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Jointly preparing the conditions in the agricultural and connected sectors in the BSB area for the digital transformation (BSB Smart Farming)

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METHODOLOGY FOR RESEARCH AND SYNTHESIS REPORT

Deliverable D.T1.1.1

WPT1 – Investigation on the level of preparedness for Smart farming in BSB area

Activity A.T.1.1. Preparation for the investigation of the preparedness for smart farming in BSB partner countries

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SUMMARY

The Deliverable *D.T1.1.1. Methodology for research and synthesis report* constitutes a document with guidelines for gathering information for the *BSB Smart Farming* project partners' counties investigation of the preparedness for smart farming.
It was produced during the implementation of *WPT1.1. Investigation on the level of preparedness for Smart farming in BSB area*, *Activity A.T1.1. Preparation for the investigation of the preparedness for smart farming in BSB partner*.
It is the outcome of work of PP4 partner in collaboration with BSB Smart Farming partners.

Joint Operational Programme Black Sea Basin 2014-2020

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Introduction

The exponentially growing global population and continued expansion of middle class is closely related to the growing demand for agricultural crops, agricultural products and processed food. Agriculture and the worldwide food system are challenged to feed an estimated global population of 9.7 billion people by 2050 with diminishing land and water resources. In order to respond to this population growth and increased need for farming products, modern agriculture is confronted with a wide range of complex challenges. Thus, world food production needs to double by 2050 to provide for population growth and healthier consumers desiring even more products, and at the same time dealing with the impact of climate change and the spread of housing across agriculturally valuable land. In fact, several authors even claim that in 2050 it is simply not possible to produce more meat and dairy with the methods we use today, even if consumers want it.

The European Environment Agency (EEA) identifies ten major natural hazards in BSB, including heat waves, heavy rainfall, river floods, storms, landslides, droughts, forest fires, avalanches, hail and storms. Today, declining precipitation, rising temperatures and the threat of droughts are the worst. It is easy to see that agriculture is one of the sectors that suffers most from these scenarios, but it is also at the same time a sector that contributes to climate change because it releases significant quantities of methane and nitrous oxide, two most powerful greenhouse gases.

Challenges facing the agricultural sector in the coming decades will be very demanding: Increase crop yields without increasing production area, reducing production costs and environmental impacts to the maximum extent possible and at the same time to ensure food security for a growing human population.

Additionally, agriculture faces the challenge of digital transformation brought by the 4th industrial revolution (I4.0). In this context, new technologies, information and communications technologies (ICT) related to Precision Agriculture and IoT, play an important role in the agriculture sector.

Accelerating the digital transition in the agricultural sector will enable productivity improvement, as well as growing environmental performance contributing to a sustainable and efficient resource management in the Black Sea Basin (BSB) area countries.

Rural and peri-urban areas in Black Sea Basin (BSB) area countries face a number of similar issues in the domains of agriculture, environmental management, connectivity, water resources management, sanitation etc, which calls for similar but locally relevant solutions to be directed towards solving issues related to these similarities.

In order to identify the needs of the farming communities, to find ways to alleviate poverty and narrow the digital divide between urban and rural areas and between BSB countries, a common research will be planned and elaborated to identify current challenges of smart farming and the opportunities that the well-focused and affordable adoption of latest information and communication technologies (ICTs), the smart technologies such as robotics, drones and internet of things technologies (IoT) and the artificial intelligence (AI) in the delivery of services to rural communities can offer to the countries.

In general, "smart farming" is an emerging concept that refers to managing farms using technologies like IoT, robotics, drones and AI to increase the quantity and quality of products while optimizing the human labor required by production.

The intention of this research is to analyse the stakeholders' and end users concerns, needs and to identify and formulate measures relevant to smart farming to be undertaken on different stakeholder levels and recommend a proper and adequate use of smart and IoTs technologies in response to those needs that will contribute to lessening the impact of poverty in the rural areas of the affected countries. The research will serve as a model to be replicated in further similar actions across BSB area.

1. RESEARCH METHODOLOGY

1.1. Background

This research will identify examples of smart technologies, to mitigate the agricultural needs of the communities in BSB for the domains of *crop production system, farming system, value chain analysis, agricultural trade and environmental policies; and sustainable food system.*

The present research methodology will be applied in order to achieve an in-depth investigation on the level of preparedness for smart farming in the countries participating in the project entitled Jointly preparing the conditions in the agricultural and connected sectors in the BSB area for the digital transformation - BSB Smart Farming.

After the research, the project partners will establish a map of digital agriculture stakeholders, to get an inventory and understanding of the level of the preparedness for digital agriculture amongst stakeholders, and encourage the creation of partnerships. Also, the research will be the base of partner's country regional analysis and a final synthesis report, that will serve as a framework and canvas in BSB area, with recommendations on smart and IoT technologies for the domain of agriculture, looking specifically at solutions to the identified needs of the region, enhancing the BSB area preparedness for the digital transformation.

1.2. Investigation approach

The Quadruple Helix (QH) is an innovation and collaboration model with a citizen/end-user perspective. It is useful in an innovation process where the citizens needs are central, as for example in agriculture. Using the Quadruple Helix and involving the citizens in the development of an innovation can led to more successful, user-oriented innovations. The end users will be more likely to accept and use the innovation.

The Quadruple Helix involves representatives from all members of society: public authorities, industry, academia and citizens (Fig. 1).

- Public authorities can be government and regional development agencies and policy makers, as well as formal health care providers in some countries
- Industry can consist of businesses, for example private health care providers, and business clusters.
- Academia can be for example the universities or research & development institutes.
- The fourth actor of the is the citizen.

To increase the success of the collaboration it is important to define which are the specific QH stakeholders that should be involved (stakeholder mapping) and to make sure all QH actors are involved, motivated and have an open mind.

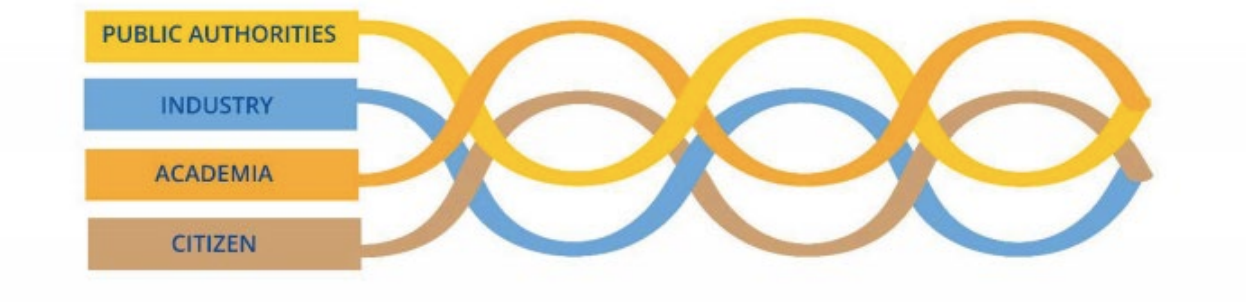

Figure 1. Quadruple Helix

A detailed database of stakeholders from the quadruple helixes of the agricultural sector and connected sectors in their regions will be elaborated trying to encompass the most representative entities for the four helixes in rural development (public authorities, industry, academia, citizen/civil society). Every partner will prepare a list of 100 stakeholders from 4 helixes with all contact details and short profile, and will execute the investigation according the methodology and will prepare 6 regional analysis with a common structure and country-relevant content.

During the investigation on the level of preparedness for smart farming, in Black Sea Basing (BSB) partner countries, from the project consortium, all the stakeholders from

the quadruple helixes (Fig. 1) are envisaged to be involved in the investigation in order to obtain a detailed map with short profiles and interlinks. The main stakeholders from the quadruple helixes will include:

- **Local public authorities**. From every partner country at list *5 (five)* local public authorities will be included in the project activities by means of municipalities, agencies, local services, depending on the different countries organisation, that are related to the agriculture, connected sectors or the wider public.
- **Regional public authorities.** From every partner country will ensure the participation in different activities of at least *2 (two)*, one related to the regional government of the region and one related to the agriculture or the connected sectors;
- **National public authorities** from every partner country will ensure the participation of at least *2 (two)*, emphasising the three dimensions of the project - the digital transformation and agriculture (ministries and agencies of information, transport, infrastructure, agriculture, ICT), the institutions related to support for SME's (ministry of economy, agencies, councils, funds, directorates), authorities related to socio-economic challenges (ministry of labour, migration agencies, similar);
- **Sectoral agency.** The relevant sectoral agencies for agriculture, ICT, youth, unemployment, social inclusion will be involved, 1 (one) each, in a total of 5 (five) per partner country;
- **Infrastructure and (public) service provider**. As the project activities are related to internet, it is envisaged that representatives of the internet services providers will be also included in some of the activities as target groups, 1 (one) per partner.
- **Interest groups including NGOs.** Every partner will involve at least 5 NGOs' from each partners country, including those aiming at supporting innovations in agriculture, supporting environmental sustainability, supporting youth and young entrepreneurship, supporting women entrepreneurship, supporting migrants and other social groups inclusion, supporting cross-border cooperation, supporting human rights and diversity.

- **Higher education and research institutes.** At least 2 (two) institutions, focused on different aspects related to the project: agriculture, ICT, machinery industry, environmental issues, business etc.
- **Education/training centres and schools.** At least 10 (ten) per partner are envisaged to take part in different activities, as the project aims at combatting the unemployment in rural areas, hence the involvement in education/training centre and school is crucial
- **SMEs (Farmers).** The focal point of the project is to boost of entrepreneurship in the area of digital transformation in the agriculture and connected sectors so the involvement of SME is of extremely importance. At least 80 SME's and/or non-registered farmers from partner countries will be involved in the investigation.
- **Business support organisation** At least 2 (two) per country.
- **International organisation under national law**. Every partner will ensure the involvement of at least 2 (two) institutions, mainly related to agriculture and digitalisation.
- **Enterprise** (excluding SMEs). In every country it is envisaged that the partner will create a link with at least 1 (one) "technical partner", amongst which at least one will be a large enterprise with the task to support the knowledge transfer to other target groups related to digital transformation in the agriculture and connected sectors.

1.3. BSB countries for the investigation

The BSB countries involve in the investigation are the BSB Smart Farming project partner countries, presented in table 1.

Table 1. BSB countries and regions involved in the investigation

No.	Country	Region
1.	Greece	North
2.	Bulgaria	
3.	Armenia	
4.	Romania	South-East
5.	Georgia	
6.	Moldova	

1.4. Stakeholder mapping

The stakeholders are those who may be affected by or have an effect on the BSB Smart Farming project. They may also include people who have a strong interest in the effort for academic, philosophical, or political reasons, even though they and their families, friends, and associates are not directly affected by it. One way to characterize stakeholders is by their relationship to the effort in question.

- *Primary stakeholders* are the people or groups that stand to be directly affected, either positively or negatively, by an effort or the actions of an agency, institution, or organization. In some cases, there are primary stakeholders on both sides of the equation: a regulation that benefits one group may have a negative effect on another. A rent control policy, for example, benefits tenants, but may hurt landlords.
- *Secondary stakeholders* are people or groups that are indirectly affected, either positively or negatively, by an effort or the actions of an agency, institution, or organization. A program to reduce domestic violence, for instance, could have a positive effect on emergency room personnel by reducing the number of cases they see. It might require more training for police to help them handle domestic violence calls in a different way. Both of these groups would be secondary stakeholders.
- *Key stakeholders*, who might belong to either or neither of the first two groups, are those who can have a positive or negative effect on an effort, or who are important within or to an organization, agency, or institution engaged in an effort. The director of an organization might be an obvious key stakeholder, but so might the line staff – those who work directly with participants – who carry out the work of the effort. If they don't believe in what they're doing or don't do it well, it might as well not have begun. Other examples of key stakeholders might be funders, elected or appointed government officials, heads of businesses, or clergy and other community figures who wield a significant amount of influence.

While an interest in an effort or organization could be just that – intellectually, academically, philosophically, or politically motivated attention – stakeholders are generally said to have an interest in an effort or organization based on whether they can affect or be affected by it. The more they stand to benefit or lose by it, the stronger their interest is likely to be. The more heavily involved they are in the effort or organization, the stronger their interest as well.

Stakeholder mapping is a very important phase in order to understand the stakeholders, where they come from, and what they are looking for in relationship to the BSB Smart Farming project. The activity should be a collaborative process of research, debate and discussion that draws from multiple perspectives to determine appropriate future project target group.

The map of digital agriculture stakeholders in partners countries will not only ensure the data base with contacts that will be used through all GA's but also will show the interconnections between stakeholders, their influence on public driven innovations in the farming digital transformation, their possible contribution on policy improvement for a smarter agriculture in the less developed rural areas in BSB countries. The main research question can be formulated as: What are the mechanisms employed for stakeholders' analysis and engagement and how they will be used throughout the planning and implementation phases of project at BSB region? At this research question can be replied using the following tools:

- mechanisms proposed by the literature for analysing and engaging stakeholders;
- recommendations of the experts and researchers for analysing and engaging stakeholders in BSB Smart Farming project;
- mechanisms for stakeholder analysis and engagement of the GA's team in the planning phase
- mechanisms for stakeholder engagement of the GA's used in the implementation phase;
- stages followed for engaging stakeholders during both phases: planning and implementation;
- challenges/barriers encountered in the process of stakeholders" engagement.

Taking into consideration the above-mentioned mechanism, the mapping process can be divided in four phases:

Phase I. Identifying the stakeholders

In identifying stakeholders, it's important to think beyond the obvious. Beneficiaries, policy makers, etc. are easy to identify, whereas indirect effects – and, as a result, secondary

stakeholders – are sometimes harder to see. There are a number of ways to identify stakeholders. Often, the use of more than one will yield the best results.

- *Brainstorm*. Creation of a group of people in the organization, officials, and others already involved or informed about smart farming and precision agriculture. Part of the point of brainstorming is to come out with anything that comes to mind, even if it seems silly. On reflection, the silly ideas can turn out to be among the best. After, stop and discuss each suggestion, identifying each as a primary, secondary, and/or key stakeholder.
- *Collect categories and names from informants in the community* (if they're not available to be part of a brainstorming session), specifically the members of a population or residents of BSB area.
- *Consult with organizations* that either are or have been involved in similar efforts, or that work with the population or in the area of concern.
- *Get more ideas from stakeholders* as you identify them.
- *Advertise*. If can be used some combination of the media - often free, through various community service arrangements - community meetings, community and organizational newsletters, social media, targeted emails, announcements by leaders at meetings and religious gatherings, and word of mouth to get the word out.

The first step is to list relevant groups, organizations, and people. The stages of stakeholder identification are presented in figure 2. This will involve the survey form presented in the table 2. Also, a brainstorming of the stakeholders should be achieved.

Figure 2. Stages of stakeholder identification

The stakeholder power/interest analysis tool could be useful in the investigation. It can also help during the selection of the proper communication approach for each stakeholder group. This technique is also known as stakeholder power/interest matrix, Stakeholder

power/interest grid, PI grid, Influence/Interest matrix. The model classifies stakeholders based on their power and interest in the project. It allocates the stakeholders to one of the categories:

- high power/ high interest
- high power/ low interest
- low power/ high interest
- low power/ low interest

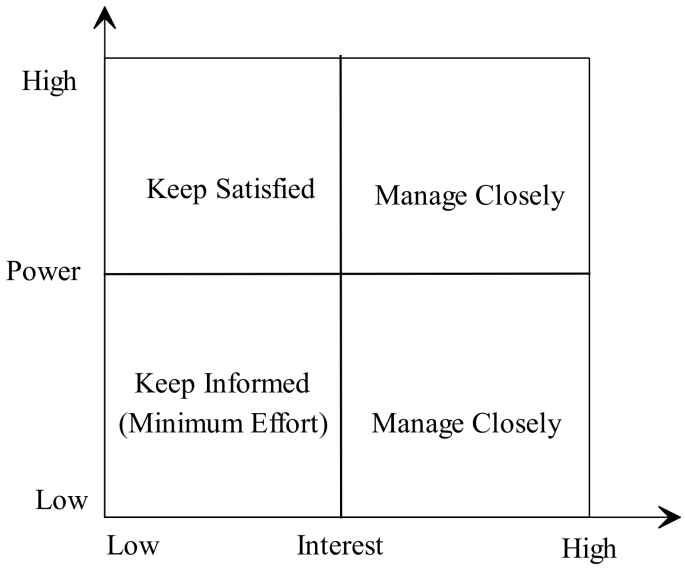

Figure 3. Assigning the stakeholders to one of four categories.

Depending on the category, this model suggests different ways in dealing with these stakeholders. Stakeholders with high power and low interest shall be kept satisfied. Those with low interest and low power shall be only involved with minimum effort. A stakeholder with low power and high interest in a project shall be keep informed and finally stakeholders with high power and high interest shall be closely involved and informed. The final estimation has to be decided by each organization.

Phase II. Analysing

It includes the understanding of stakeholder perspectives and interests. In depth-analysis should be achieved to better understand their relevance and the perspective they offer, to understand their relationship to the project and each other, and to prioritize based on

their relative importance for this project. In order to identify each stakeholder, the following list of criteria could be used:

a) Stakeholder Type: Sponsor, Project Team, Reference Group or User.

b) Contribution (value): Does the stakeholder have information, counsel, or expertise that could be helpful to the project?

c) Legitimacy: How legitimate is the stakeholder's claim for engagement?

d) Willingness to engage: How willing is the stakeholder to engage?

e) Influence: How much influence does the stakeholder have? (You will need to clarify "who" they influence, e.g., other stakeholders, teams, departments, investors, clients, etc.)

f) Involvement: Is this someone who could derail or delegitimize the process if they were not included in the project?

Phase III. Mapping

This phase will include a visual diagram of relationships between the project objectives and other stakeholders. Mapping stakeholders is a visual analysis tool that can be used to further determine which stakeholders are most useful to engage with. Mapping allows to see where stakeholders stand when evaluated by the same key criteria and also helps you visualize the often complex interplay of issues and relationships created in the criteria chart above. This phase will include a visual diagram of relationships between the project objectives and other stakeholders. An example of stakeholder mapping can be seen in the figure 3.

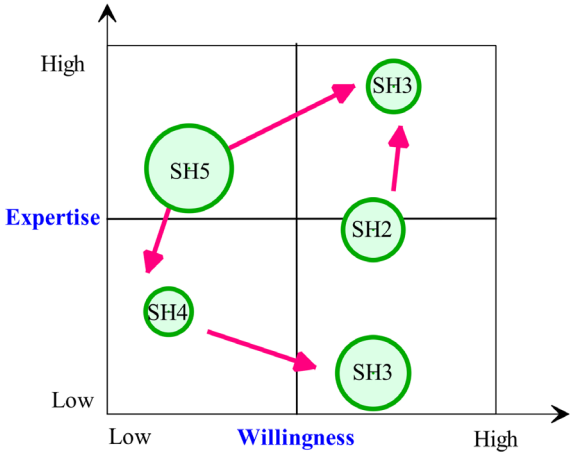

Figure 4. Sample of mapping using stakeholder power/interest analysis

Phase IV. Prioritising

In this phase it is necessary to be elaborates a ranking system for the stakeholders, for their relevance and identified profiles. It is not a practical activity and usually it is not necessary to engage all stakeholder groups, with the same level of intensity, and in the same time. The prioritisation should replay to the following questions:

- What are the issues for prioritising stakeholders?
- Which issues do all stakeholders most frequently express?
- Are the real issues apparent and relevant to the project engagement objectives?

Combining the criteria chart and mapping, use issue materiality to rank your stakeholders into a prioritized engagement list.

In the following table the stakeholder survey aims to identify the stakeholders from the quadruple helixes, using the profiles presented in chapter 2.2. Investigation Approach, its level of preparedness for smart farming in BSB partner countries, and also to tailor the digital mapping and Smart Farming platform database. This survey will focus on smart technologies, to mitigate the agricultural needs of the communities in BSB area in the fields of crop farming, weather forecasting, wildlife management, forestry, livestock farming, market identification and rural financing.

Table 2. Survey for stakeholder mapping

Organisation Name	
Business name: ACRONIM	
Registration year	
Organisation type	
Type of organisation (Public/Private)	
Quadruple Helix (Public Authorities, Industry, Academia, Citizen)	
Organisation Profile	
Field of activity	

Address	
Postcode	
City	
Country	
BSB Region	
URL	
Telephone 1	
Fax	
Non Profit Organisation (Yes or No)	
NGO: (Yes or No)	
Contact person:	
Title/ of the contact person	
Type of business	
Type of smart technology is used Precision farming, precision livestock farming, farming automation, IoT solutions, automation in smart greenhouses, agricultural drones, internet of food or farm 2020, 3th green revolution etc.	

2. INVESTIGATION OF THE PREPAREDNESS FOR SMART FARMING IN BSB PARTNER COUNTRIES

2.1. Objectives for the investigation

The vision of this investigation is helping Black Sea Basin (BSB) farming communities become more competitive, sustainable and productive by improving their businesses, production processes, products and services through a smart farming ecosystem, supported by the digitisation of services available through a joint platform with combined sectors in a BSB network.

The present investigation main objective is to identify of the preparedness for smart farming in BSB Smart Farming project partners' country. The final synthesis report aims to present specific recommendations on smart farming and IoT solutions to agricultural problems and identified constrains/basic needs f of the main actors in the partner's countries.

In fact, smart farming has a real potential to deliver a more productive and sustainable form of agricultural production, based on a more precise and resource-efficient approach. New farms will finally realize the eternal dream of mankind. It'll feed our population, which may explode to 9.6 billion by 2050.

The main research questions raised are:

- What are the agricultural needs of the rural and peri-urban communities that, when addressed through the application of smart technologies and IoTs, can lead to the poverty alleviation, improve the effectiveness and efficiency of use of the rural area resources;
- How is possible to address the agricultural local needs and identified constrains through IoT and smart technologies solutions to strengthen the development of smart farming in rural and peri-urban areas within BSB partner countries to decrease the poverty level and increase the efficiency of agriculture production and natural resources use? What smart and IoT technologies are implemented

already in the country, which of the existing might be transferred from one country to another and what smart technologies and IoTs can in the future be designed and developed by the involved stakeholders and entrepreneurs in the BSB area to meet these needs effectively and efficiently, mobilising the local/regional resources to further fostering the competitiveness of the economies in the BSB area in answer to other main socio-economic challenges in the area, such as the brain drain, youth unemployment and brain waste.

- What are the successful use cases of smart farming in BSB partner countries and how we can adopt and widen it?
- How to strengthen the interactions between the relevant helixes, particularly how to boost research, innovation and business cooperation development?

2.2. Methods of investigation

Smart farming Preparedness Measures in BSB areas within this research will be identified under:

crop production system, farming system, value chain analysis, agricultural trade and environmental policies (within social learning, consumers' behaviour) and sustainable food system to ensure the involvement the comprehensive areas of all of the relevant quadruple helixes.

The research will be done through:

- Desk research on the agriculture challenges and trends such as globalization, 4th revolution industry, urbanization, global market trends, climate change impacts in agriculture or/and smart farming in BSB countries needs to be identified along with local farmers' needs and basic constrains for development of smart farming in BSB areas (overall situation, policies, quadruple helix stakeholders will be defined).
- Collection of information and creation of database with the main stakeholders in the covered countries (at least 600 stakeholders, 100 per country)
- Education, science, research institutions and projects towards increasing digital technologies in the farming sector should be surveyed and shared within the platform

- Food Industry, local and regional market trends towards digitize agriculture in BSB countries shill be revealed
- End users, local farmers and food consumers' behavioural changes should be identified to elaborate society's readiness towards smart farming
- ICT infrastructure development level shill be identified within BSB countries rural and peri-urban areas
- Strategy, policy, legislation readiness shill be defined and any legislation constrains needs to be identified
- Inventory on the stakeholders needs, concerns, level of preparedness, regional digital entrepreneurship ecosystem and related opportunities - online survey with not less than 300 participants and 6 focus groups meetings in every country
- Identifying relevant use cases and enhancing its widening within BSB areas through Business to Business models based on provided trainings
- Training needs assessment and draft estimation among local farmers, end users, consumers, professionals, covering all sectors and trades will be conducted (farmers, technicians, the value chain etc.)

In order to effectively address the research problem, an interpretive approach will be used (based on combination of quantitative and qualitative methods to obtain and analyse data).

Research, which includes all forms of market, opinion and social research and data analytics, is the systematic gathering and interpretation of information about individuals and organisations. It uses the statistical and analytical methods and techniques of the applied social, behavioural and data sciences to generate insights and support decision-making by providers of goods and services, governments, academia, non-profit organisations and the general public.

Methods and resources of identifying the above-mentioned research areas are SWOT analysis, desk research, literature and scientific literature review, national and international reports, national data bases etc.

Conclusions and Recommendations

Recommendations and conclusions on the level of preparedness for smart farming in BSB partner countries are presented in this chapter. The recommendations are based on findings from the investigation achieved in six countries.

Services, applications, knowledge combined platform will be developed based on the investigated measures to stregthen the developement of smart farming in BSB countries through enlargement „think triangle" principal such as *KIP „Knowldege, innovation, partnership"* within the participant stakholders.

It is critical in enhancing the researcher's understanding of human behaviour and action as it relates to the phenomenon under investigation. It is based on the notion that knowledge of reality can be best obtained through social construction which includes documents, shared meanings, etc. A literature review will be conducted on both the agricultural needs/challenges of the rural communities, and IoT technologies that can be adopted to meet the needs/challenges. The final report will be evaluated for its relevance to the project and programme, and will be then published at the project website.