or cooling systems. These devices certainly involve complications in the installation system. But allow at the same time to adjust the temperature depending on the need in the different spaces (e.g. bathrooms, bedrooms or kitchens). This makes it possible to create good comfort conditions and to avoid warming uselessly rooms.

The use of biomass for household energy production is favored since woody biomass is diffused and simply available. In any case, the pollution associated with the biomass combustion depends on the technological devices. In term of efficiency and correct use of the device as well as on the quality of the biomass.

Depending on the adopted technology (e.g. stoves, boilers, etc.), biomass can be used in form of pieces of wood, pellet or chips. Although in many cases the use of chopped wood is favored by the possibility of autonomous supply.

The use of wood chips as fuel for boilers could be significant in case of agro-tourism structures. With considerable quantities of waste woody biomass, as result of the agricultural activities.

The technological progress that followed over time has allowed the realization of appliances for the combustion of biomasses with better performance and quality of combustion, thus intervening on the most relevant problem of the systems operating on biomasses.

The traditional wood-burning stoves consisted of a combustion chamber connected to the flue and an external air intake, these types do not allow to exploit all the heat obtainable from wood as they do not allow the complete combustion of the gases produced.

Wood or pellet stoves can be directly installed in rooms (e.g. they are frequently present in kitchens or living rooms) and they mainly heat spaces by convection. Being easy to install since they do not require recirculation of heat transfer fluid, but they offer a low thermal inertia. Devices working with convection generate air movements with significant vertical temperature gradients that can affect the comfort conditions.

All biomass-powered devices require proper installation by qualified technicians. It is also fundamental to clean and check the appliance (stove and chimney flues). Important is the routine maintenance operations in order to avoid malfunctions with serious consequences such as gas poisonings and fires.

It’s better to do devices revision and maintenance before the winter season or before the period of frequent use of the appliance. In addition to this, each device requires specific management and maintenance operations. These practices are necessary in order to ensure a safe combustion process and good energy performances.

Regarding the heating terminals are related to the type of heat generators used in the building. Radiators were the systems traditionally used in the past, in new or refurbished buildings ceiling, floor or wall heating systems and fan heaters are diffused.

In case of existing installations with radiators, it is important that they are not covered with curtains or furniture that obstruct the convective air flow. If they are positioned under the windows, it is advisable to place an insulating material between the wall and the radiator. This is in order to avoid heat losses as the walls where the radiators are positioned are thinner. Radiators are characterized by a reduced thermal inertia compared to radiant floor heating. Underlining that the first allow reaching faster the desired temperature in the rooms even when these are discontinuously used.

Concerning possible solutions of energy saving in agro-tourism structure in regard with thermal insulation are next presented.

Energy rehabilitation interventions designed to improve the thermal insulation of the building in order to reduce the energy requirements needed to guarantee the living comfort in different seasonal conditions, makes it possible to improve the energy class of the building and constitute significant initiatives to improve the structure.

The issue of energy improvement of buildings is particularly clashed with structural difficulties of various kinds that can hamper or prevent the implementation of some interventions.

In any case, improvement interventions are easier to achieve in new agro-tourism structures that can already be built from the beginning with particular structural attention.

- Requirements for sanitary hot water

Hot water production involves an energy requirement that has grown over time as a percentage of total consumption. Because, by improving the thermal insulation of the agro-tourism structure, the required heating load decreases instead of hot water loads.

The demand for hot water supply, as opposed to heating, depends primarily on user habits. Warm water preparation can be done with boilers of different types and fired with fossil fuels or biomass or with heat pumps. These technologies can also be integrated into the exploitation of renewable energies.

Hot water quantity requirements can be guaranteed through instantaneous boilers or storage tanks. Instantaneous boilers work producing hot water only when it is requested. With this type of functioning water is warmed to the desired temperature passing through a heat exchanger. As long as there is warm water it requests the heating function is excluded.

Compared to instantaneous hot water production systems, the use of a storage tank reduces the boiler's ignition. And also makes it possible to use boilers with lower thermal power fulfilling the same requests. The accumulation systems allow also to abandon the on/off functioning and the working becomes more continuous and regular. This brings benefits in term of performance and polluting emissions. The use of a storage tank is also required in presence of solar thermal panels or when there are heat pumps or biomass boilers.

The possibility to accumulate thermal energy is a particularly important issue when using renewable sources such as solar thermal energy. The solar energy availability is actually not predictable, and its presence does not always correspond to the requests.

Storage tank's size is mainly due to the daily consumption of hot water and to the concentration of this demand. It is also crucial the presence of a good thermal insulation and the possibility of ensuring thermal layering within this. The absence of thermal stratification activates the heat supply by the boiler or the heat pump. Which warms the entire storage precluding the possibility of exploiting the energy absorbed through solar collectors.

- Electric energy in agro-tourism structures

In the electricity sector, as well as for thermal energy requirements, it is crucial to act first by reducing the energy demand required by the building. Only later the electrical requirements can be integrated with on-site production from renewable sources, for example through solar photovoltaic technology.

Energy saving in agro-tourism structures can be realized in various ways, both by responsible use of energy and by choosing renewable energy sources. In this regard, the use of lighting systems, appliances and low-power equipment, automatic ignition and switch-off systems, sensors or timers in the unattractive areas. And also, the adoption of magnetic cards to enable and disable the power supply in the rooms. Together with a responsible use of luminaires and lighting, allow limiting the electrical consumption of the agro-tourism structure.

As regards the electric consumptions, the use of energy saving is important. Using technological lighting systems. This mixt with responsible use of lighting and devices, allow to reduce the electrical consumption of the agro-tourism structure. In case of replacement or purchase of new household appliances, it is important to choose the ones characterized by high energy efficiency. Since even if they have a higher initial cost, they can produce energy savings over the years of use.

Concerning the possibility of using electricity from renewable sources electricity, besides the possibility of adopting photovoltaic technology, it is possible to enter into contract with the supplier to guarantee that electric energy comes from renewable form of energy sources. In any case, the use of these sources is primarily aimed to reduce the use of traditional fuels and reduce the emissions of climate impacts associated with their use.

Regarding the electricity demand, the possibility to use the photovoltaic technology (Renovo - Tecnologie energetiche, n.d.) is a way to cover part of the electrical consumption with a production from renewable sources. In these cases the use of photovoltaic panels does not derive from a related need the lack of connection to the electricity grid but rather a choice

to contribute to an on-site production of energy. The consumption of self-produced electricity also makes it possible to eliminate losses due to distribution.

The system of photovoltaic productivity and the convenience of this type of choice depend first of all on the geographic position of the building. In terms of solar radiation availability during the year. There's also a significant dependence on orientation, roof inclination and global yield of the system, taking into account also the quality of the components.

In order for the plant to provide a good part of the annual electricity needs of the agro-tourism structure, it is essential that this is sized taking into account the specific electrical consumption in question.

Photovoltaic panels can be installed over the framework of the structure in an integrated way. For example, if the operation is carried out in conjunction with the overhaul or overlapping. Alternatively, they can also be installed on roofs, on the roof of car parks or terraces.

Considering the landscaping in which agro-tourism structures are located is preferable to position the panels to allow for the best possible integration with the site. Considered that in most cases the tourist inflow is mainly concentrated during summer, photovoltaic technology represents a strategic option.

The successful use of renewable sources requires a synergy between a good insulation of the building envelope, the presence of suitable heating terminals, and a well dimensioned and isolated reservoir. Since different technologies, if considered individually, have advantages and limitations, the best choice is to combine different solutions.

Most of the cases the tourist arrivals inflow to the agro-tourism structures is mainly concentrated during the summer months. Photovoltaic technology allows providing the highest energy production, taking anyway into account the local weather conditions during the months of most electricity demand.

- Efficiency lighting in agro-tourism structures

Although the lighting of a agro-tourism structure is responsible for a limited fraction of the energy consumption, in comparison for example to what is required for heating, it is possible to achieve significant savings in the electricity sector, since energy efficient technologies and lighting systems are often not used.

Depending on the kind of lamps installed in the building, there can be significantly changes in the energy consumption. As well as in terms of quality and quantity of produced light.

The use of high-performance energy-saving lighting devices, as well as being quick to turn on, they can produce environmental benefits as modern bulbs. With lower energy consumption than the bulbs traditionally used in the past and in addition to this, the modern ones have much longer working life.

The choice of lighting devices must take into account the requirements related to the type of activities carried out. In the different rooms, common spaces in which they have to be positioned and the daily working hours.

It is also important the position of the lighting fixtures in the various rooms and the choice of chandeliers or ceiling lamps that allow to maximize the diffusion of the light produced in the rooms, avoiding having to resort to more powerful light bulbs.

Incandescent light bulbs, used in buildings in the past mainly in the past, have a low luminous efficiency that is reflected in consumption.

Preferable services are possible through fluorescent lamps, tubular or compact, which capable of delivering a higher efficiency of incandescent systems and are particularly suitable for illuminating environments in which a prolonged and continuous operation of the lighting is required since frequent switching on and off can reduce the estimated operating time.

- Considerations

To make the best use of the various mentioned technologies it is necessary to be able to reduce significantly the amount of energy requirements of the agro-tourism structure. Especially those that allow using solar energy such as thermal and photovoltaic panels. By this way, an important fraction of the demand can be satisfied using renewable sources so as to avoid traditional fuels' use. When the energy requirement is reduced, it's possible to use renewable energies without excessive oversizing.

It is therefore clear that the success of an effective integration with renewable sources requires a synergy between a good insulation of the building envelope, the presence of suitable heating terminals and a well-sized and isolated storage tank.

Considering individually the different technologies, they present advantages and disadvantages. The best choice is to combine the various solutions to make it possible to use several energy sources favoring the renewable ones.

Economic and environmentally advantages and benefits are significant according to amount of the global requirements that can be satisfied through renewable energies.

Given the not negligible impact of biomass burning on air quality, it is important to adopt better technologies that favor progressive replacement of household appliances outdated, with modern and technologically assisted solutions, with more efficient combustion control systems in order to limit as much as possible the production of pollutants and improve energy efficiency.

It is important to choose correctly the appliances to be used for the combustion of woody biomasses.

In this regard, there are certifications that can be adopted on a voluntary basis, by companies producing stoves or biomass boilers, which aim to help consumers identify and adopt products that can guarantee the production of a clean heat, accompanying the reduced emissions of fine dust to a better energy yield.

Very often, users underestimate or are unaware of the high emissions that may result in daily biomass combustion practices, many times guided by customary procedures and unaware of the consequences.

Despite the air pollution issue and the consequent repercussions on human health are often the subject of the media, due attention is not always paid to emissions deriving from domestic combustion, especially with reference to indoor air quality.

It is important to spread the themes regarding the type and quality of the fuels used, correct management and maintenance practices of the system and of the relative flues in order to increase the sensitivity of the citizens towards the correct management of the appliances and the progressive renewal.

Currently the Autonomous Province of Trento has set up a land registry computer software for civilian heating systems (SIRE), established by Provincial Law n. 20/2012. The target main part of this procedure is to obtain a mapping of the civil thermal plants park with the respective data concerning technical characteristics, periodicity of maintenance and identification direct owners, in order to have a control over the situation of the plants in use on the provincial territory.

The good practices regarding electrical and thermal energy consumption in an agro-tourism structures are also presented in some published studies by the author of this paper (Giurea, et al., 2017).

5.1.3. Sustainable water management and consumption in agro-tourism structures

- Water consumption and operating context in an agro-tourism structure

Agro-tourism structures are generally characterized by significant drinking water consumption. Because of domestic household pickups in kitchens, for cleaning and washing linen, but mainly for the provision of sanitation in rooms or in the accommodations. The classic water consumption can then be added, depending on the specific reality, the use of irrigation water for gardens, gardens and crops.

The traditional use of water resources for the domestic and tertiary sectors was often characterized, above all in the past, by non-responsible and unguided uses of the saving of the correct use of water, although this is a precious element for living of people and nature.

This change of attitude can be guided in some cases by the mature awareness of the need to make careful and sustainable use of the resource, increasingly perceived as valuable, but above all by the possibility of achieving savings on water consumption and consequently, economic advantages.

- Strategies for saving water consumption

A careful management of water consumption requires proper maintenance of hydraulic systems and taps in terms of seals control and pressure monitoring in the plant. The presence of small but continuous losses results in negligible consumption without any service being provided to the user. Additionally, feeding the hydraulic system with pressures higher than the recommended one’s entails significantly higher fuel consumption as the pressure rises at the same lifetime.

In any case for a better monitoring of water consumption it is recomandable to periodically check consumption, also in relation to the number of people present at the facility.

Often in agro-tourism structures that have not undergone recent renovations or replacements in the field of sanitary water, there are taps that were designed and installed when the protection and water saving were not yet fundamental aspects. In this sector, technological

progress has allowed the creation of devices that allow to reduce water consumption without compromising comfort.

Considering the significant use of water by tourists, the installation of various types of devices designed to save water can reduce per capita consumption, thus reducing the quantities withdrawn, without however affecting the quality of the service offered.

These are various types of water-saving devices. For example: mixers that allow the flow temperature and flow to be adjusted more rapidly, friction-jet devices that mix air out of the air with air by increasing the power of the jet, but at the same time reducing the amount withdrawn, flow reducers designed essentially to reduce the flow rate and timer, low or differential flow using less litters depending on the button; timing taps or photocells.

The use of high-efficiency washing machines and dishwashers also combines the reduced energy consumption required by the appliance with reduced water consumption. At all, the efficiency of machines must also be accompanied by proper use in terms of choice of washing cycles, temperatures and full load starting. When replacing appliances, it is always advisable to choose the ones belonging to the upper energy efficiency classes.

Various practical technologies can lead to water savings in agro-tourism structures. Are effective and only allow for real differences if they are accompanied by correct behaviors from the part of the tourists and the staff.

Therefore, is important to involve tourists in the environmentally-friendly management systems chosen by agro-tourism structure, stimulating conscious behaviors to avoid frustrating the efforts put into practice. For example, the opening of the taps should be limited to the actual need for running water. Thus avoiding unnecessary consumption during both hygienic use and washing and cleaning practices.

In this collaboration, the tourist in agro-tourism structures is not only a passive presence but plays an active role because its actions significantly affect the final results of the choices made by the structure.

It is therefore important to involve tourists in the environmental management systems chosen by the farm, stimulating conscious behavior to avoid call of the efforts put into practice.

The new approach regarding the role of the tourists in agro-tourism structure should not be perceived as a restriction to the quality of services. It is necessary to communicate the importance of the goals that can be achieved with the active participation of the tourists. The

concrete initiatives which tourists are invited to take part, also include the choice of a flexible change of sheets and towels, avoiding unnecessary washing.

In the same way, the staff of the agro-tourism structure must be educated and sensitized to the choices made so that the commitment of reducing water consumption to be a practice conducted with constancy in work activities.

The internal consumption of the agro-tourism structures often adds irrigation water. Preferably carried out in the absence of direct irrigation and outside the warmer hours. To avoid rapid evaporation, can be optimized by adopting programmed irrigation. Recommended drop wise to distribute where necessary the water with the right amount without dispelling it unnecessarily.

Remarkable savings in water drainage can then be achieved by installing storage systems and plumbing systems. Allowing the reuse of rainwater for non-sanitary and non-drinking purposes, which however represent a significant fraction of the daily water necesity. Although common habit is using drinking water for all purposes, almost half of the water needed in agro-tourism structures doesn't require water with potable characteristics.

Given that a significant part of the possible reduction in water consumption concerns the use of hot water, in these cases the saving of the resource is added to the energy one. In the case where the domestic hot water heating takes place with the solar thermal panels, then it becomes advantageous from the point of view of energy to feed washing machines and dishwashers directly with hot water.

- Rainwater collection and reuse in agro-tourism structures

Although the common habit is to use drinking water for all purposes, almost half of the water needs of agritouristic structures do not require water with drinking characteristics. It therefore becomes advantageous to be able to limit withdrawals from the aqueduct network.

Rainwater is a precious and free resource; it can be collected, filtered and reused for various purposes that do not require drinking water which irrigation of gardens, car wash, agricultural machinery and paved areas. But can be also used for inside of the agro-tourism structure as cleaning and for the toilet flushing. There are also on the market washing machines equipped with double connection, for rain and drinking water, which allow the use of rain water during the washing process while in the rinse phase, the drinking water.

In the case of the specific use of rainwater for the washing machine, to the water saving is added the not inconsiderable advantage that, being the meteoric water free from limestone and low in mineral salts, there are no deposits formations calcareous in the pipes and on the electric resistances and in addition the softer nature of the meteoric water requires a lower quantity of detergents.

In periods of rain, water is collected from gutters and downspouts of waterproof coverings such as roofs and terraces. The rainwater undergoes a filtration treatment before storage in the tanks that allow the temporary accumulation and decantation of the sedimentable material still present as well as making it possible to separate on the surface any floating substances such as oils and fuels.

Rainwater filtration is necessary because of the dust, residues from combustion plants, feathers and foliage can accumulate on the roofs, especially if the building is located in rural areas with deciduous and high trunk vegetation and in the case of prolonged periods of absence of precipitation.

To ensure better water retention quality, it is possible to add traditional UV filtering filters to eliminate the dangers of bacteria in the collected waters. In the case of reuse of meteoric water for irrigation purposes. And other non-sanitary uses outside the building, simple systems for the collection and storage of water can be adopted in tanks.

- Recovery and reuse of gray water

In the agro-tourism structures water consumption with showers, baths and sinks make up the bulk of all withdrawals. Precisely in this type of structure using gray water treatment systems for re-use could make a significant contribution to reducing drinking water consumption.

Gray waters are referred to as discharges of sinks, baths, showers, washing machines and dishwashers. Unlike black waters, they have a low organic load and nutrients. Gray waters can be properly treated and reused for purposes that do not require drinking water. For example, irrigation, external washing or rinsing of the toilet. It is also advisable to avoid hand washing of linen or dishes, preferring instead the use of washing machines and dishwashers that, at the same level of service, consume less water. Water saving, at the civil level, made by rational

water use and the reuse of wastewater after treatment, is a matter that will become a subject of increasing concern.

Water management optimization is a topic more and more important in the management of the environment. In Europe a steady attention is put to that to complete a pathway that today guarantee high standard for surface water. The technological level to be adopted for water management depends in Romania and Italy on the local context thus other solution is available. In the whole, the management criteria concern solutions available for prevention of losses, for water separation (black and gray water, etc.) for treatment and recovery. A comprehensive vision of the targets in compulsory to guarantee an integrated management of all the types of water used or „polluted" at the structure.

Water saving at a civil level, both in the home and in the services such as hospitality facilities, achieved through more rational consumption of water and the reuse, after treatment, of wastewater, is a question that, although today clashes with technical difficulties especially in the case of existing buildings, in the future will become the object of greatest interest, given the increasing problems for water supply for domestic purposes and especially for irrigation uses.

The good practices regarding water management in an agro-tourism structures are also presented in some published studies by the author of this paper (Ragazzi, et al., 2017).

5.2. Management of agro-tourism structures

5.2.1. Modes of managing agro-tourism structure

An important role focusing environmental optimization in an agro-tourism structure it is held by the staff and tourists. Even if an agro-tourism structure implements the best available technology. Designed to save resources and control the impact of environmental activities from the agro-tourism activities. Commitment and efforts do not give hope for results if the occupants of the structure (owner, staff , tourists, collaborators) do not cooperate to let achieve environmental quality objectives.

Information and explanations given to tourists should be provided in such a way that they are not perceived as a restriction that compromises the quality of the service. Is important to explain the purpose of the various actions and the possibility for the tourists to contribute. Even in the short term of their stay, to achieve a common objective aimed primarily at preserving the environment.

The attention to sustainability put into practice by the agro-tourism structure must be perceived bytourists also through the use of technologies. For the same comfort, produce minor impacts that through the provision of catering services, sales or leisure activities, sports and educational activities united by the attention to the environment.

It is recommended that management methods for the owner of the agro-tourism structure and its collaborators to be cordial. This in order to establish a climate as familiar as possible within the agro-tourism structure.

- Monitoring and maintenance of agro-tourism structure

Important aspects in managing the agro-tourism structure is monitoring and maintenance.

Monitoring of installations in agro-tourism structure is a very important task, but often neglected. In fact, in most cases, only installations and appliances are affected in case of failure and there is no evidence of problems that could lead to inefficiencies.

It is necessary to carry out regularly and with the suggested frequency depending on the type of system, the maintenance and revision of the heat generators and the stove, using specialized technicians.

The aims regarding the maintenance and revision of the heat generators and stoves must be carried out regularly. Depending on the type of installation, using specialized technicians.

In order to avoid unnecessary water consumption, it is essential to periodically check the taps' faults and inform the tourists to promptly announce the staff of the agro-tourism structure if water leaks.

Regarding the care of the surrounding areas of the farm, it is advisable in the presence of gardens and green spaces, to use systems that allow the reuse of rainwater. for crops instead, since it is not possible to use only rainwater, being too vast extensions, it is advisable to use drip irrigation systems in order to limit dispersions as much as possible.

It is also advisable to avoid the use of herbicides and chemical products that avoid snow adhesion and, instead, use traditional methods.

If entertainment or animation events are organized inside or outside the agro-tourism structures, it is necessary to control the noise. And always in order to ensure the tourists acoustic comfort. It is preferable that the heat generators, pumps and any compressors of refrigerating machines are placed in a room away from rooms or accommodation. The adoption of modern lighting fixtures also allows the reduction of outside noise as well as the limitation of thermal dispersions.

For a managing the agro-tourism structures a component as monitoring is important. For the use of information obtained from agro-tourism structures having an update status of the agro-tourism structures helps to have a realistic view and approach on situations (See Annexes 7.2).

Starting from the placement of the agro-tourism structures spread over the regions, each record should be associated with a file containing the overall information known about the farm in question. In this way there is the possibility of being able, subsequently, to update information or add new fields.

The possibility of having information, also from the point of view of the environmental sustainability of the agro-tourism structures, is useful for different purposes, both to identify the impacts came from its growing sector entails for the territory, but also to gather information on the environmental side that is always greater importance in the choice of a destination for tourism or recreational purposes (See Annexes 7.2).

- Catering services and local products in agro-tourism structures

A significant percentage of the agro-tourism structures from Trentino and Sibiu County also offers catering and tasting services.

Regarding the products to be offer to the tourists, the regulation governing agro-tourism structures requires compliance with limits regarding the origin of the food, in particular fixed percentages concerning the minimum quantities of food and beverages that must come from the company itself and from local companies.

Getting tourists to know the productions of other local companies is also a way to support the local economy and agriculture that often, due to climatic and morphological difficulties, can not produce food at competitive prices and therefore can be excluded from the market.

It is also essential that at the structure are mainly proposed sustainable menus and typical of the Trentino or Sibiu County tradition enhancing local products and local specialties, while offering the possibility for tourists to find a vegetarian and gluten-free menu among the offers.

In the menu, the products of the agro-tourism structure used and the origin of the products must be properly highlighted, it is also appropriate for the tourists to be informed about the food offered in terms of seasonality, cultivation, reproduction and production techniques.

It is preferable that food products come from organic farms using natural fertilizers or compost obtained from domestic composting for the fertilization of agricultural land if at the farm this practice is carried out to treat the organic fraction of waste.

It is important to promote sustainability in agricultural practices with a view to achieving a qualified agriculture, the result of sustainable development of the territory and the community.

In fact, food production is strongly linked to the environment, so farmers must act in such a way that the ultimate goal is not only the quality and quantity of production, but also the territory and biodiversity must be properly considered.

- Cleaning service and reformation in agro-tourism structures

Although the same classification of agro-tourism structure refers, with regard to the quality of the service offered, to the frequency of cleaning and reorganization of rooms and lodgings. As illustrated in the management of water resources it is advisable to make known to the tourists the possibility to decide the frequency of washing of linen and towels, according to

your needs. In this way it is possible to combine the quality of the guaranteed service with the possibility for tourists to avoid unnecessary washing.

With regard to the cleaning of the agro-tourism structure it is important that environmentally friendly products are used in the right quantities, taking into account the hardness of the water in the area.

It is also advisable to avoid hand washes of linen or crockery instead preferring the use of washing machines and dishwashers that, for the same service, consume less water.

5.2.2. Communication and information in agro-tourism structures

In order to pursue the objectives of reducing the environmental impact generated by agro-tourism structures, the collaboration between tourists and staff is essential.

It is essential first of all that the employees or the staff who work at the company are informed of the choices made by the structure and that there has been a correct communication about what attention they have and what to change or avoid regarding the practices traditionally performed by the staff. Correcting habitual practices is often not easy, so it is necessary to transmit the motivations on which these choices are based.

The behavior of the tourists is also indispensable to avoid nullifying the commitment made by the agro-tourism structure. In this regard it is necessary to communicate to tourists the choices pursued and through which ways and in which areas concrete action is taken, for example through water saving, energy saving, separate waste collection, alternative mobility and local food supply.

The virtuous behavior of the tourists should be encouraged by written and verbal communications. By underlining to appreciate the commitment of the agro-tourism staff and to encourage tourists to actively contribute.

In fact, everyone's commitment is fundamental, above all, to achieve good results with regard to the separate collection of waste, as conferments in incorrect containers compromise the final results. In this sector it is therefore necessary to communicate to tourists how it is done

the separation of waste at the facility mainly because these often come from different regions, countries with different habits and methods of separation.

It is therefore appropriate to place exemplary signs in several languages that recall what should be given in the various containers, the signs must also recall the color of the reference container and provide a list of hypothetical objects that can be given in reference to the waste that can actually be produced in that ageo-tourism structure.

Considering also the family climate that can be established in an agro-tourism structure , it is easier to promote communication, dialogue and comparison, also collecting observations and criticism trying to find constructive solutions better.

Agro-tourism structures can provide recreational and educational opportunities of various types, depending on the activities offered by individual agro-tourism structures.

Generally, the tourists appreciate information on nearby events and public transport, possibly through books, guides and information about the main tourist attractions in the area.

The agro-tourism structure is often preferred over other accommodation facilities because tourists are offered activities in contact with nature. And very often related to agricultural or zootechnical practices.

Therefore, it is important for the agro-tourism structure to take advantage of this opportunity. Allowing tourists to participate in some of the agro-tourism structures demonstration practices, depending on the season in which the stay takes place. Tourists may be invited to participate in fruit or vegetable harvesting, milking and milk processing, production of honey and culinary products, livestock breeding, or demonstrations of handicraft production techniques. All those activities in a context of preserving and protecting the environmental thru an eco-friendly approach.

To actively involve tourists in the sustainable management of the agro-tourism structure, it is important that the staff is properly trained in the field of environmental issues and strives to disseminate and promote responsible and sustainable awareness through the education of good practices.

All of these must be geared not only to limiting the impact of the agro-tourism structure, but generally bring the tourists closer to global issues whose farm-generated impacts are only a small part.

Proposals and practices can sometimes be perceived by tourists as limiting the quality offered, especially during a certain period, such as a holiday stay or an alternative meal; for this reason, the structure needs to focus greatly on communication, to convey the sustainability commitment. Agro-tourism structures as a typology of structures favours a more direct and confidential relationship with tourists. For this reason, in addition to traditional ways of providing information, such as explanatory brochures, websites or various types of messages, it is essential to communicate directly through demonstration and exemplifying practices and increase interest to encourage implementation.

Agro-tourism structures are often located in places not reached and served by public transport, to the staff should provide the tourists with information on the local public transport network, including connections and payment methods. The use of public transport could be exploited, above all, during the time spent at the farm in order for tourists to be able to visit places nearby without the need of using their own car.

As an alternative, the staff could promote the use of bicycles provided by the farm or by indicating rental possibilities and illustrating possible paths on bicycle paths. Specifying also length, difficulty level and whether or not children can be taken or elderly. Structures with horse farms can also take this opportunity as an alternative mobility option.

The aim is both enlarging the offer of recreational activities and involving the tourists in a fruitful cooperation to reduce wastefulness and improve the environmental sustainability of the farm.

The environmental sustainability aspects of the agro-tourism structures, the efforts and concrete actions implemented in favor of the environment should be highlighted and presented as an added value to the offer.

5.2.3. Environmental education regarding agro-tourism structures

The selection of a farm as a destination is linked above all to the desire for an experience away from the city contexts and close to the environment and farming practices, which can also offer educational and educational opportunities.

In addition, offering to the tourists recreational and sporting activities of various kinds, it is important that the naturalistic and cultural heritage of the territory is enhanced at the agro-tourism structure. And an environmental education is transmitted to the tourists to safeguard this respect for the values and traditions to limit the interference caused by tourist practices.

In order to actively involve tourists in the sustainable management of the agro-tourism structure it is important that the owners and employees working at the farms are adequately trained in environmental issues. And endeavor to spread and promote a responsible and sustainable awareness, educating to good practices and seeking to make actions aimed at containing environmental impacts spontaneous and daily.

Encouraging correct and virtuous practices and showing the implications that the choices put into practice by the agro-tourism structure have on the environment, we can highlight the concrete commitment of the structure and the importance of contribution made by tourists.

All this must be oriented not only to limit the impacts generated by the agro-tourism structure, as among other things the agro-tourism structure is proposed. But more generally to bring the tourist closer to the global issues of which the impacts generated by the agro-tourism structure are only a small part.

The choices and practices proposed can sometimes be perceived by the tourists as a limitation of the quality offered, especially during a particular period such as a holiday or an alternative meal. For this reason, the agro-tourism structures must focus a lot on communication in order to convey the commitment to sustainability.

Agro-tourism structure favor a much more direct and confidential relationship with the tourists, for this alongside the traditional methods of information such as explanatory leaflets, internet pages or posting of messages of various kinds, it is essential to communicate directly also through demonstrative and exemplary practices and arouse interest in encouraging implementation.

For the purpose of promoting the agro-tourism structure it is essential to take care of the advertising of this through different channels, especially through the use of the network since the search and choice of tourist destinations and accommodation facilities is mainly through the consultation of websites from the moment that allow you to access information quickly and intuitively. It is therefore essential that the structure has a dedicated, clear and complete web page and updated of all useful information to characterize the service offered.

It is important that the environmental sustainability aspects of the building, the commitment and concrete actions put in place for the environment are highlighted and presented as an added value to the offer.

6. FINAL CONCLUSIONS, CONTRIBUTIONS AND FUTURE RESEARCH DIRECTIONS

6.1. Conclusions

Objective 1

Analysis of the current state of research in the field of sustainable development (highlighting the environmental part) and circular economy in order to connect these concepts and to integrate and optimize specific processes in agro-tourism.

By proceeding to a detailed analysis, these concepts are not disparate, between them there are a number of links that have been highlighted by the research

The research theme of the PhD thesis was based on the concepts presented in Table 6-1.

Table 6-1 The concepts underlying the research theme

Agro-tourism	Mix between two industries: agriculture and tourism, including various tourist activities: accommodation (room and breakfast, rural housing), catering (meals), pleasure activities (educational farms, sports, farm visiting, etc.). Activities are linked with the local gastronomy, cultural and natural heritage, overall to the environment.	In agro-tourism, the development thru circular economy linked to the UN's Sustainable Development Goal number twelve is view as a model that's carrying the environmental direction.
Sustainable development	This notion presented in this paper represents the ability of an organization to provide long-term resources.	
Sustainable Development Gold number twelve	Key challenges regarding sustainable consumption and production patterns. This objective aim is to reduce resource consumption and pollution and analyses the use of goods throughout their life cycle.	
Circular economy	The concept use in this paper is related to the ideal to consume as many resources as they can be regenerated.	

Objective 2

Realization of a model concerning the planning and design process for sustainable development in agro-tourism from circular economy perspective: environmental pillar.

With a view to the unitary approach of the model regarding the achievement of sustainable development and the integration of the circular economy treated in the paper, we have identified and set out the main elements that determine the meaning of the environmental aspect in agro-tourism structures and are the starting point for its modeling:

- The concept of agro-tourism, sustainable development and circular economy;
- Sustainable Development Goal number twelve because of the connection with circular economy approach concerning approaching a model carrying about the environmental direction.
- The circular model can help to make agro-tourism activities more sustainable.

To elaborate the conceptual model for achieving sustainability in agro-tourism from the perspective of the circular economy, the approaches of Sustainable Development Goal number twelve have been analyzed and transformed into measures to achieve sustainable development in agro-tourism.

Starting from these it has been settled objectives in order to achieve sustainable development (environmental pillar) in the agro-tourism structure under the circular economy directives. The circular model can help to make agro-tourism more sustainable.

Objective 3

A method focusing agro-tourism structures. Deriving from the results of this investigation, research and information collecting, the study offers some answers concerning the impact of the activities from an agro-tourism structure. The methodology used in this paper it is inspired from a model named DMAIC. This model is used in organizations in the six-sigma projects. The main aspect is to develop and propose a healthy agro-tourism development strategy for both case studies.

Objective 4

A guideline focusing the activities in an agro-tourism structure regarding waste, energy and water sector. Elaborate a management system to guide agro-tourism activities and the participants to a sustainable development (environmental pillar) under the influence of circular economy. The present guideline is focusing on several aspects regarding waste management, energy use optimization, water management in an agro-tourism structure.

6.2. Original contributions

- Systematization and synthesis of information from 150 bibliographic sources.
  The bibliographic research was necessary in order to identify the current state of the research in the field and for a theoretical substantiation regarding the concepts of sustainable development and circular economy within agro-tourism.

- Research conducted to identify the current state of the agro-tourism structures with regard to waste, energy and water management.
  Two organizations have been implicated in the case studies: Ufficio di Economia e Politica Agraria Provincia Autonoma di Trento (Italy) and the Sibiu County Tourism Association (Sibiu). Both local governance provided for the study to make information accessible on the structures of the two regions and on the manner used to disseminate sustainable criteria of management. The information access was accessible in form of raw databases and printed dissemination documents and participation to conference in the field of tourism taking direct contact with the players from agro-tourism sector.

- Systematization mode and graphical presentation ideas and concepts, through tables, illustrations, graphics and original models
  By using specialized software for editing, image processing, (Microsoft Word, Microsoft Excel, Microsoft PowerPoint) it was followed watched a graphic representation in order to concentrate the information in a more original and comprehensive form.

- Approach concerning the impact of agro-tourism structures activities on the environment.

  Through:

  - Analyzing current state of the research in the field of sustainable development, circular economy and the connection of these concepts and the integration carried out in agro-tourism;
  - Proposing a conceptual model for the sustainable development of agro-tourism structures activities from an environmental view under circular economy perspective.
  - Proposing a research method focusing agro-tourism structures for environmental optimization. Deriving from the results of this investigation and information selection, the method offers some answers concerning the question: are agro-tourism structures environmentally friendly? The main aspect is to develop and propose a healthy agro-tourism development strategy for both case studies.
  - Making a guideline regarding good environmental management practice in agro-tourism. The guideline focusses the activities in an agro-tourism structure regarding waste, energy and water management. Elaborate a management system to guide agro-tourism activities and the participants to a sustainable development under the influence of circular economy;

6.3. Future research directions

There are three main direction regarding the future research directions and are the following:

- Implementing and monitoring the model created regarding environmental optimization in an agro-tourism structure.

The present paper is presenting a proposal of a research method focusing agro-tourism structures for environmental optimization. Thru this will be identified potential causes of environmental pollution from agro-tourism structure and some resources that could be economically used.

This conceptual model that is meant to facilitate the purpose defined by the agro-tourism structure activities impact on environment. Therefore, implementing this proposal is one of future research directions analyzing a real case study were the impact on environment of agro-tourism activities have an environmentally friendly approach.

- New ranking for the classification of tourist accommodation establishments with the functions of agro-tourism boarding house type because of the gaps in terms of criteria for agro-tourism structures (no environmental criteria).Highlighting the link between agro-tourism and ranking).

At the present time, global tourism growth has caused a significant interest in research focused on the impact of the tourism on environment and community.

The future research directions are to introduce a new ranking for the classification of tourist accommodation establishments with the functions of agro-tourism structures (agro-tourism boarding house - ABH) type. By examining the sector of agro-tourism based on a research aimed to improve the environmental performance of agro-tourism structures.

The agro-tourism sector could be developed more viable and sustainable by delivering major benefits for local communities and for the economy of Europe. This being possible by focusing on agro-tourism structures for environmental optimization.

Since contemporary tourism requirements are increasing regarding the quality and the quantity of the rural touristic products and services, it is essential to carry out a review on the classification of ABH's at the UE level.

For the licenses and the tourism certificates, the requirements consider only the level of comfort. The methodological norms regarding the issuance of the certificates for the classification of the tourist accommodation structures with functions of accommodation and public catering, of the licenses and the tourism certificates,

In the context of a sustainable development in agro-tourism, the need for protecting and conserving the environment (natural and cultural heritage: landscape, farms, etc.) is vital. The absence concrete criterion in the classification of agro-tourism structures regarding the impact on the environment, without guidance of protection, can lead to negative impacts.

The classification of tourism structures is not connected with environmental impact. The classification represents only a systematic collection of data regarding the comfort level and the range and standards of touristic products. And services based on a reputation, moral climate, etc. Considering the adopted case studies, both Italy and Romania adopted an official system of agro-tourism structures classification.

The classification is based on the assignment of a number of daisies, ranging from a minimum of one to a maximum of five.

The criteria for the calculation of the points that result in a certain number of flowers consider the entrepreneurship and landscape contexts of the agro-tourism structures. The general quality of management of the farm, accommodation services and commodities, catering services, the presence and level of recreational activities and the agricultural activities and typical products of the farm.

Introducing of a new criterion for the classification of tourist accommodation establishments with the functions of agro-tourism structure type, mean:

- Increasing the awareness of farmers and tourists regarding the impact of agro-tourism activities from the socio-economic and environmental points of view. These three parts are key opportunity for the development of agro-tourism structures, local communities and landscape areas;
- Stimulating the development of the rural environment by improving environmental performance of agro-tourism structures;

- Protecting the environment, which constitutes the raw material of agro-tourism activity. The development and protection of the environment is the vital condition for its practice.

- Micro-management indicator for agro-tourism structures.

For the managers of agro-tourism structure the need of a specific tools regarding the impact of the activities in environment is vital. Because the sector of waste management is traditionally set to wide scale indices and indicators, a new indicator (Giurea et al., 2018) has been set to take into consideration the mentioned issues.

The sector of agro-tourism needs specific indicators helping the participants to optimize selective collection activities. In agro-tourism sector local products and the specificity of the environment make it necessary a particular attention to waste management.

Items listed in Table 5-1, taken from the two case studies, have been reorganized in two classes: actions concerning food and drink and other actions, in order to be integrated in a waste indicator.

In Figure 6-1 an example of adoption of the indicator is shown. The value of each item can range from 0 to 1. The values are assigned as above (see parentheses):

- food and drink implemented (1), partially implemented (0.5) or non implemented (0) actions;
- other implemented (1), partially implemented (0.5) or non implemented (0) actions.

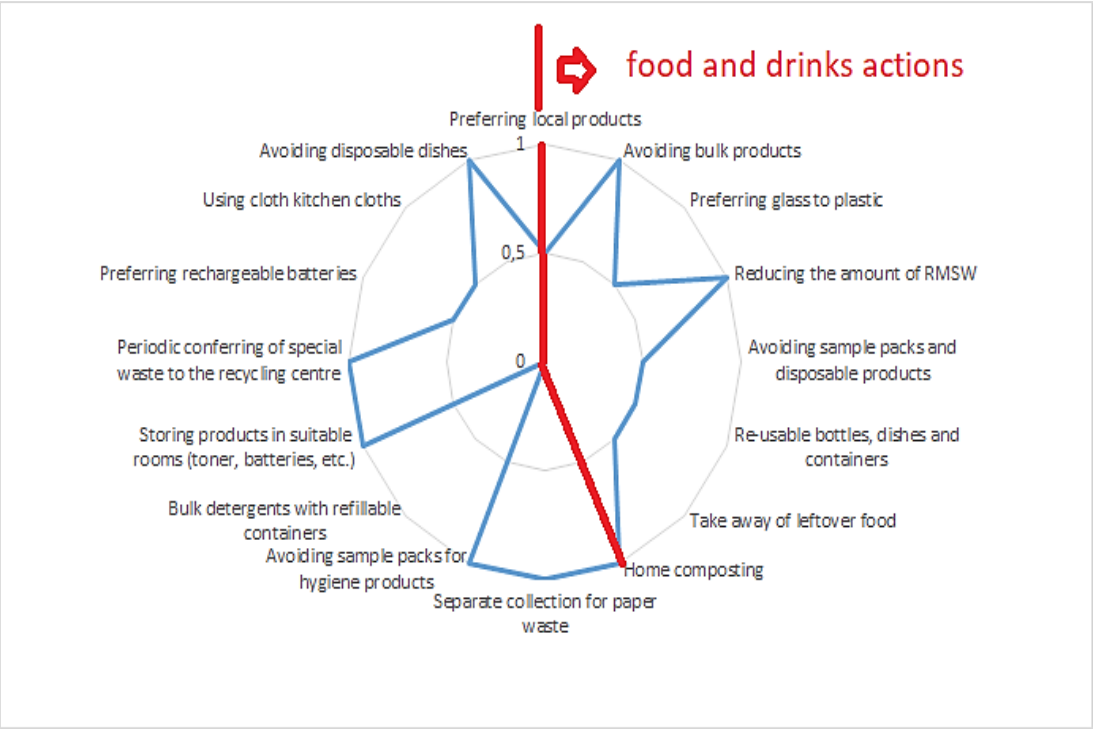

Figure 6-1 Indicator for waste management optimization in agro-tourism structures

The area at the right of the red lines (border included) concerns food and drink actions. In the example of Figure 6-1, the priority should be the adoption of refillable containers for bulk detergents.

7. ANNEXES

7.1. Questionnaire applied to agro-tourism structures

A. Characterization of the agro-tourism structure:

Role of the interviewee in the company:

ex. owner, employee, family collaborator, etc.

……

The tourists of the structure are mainly of origin:

Italian/Romanian☐ foreigner☐

Do you frequently use disposable products?

Yes☐ No☐

Do you organize educational farms or entertainment and demonstrations of various kinds?

Yes☐ No☐

Do you consider it important to establish a family and participatory relationship with the tourists?

Yes☐ No☐

Has an energy certification of the building been carried out?

Yes☐ No☐

In case of positive answer; in which class is the structure? es. A, B, C, D, E, F, G

……..

Materials of the external walls of the structure:

Wood ☐ Stone☐ Self-supporting bricks☐ Reinforced concrete structure☐

In case of positive answer; does this system, provide heat recovery?

Yes☐ No☐

For lighting what kind of bulbs are installed mainly? E.g. incandescent, fluorescent, LED ……

Presence sensors for lighting and systems are used. automatic lights off?

Yes☐ No☐

Are low-consumption appliances used?

Yes☐ No☐

Are environmental management measures taken at the facility? e.g. equipment maintenance, periodic consumption checks

Yes☐ No☐

Is environmental education promoted at the facility? e.g. incentive tourist to separate waste collection, water saving, alternative mobility, etc.?

Yes☐ No☐

Is the flexible change of linen adopted, in agreement with the tourists?

Yes☐ No☐

Is your structure in possession of environmental certifications?

Yes☐ No☐

In the event of an affirmative answer, which one?

……

Is there any intention in the future to adopt or increase environmental management measures and energy efficiency?

☐No

☐Yes Specify: ……

If not, what are the reasons for this answer? E.g. excessive bureaucracy to access incentives, I do not think they are cheap, too high initial investments, etc.

…….

B. Waste sector:

Is home composting done for the organic fraction?

Yes☐ No☐

For the various fractions of the separate collection (except the organic fraction):

Is door-to-door service active?

Yes☐ No☐

Do you have to personally give it to the nearest material collection center?

Yes☐ No☐

In the case of production of agricultural waste (twigs, weeds, etc.), how is it customary to proceed? e.g. they are burned outdoors, they are used to feed biomass boilers, etc.

…….

C. Water sector:

Is the agro-tourism structure linked to the municipal water supply system?

Yes☐ No☐

Are periodic checks of water losses carried out?

Yes☐ No☐

Are flow reducers installed on the taps or the use of air filters in the mixers?

Yes☐ No☐

Are there systems for the reuse of rainwater for purposes as irrigation or for toilets?

Yes☐ No☐

Are gardens watered with network water or rain?.....

Are drip irrigation systems used?

Yes☐ No☐

Is the structure connected to the sewage system and to the purifier?

Yes☐ No☐

In the case of sewage treatment on site, are these then reused for purposes compatible or discharged into water bodies?

…….

D. Energy sector:

Is the agro-tourism structure connected to the electricity grid?

Yes☐ No☐

Are photovoltaic panels installed at the property?

Yes☐ No☐

Are solar panels also used to supplement the heating?

Yes☐ No☐

Is the structure connected to the pipeline?

Yes☐ No☐

Do you use LPG cylinders for kitchen use?

Yes☐ No☐

Are there economical kitchens, fireplaces, oil stoves, pellet stoves?

……

In the case where wood is used; mainly of what type? e.g. beech, birch, etc.

…….

How often is the chimney flue cleaning performed above?

…….

Is there a connection to centralized heating?

Yes☐ No☐

How often is the revision performed?

Every year☐ Every 2 years ☐ When faults or malfunctions occurs

E. Environmental incentives for the agro-tourism structure:

Have the public incentives been used for the restructuring operations carried out at the facility or for energy improvements?

Yes☐ No☐

Has the presence of incentives been decisive for the restructuring measures carried out at the agro-tourism structure or for energy improvements?

Yes☐ No☐

In the absence of incentives, would interventions to the agro-tourism structure be adopted to the same extent or would they have been implemented to a lesser extent?

…….

7.2. Models of reports related with agro-tourism structures

7.2.1. Identification of the agro-tourism structure

Table 7-1 Model identifying the agro-tourism structure

Identification of the agro-tourism structure
Name of the agro-tourism structure
Address
E-mail address
Web site
Telephone number

7.2.2. Form of services delivered by the agro-tourism structure

Table 7-2 Model for services delivered by the agro-tourism structure

Type of service offered	
Number of apartments	
Number of rooms	
Breakfast service	Yes/No
Catering service	Yes/No
Total seats at the table	
Ecological menu proposal	Yes/No
Educational farm	Yes/No
Classification daisies	1-5 daisies

7.2.3. Characterization of the building

Table 7-3 Model of the characterization of the building

Characterization of the building	
Accessible by public transport	Yes/No
Accessible by car	Yes/No
Type of structure example stone, brick, reinforced concrete	
Energy certification of the building	Yes/No
Environmental certifications	Yes/No
Energy class of the building	
Lighting	type of lamps used

7.2.4. Management in the agro-tourism structure

Table 7-4 Model of management of the agro-tourism structure

Management of the agritourism structure	
Adoption of environmental management measures	Yes/No, such as
Promoting environmental education for tourists	Yes/No
Adoption of biological measures for agriculture and reproduction	Yes/No

7.2.5. Waste management in the agro-tourism structure

Table 7-5 Model of waste management in the agro-tourism structure

Waste management	
Uses customary disposable products	Yes/No
Use customary single-portion products	Yes/No
Separate waste collection	Yes/No
Domestic composting for organic fraction	Yes/No
Method of conferring waste	Description

7.2.6. Water management in the agro-tourism structure

Table 7-6 Model of water management in the agro-tourism structure

Water management	
Connection to municipal water pipes	Yes/No
Installation of devices for water saving	Example
Rainwater reuse systems for compatible purposes	Yes/No
Connection to sewer system	Yes/No
Systems and technologies adopted	Example
for eventual waste water treatment on site	

7.2.7. Energy management in the agro-tourism structure

Table 7-7 Model of energy management in the agro-tourism structure

Energy sector	
Connection of the agro-tourism structure to the electricity network	Yes/No
Connection of the agro-tourism structure to the natural gas pipeline	Yes/No
Connection of the agro-tourism structure to the heating	Yes/No
Use of gas cylinders for kitchen use	Yes/No
Installation of photovoltaic panels	Yes/No
Installation of solar thermal panels	Yes/No
Using biomass stoves	Example
Type of wood used for the stoves	Example
Frequency of cleaning the chimney flues	Example
The type of heat generator	Typology
Fuel supply	Example
Frequency of revision	Example

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