Project funded by EUROPEAN UNION

AGREEN
Community for climate-smart agriculture

Black Sea CROSS BORDER COOPERATION

AGREEN
CROSS-BORDER ALLIANCE FOR CLIMATE-SMART AND GREEN AGRICULTURE IN THE BLACK SEA BASIN

Subsidy Contract No. BSB 1135

FEASIBILITY STUDY

CLIMATE-SMART AGRICULTURE IN THE BLACK SEA BASIN REGION OF BULGARIA

Common borders. Common solutions.

AGREEN
CROSS-BORDER ALLIANCE FOR CLIMATE-SMART AND GREEN AGRICULTURE IN THE BLACK SEA BASIN

Subsidy Contract No. BSB 1135

FEASIBILITY STUDY

CLIMATE-SMART AGRICULTURE IN THE BLACK SEA BASIN REGION OF BULGARIA

The project **Cross-Border Alliance for Climate-Smart and Green Agriculture in The Black Sea Basin (AGREEN),** Ref. No. BSB 1135 is funded by the Joint Operational Program for Cross-Border Cooperation under the European Neighbourhood Instrument "Black Sea Basin 2014-2020", under Priority 1.2 "Increasing cross-border opportunities for trade and modernization of agriculture and related sectors".

Table of Contents

1. General Description

Author: Dobrudja Agrarian and Business School, Bulgaria, DABS research team

Funding Instrument: Programme funded by the European Union / European Neighbourhood (ENI)
Date of publication: April, 2021
Copyright:
Language: EN, Bulgarian
Partners:

- ✓ Dobrudja Agrarian and Business School, Bulgaria
- ✓ Ovidius University of Constanta, Romania
- ✓ Tekirdag Namik Kemal University, Turkey
- ✓ International Centre for Agribusiness Research and Education, Armenia
- ✓ Biological Farming Association ELKANA, Georgia
- ✓ ANATOLIKI S.A., Greece

Theme: Climate Smart and Green Agriculture
Keywords: Climate-smart Agriculture, Black Sea Basin, Europe
Citation:
Target Audience:

- ✓ Development Partners
- ✓ International Policy Research Organizations
- ✓ International Research Institutions
- ✓ National Agricultural Extension Representatives
- ✓ NGOs Operating at Farmer Level

Category: Report

1.1. Definitions and Acronyms

Definition of Climate – Smart Agriculture

Climate smart agriculture (CSA) is defined by the Food and Agriculture Organization of the United Nations as an approach that "*…helps to guide actions needed to transform and re-orient agricultural systems to effectively support development and ensure food security in a changing climate*" [1] . The concept was first introduced in 2009 as an attempt to provide a globally applicable principle on managing agriculture for food security under climate change and to serve as a basis for policy support.

The three pillars of sustainable climate-smart agriculture outlined by FAO are:

- ✓ **Productivity** and income increase
- ✓ **Adaptation** and building of resilience to climate changes
- ✓ **Reducing**/or **eliminating** if possible greenhouse gas emissions

Climate change refers to the large-scale shifts in weather patterns mainly due to global warming driven by the greenhouse gas (GHG) emissions. The primary sources of GHG are energy consumption (fossil fuel burning), agriculture, deforestation and manufacturing. Climate change is manifested through (1) temperature rising; (2) rising of the sea level; (3) increased snowmelt and change in the water volume; and (4) increased probability of extreme events. The climate changes are impacting the ecosystem, agriculture, forestry and fisheries. Different regions are affected differently by climate change. For some, the effect might be disastrous while for others (as for example, the colder regions), the climate change might be perceived as a "climate improvement". These differences in impacts can lead to diverse response and mitigation activities (Lipper et al, 2018).

Innovations for climate smart agriculture are approaches, processes and/or ideas that results in tangible improvements in the agrarian sector's response to the climate change. The innovations can be divided into three groups; 1) technological (such as mechanical, biological and chemical); 2) managerial (land-se, on farm management etc.), and 3) institutional (trade regulations, insurances, social safety net, mitigating strategies etc.)

[1] http://www.fao.org/climate-smart-agriculture/en/

Acronyms

BAS - Bulgarian Academy of Science

BGN - Bulgarian Lev (national currency)

CSA – Climate Smart Agriculture

OA – Organic agriculture

CAP – Common Agricultural Policy

GHG – Greenhouse Gasses

GMO – Genetically Modified Organism

CO2 – Carbon Dioxide

GVA - Gross Value Added

EU – European Union

EUR - Euro

FDI – Foreign Direct Investments

GDP – Gross Domestic Product

ha - Hectare

MAFF - Ministry of Agriculture, Food and Forestry

NGO - Non Governmental Organization

NIHM - National Weather Forecast Institute

NSI - National Statistics Institute

PDO – Protected Designation of Origin

PGI – Protected Geographical Indication

UAA – Utilized Agricultural Area

UPOV – International Union for the Protection of New Varieties of Plants

1.2. Abstract

The Climate-smart agriculture as a concept is gaining a considerable attention at national and international level and is considered to be the key towards addressing many of the challenges of agricultural planning under climate change (Lipper et al, 2018)

Climate smart agriculture is based on the idea that the agricultural sector is fundamental to climate response, not only because of its high vulnerability to climate change, but also because it is a main contributor to the problem. CSA is an integrated approach to manage landscapes, crops, livestock, forests and fishery to adapt in a sustainable way towards climate change, while in the same time ensuring food security for the growing global population.

In Bulgaria, climate change negative impacts are manifested through weather variability, shifting of agroecosystem boundaries, invasive pests and weed plants and growing occurrence of extreme weather events. Those factors threaten the crop yield and the livestock productivity. Farmers are becoming increasingly aware of the problem and are introducing a number of technological advances and innovations in their land-use models and practices. One of the obstacle for adopting a CSA-based approach is the high transaction costs for smaller producers and their difficult access to financing schemes. Another stumbling block is the low level of institutionalization of the CSA as a distinctive area for improvement within the policy-making initiatives. The need for raising awareness towards the climate change problematics on consumers' level is also evident. In this regard, introducing a CSA brand for food products and presenting CSA crop models, which are in the focus of the present study, are essential steps towards achieving sustainable agriculture.

2. Introduction

2.1. The Agricultural Sector in Bulgaria – The case of the North East and South East Regions

Bulgaria is a southeast European country with a diverse relief and mild climate. It encompasses 31% lowlands, 41% hills, 25% highlands and 3% mountains (of more than 1600 m of height). The Balkan Mountain ridge splits the country into north and south part and has a strong effect on the temperature regime. The annual mean air temperatures in Bulgaria vary from 3 to 14° C, depending on the location and elevation. The temperature normally reaches a minimum in January (ranging from -11 to +3 ° C), and a maximum in July (up to 25 ° C). Total precipitation depends on the circulation patterns, site elevation, and the specificity of local features. Annual mean total precipitation is approximately 500– 650 mm, with an annual variation ranging from 440 to 1020 mm (Alexandrov et al, 2004).

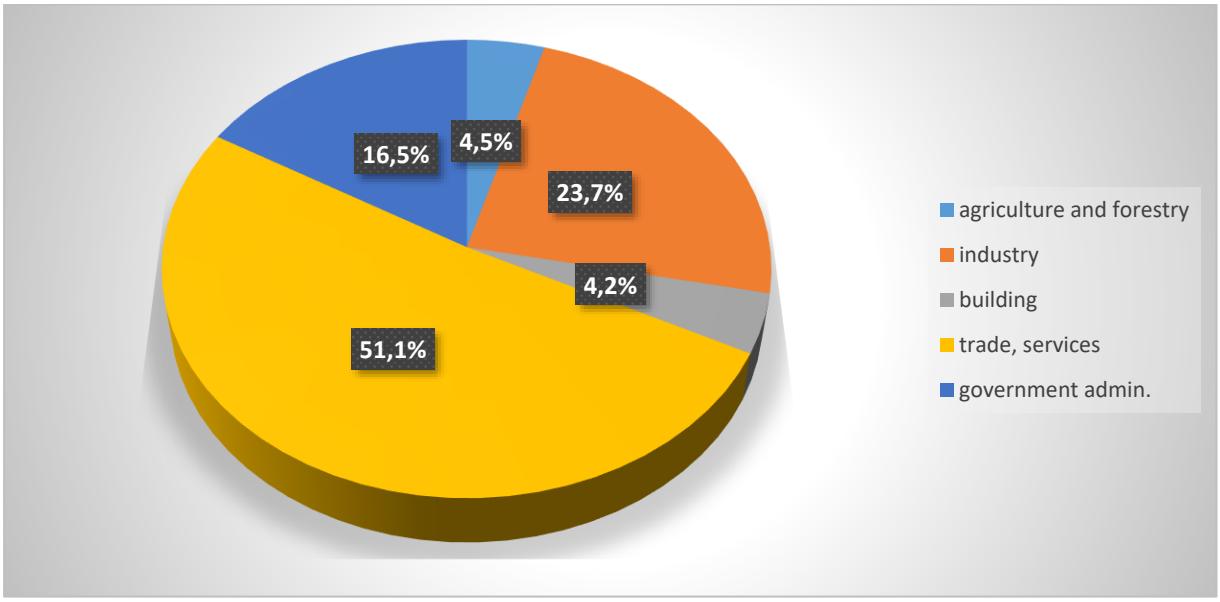
Agriculture is one of the sector of the Bulgarian economy with a historical importance and traditionally a large share of the population was involved into some type of agricultural activity, farming or husbandry. In the period after the state independence (end 19th century) the agricultural activities was dispersed in smaller family-centered farms with limited output and primitive methods of production. During the communist regime (the period between 1944 - 1989), the land was nationalized and consolidated into larger state-owned agro-industrial complexes with integrated systems of automation, cultivation and supply. In 1990 the restrictions on private farming was lifted, and almost all agricultural land was restored to the private ownership. A new process of consolidation began with the funding of private agricultural cooperatives. Unfortunately, with the progressive urbanization of the country, farming became a less popular career choice for the younger generation. The accession of the country to the European Union however, provided a number of incentives as various financing schemes and loans were made available. As a result, the agricultural sector is becoming more attractive and the crops are being diversified continuously for achieving an optimal gain and productivity.

The natural conditions for agricultural development in Bulgaria are excellent. Cultivated agricultural land occupies about 4.9 million hectares or 44% of the total territory of the country (IBG, 2019). The favourable climate and the availability of agricultural land for crop production have resulted in well-developed plant growing and animal breeding.

Today, the Agriculture accounts for around one-tenth of the national gross domestic product and 4,4% of the country's total gross value added (GVA). It provides employment for about 5,8% of the Bulgarian population (Ficompass, 2020). With the raise of the service sector, the forecasts are for further decrease of this share in the next few decades (Ivanov et al, 2019). However, the eminent economic crisis following

the Covid19 pandemic may lead to a reverse in this trend, since the sector is less vulnerable than the services and adapts easier to the post-crisis market demand.

Fig.1 Share of GVA (Gross Value added) by economic sector in Bulgaria in 2018



Source: Delisivkov K., TCI 2018 European Conveference, Sofia

Bulgarian agriculture is characterized with diversified crop structure and polarized farming models. At one extreme there are small, usually family-based farms that manage less than 2 ha. Those account for 82% of total farms (or 166 000 of all farms). Their market involvement is limited mostly at the local level, and their production is mainly based on high value crops, such as fruits, vegetables and tobacco. At the other extreme are large commercial farms with an Utilised Agriculture Area (UAA) of over 100 ha. These farms account for less than 2% of total farms (or 6 060 of all farms). They specialise on less diverse and cereal crops, such as wheat, maize or barley.

Crops

Cereal crops hold the biggest share of agricultuiral production as they are grown on almost three-fifths of the cultivated land. Out of them, wheat is the most important, followed by corn (maize), barley, rye, oats, soybeans, and rice. Sunflower seed is the primary source for cold-pressed oil.

Table 1. Production of Cereals in 2015 and 2016 Harvest Years

Crop	Harvest areas (ha)			Average Yield (tonnes/ha)			Production (tones)		
	2015	2016	Change 2016/2015	2015	2016	Change 2016/2015	2015	2016	Change 2016/2015
Wheat	1 105 916	1 192 589	7,8%	4,53	4,75	4,9%	5 011 597	5 662 721	13,0%
Rye	6 304	7 468	18,5%	1,78	2,03	14,0%	11 210	15 178	35,4%
Triticale	12 714	16 096	26,6%	3,02	3,06	1,3%	38 402	49 265	28,3%
Barley	175 957	159 830	-9,2%	3,97	4,32	8,7%	697 863	689 850	-1,1%
Oats	11 076	15 323	38,3%	1,96	2,05	4,4%	21 694	31 372	44,6%
Maize for grain	498 644	406 942	-18,4%	5,41	5,47	1,1%	2 696 923	2 226 094	-17,5%
Rice	12 410	11 988	-3,4%	5,45	5,40	-0,9%	67 684	64 773	-4,3%

Source: MAFF, Department of Agro Statistics, 2017

Bulgaria is a leading exporter of grapes, oriental tobacco, tomatoes, peppers, peaches, apricots and nuts to European markets. During the communist regime (1945-1989) the country was the main exporter of fresh and processed fruits and vegetables for the Eastern Bloc and the second biggest exporter of tomatoes in Europe.

Table 2 *Total production of main vegetables in 2015 and 2016*

Types of vegetables	Harvest 2015	Harvest 2016	Change 2016/2015
Tomatoes	121 646	141 367	16,2%
Pepper (sweet and hot)	67 819	72 030	6,2%
Eggplants	9 933	7 905	-20,4%
Cucumbers and gherkins	50 335	66 653	32,4%
Watermelons	59 960	85 651	42,8%
Headed cabbage	42 447	75 650	78,2%
Onions	8 926	14 921	67,2%
Strawberries	4 999	5 150	3,0%

Source: MAFF, Department of Agro Statistics, 2017

Essential oils

Traditionally, Bulgaria is known for the production and export of essential oil crops such as Rosa Dmascena which is one of the country's national symbols since Bulgaria is the second biggest producer of rose oil in the world. The last few years more sorts of fragrant plants and spices became also popular for both – production and consumption (as food, medicine, and in the cosmetics industry). Those include lavender, lemon balm, thistle, fennel, salvia and others

Rosa Damascena

Source: afya-pharmacy.bg

Fruits

In 2016, 198 982 tonnes of fruits were produced. The most important fruits for Bulgaria are plums, apples, cherries and peaches. Apricots and berries are also popular. The production of nuts, such as hazelnuts, walnuts and almonds, registers significant increase over the last decade.

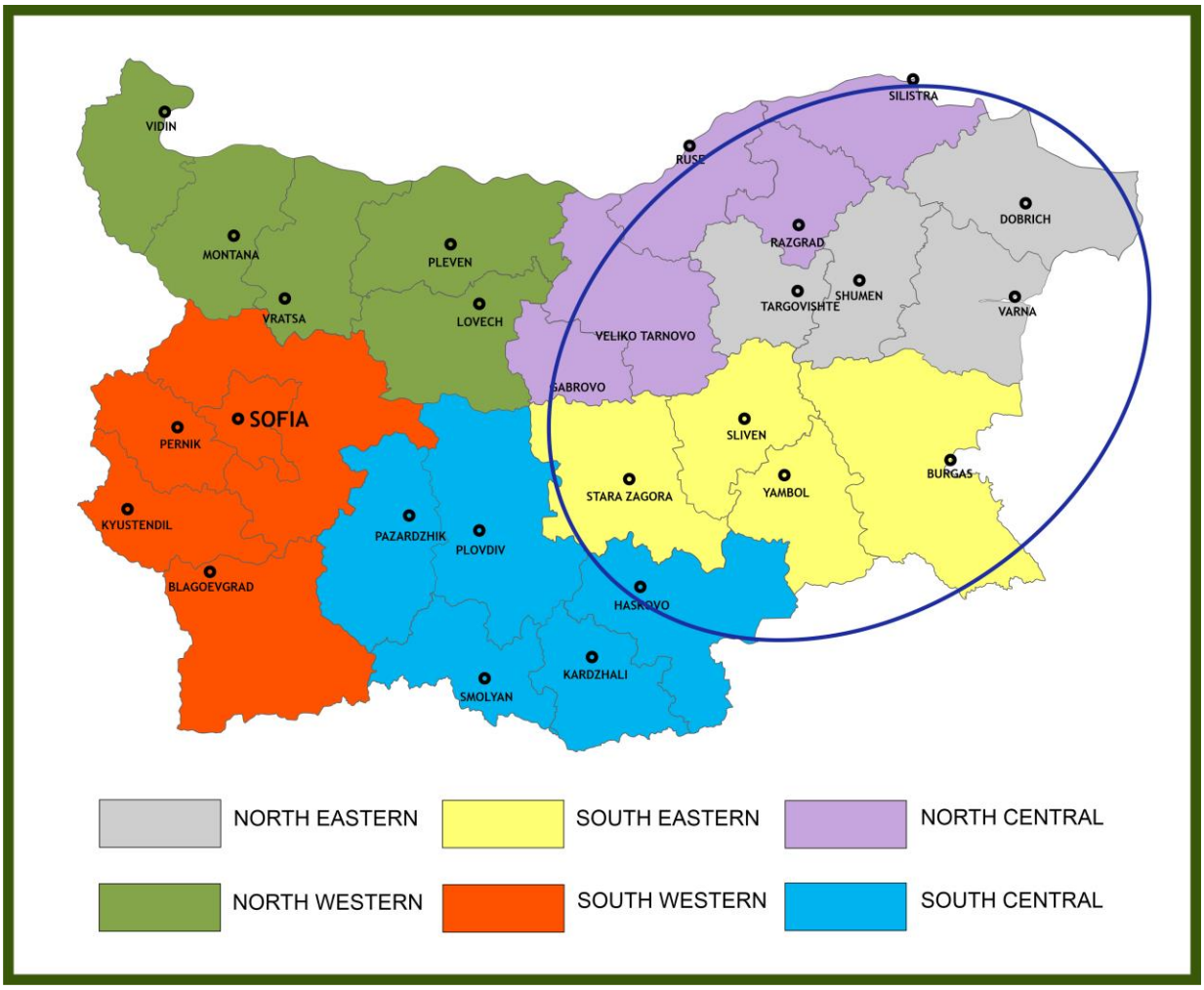
***Table 3**. Production of Fruits in Harvest Year 2016*

Fruit crops	Harvested areas (ha)	Average Yield (kg/ha)	Production (tons)
Apples	4111	10887	44755
Cherries	8463	4549	38496
Plums	6705	7253	48630
Peaches	3816	7975	30432
Walnuts	6280	790	4959
Raspberries	1833	4582	8398
Apricots	2554	6070	15503

Source: MAFF, Department of Agro Statistics, 2017

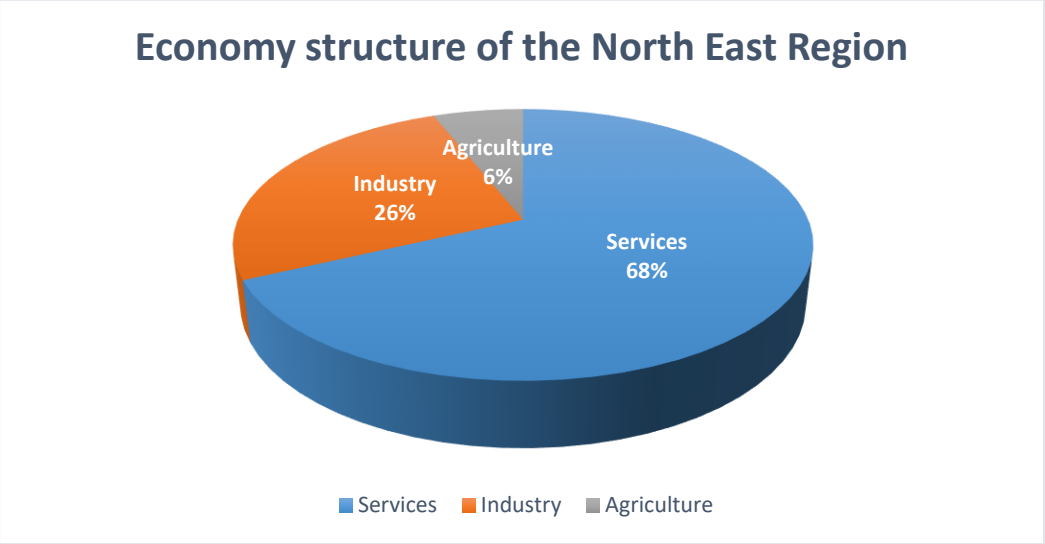
The agricultural sector in the North East and South East regions of planning (the eligible areas as per the Black Sea Cross-border Cooperation Program), is of a key importance along with the service sectors. The both region benefit from the excellent fertile soils and mild climate impacted by the Black sea vicinity.

Figure 1. North East and South East regions of planning

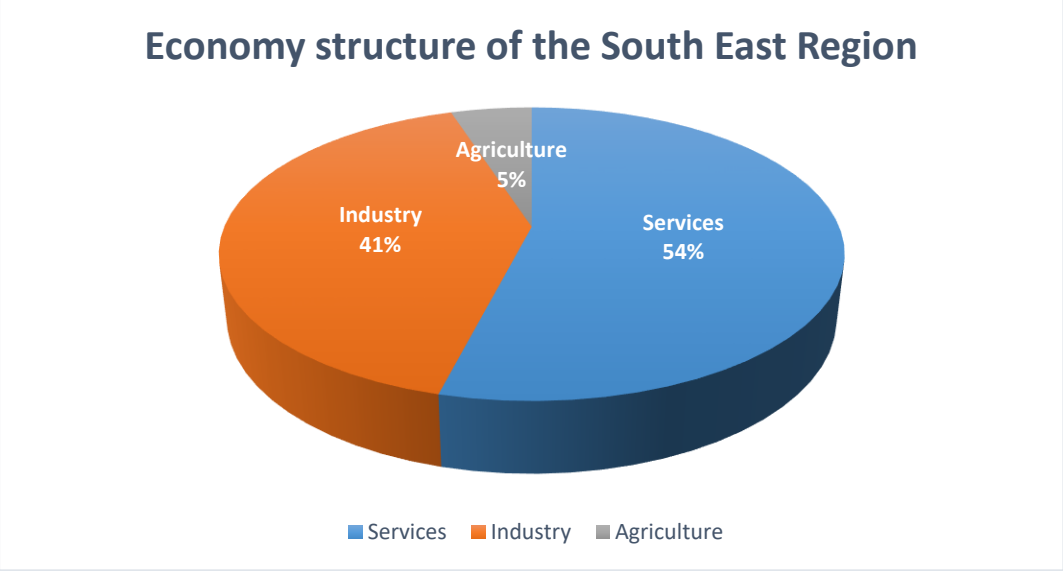


Source: mrrb.bg

The economic structure of the North East region reveals that nearly 67% of the business activities are related to tourism and hospitality (NSI, 2020), 27% is the industry share and the agriculture accounts for 6% (well above the country's average) Varna is the administrative and logistic centre of the region, while Dobrich (the centre of South Dobrudzha is a leading crop producer. The region of Dobrich is also known as the "Bulgarian granary" which accentuate the importance of the agricultural sector.



The South East Region relies mostly on the service sector (54.1%), followed by the Industry (41%), while the Agriculture accounts for only 4.9% (NSI, 2020). Due to the proximity of the Black Sea Coast and the Mediterranean mild climate, tourism is one of the most important and rapidly growing sectors here.



2.2. Climate Change and its Impact on Bulgaria

The impact of the climate change on the weather pattern, agriculture, health and well-being of the population is a subject of numerous discussions, researches and strategic documents on local, European and national level. In general, there are four main consequences of the climate change that affect also the agricultural sector Those are:

1) raising temperature and shifts of the weather pattern

Globally, it is observed that the temperatures have increased with more than 0, 6 ° C during the last 100 years (Alexandrov et al, 2004) and are expected to increase even further by 1-3° C which is equivalent to a shift of 300–500 km of weather patterns away from the equator and towards the poles (Lipper, 2018). The raising temperatures are having twofold impact. On one hand, because of them, some warm agricultural areas become unusable for crop production, while other colder areas experience beneficial effect of milder climate. Innovation to respond to those changes may lead to introduction of new crops and plant varieties in some area or migration away from barren lands in others.

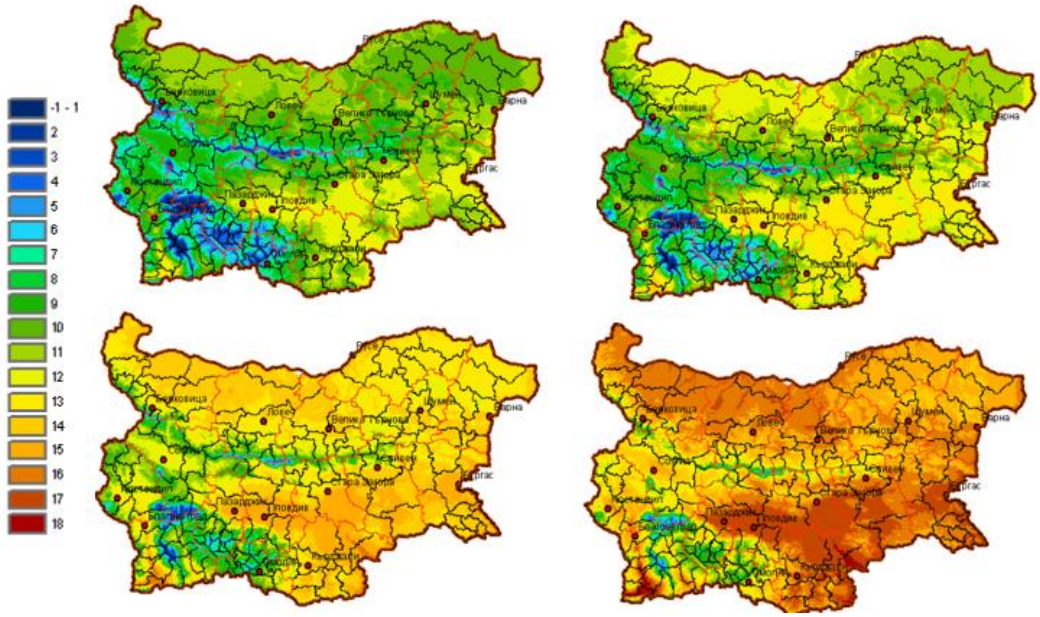
The temperature shift will not only affect crops and plans, but will also have snowball-like effect across multiple species. For example, temperature serves as an important barrier to prevent pest infestations. Wildlife and insects vital for pollination will also be impacted. Finally, those changes may lead to migration of people and have a vast and lasting social and economic effect.

In Bulgaria, the overall shift trend of mean annual temperature is not significant for the last century. Warming however is observed since 1980s. From this period till today all temperature abnormalities are positive (with 2007 being the warmest year in the records).

The average temperature between 1980-2010 was 1.6 ° C above the average for the period 1961-1990[2]. The Figure below demonstrates the temperature shift trend in a century – long span. It is evident that he pessimistic forecasts are for continuous raising of the temperature all over the territory of the country.

[2] https://www.climatechangepost.com/bulgaria/climate-change/

Figure 2 *Average annual air temperature during 1961-1990 (a), 2020 (b), 2050 (c), 2080 (d) under pessimistic climate scenario*



***Source**: V. Alexandrov (2020), NIHM BAS*

2) low precipitation and snowmelt

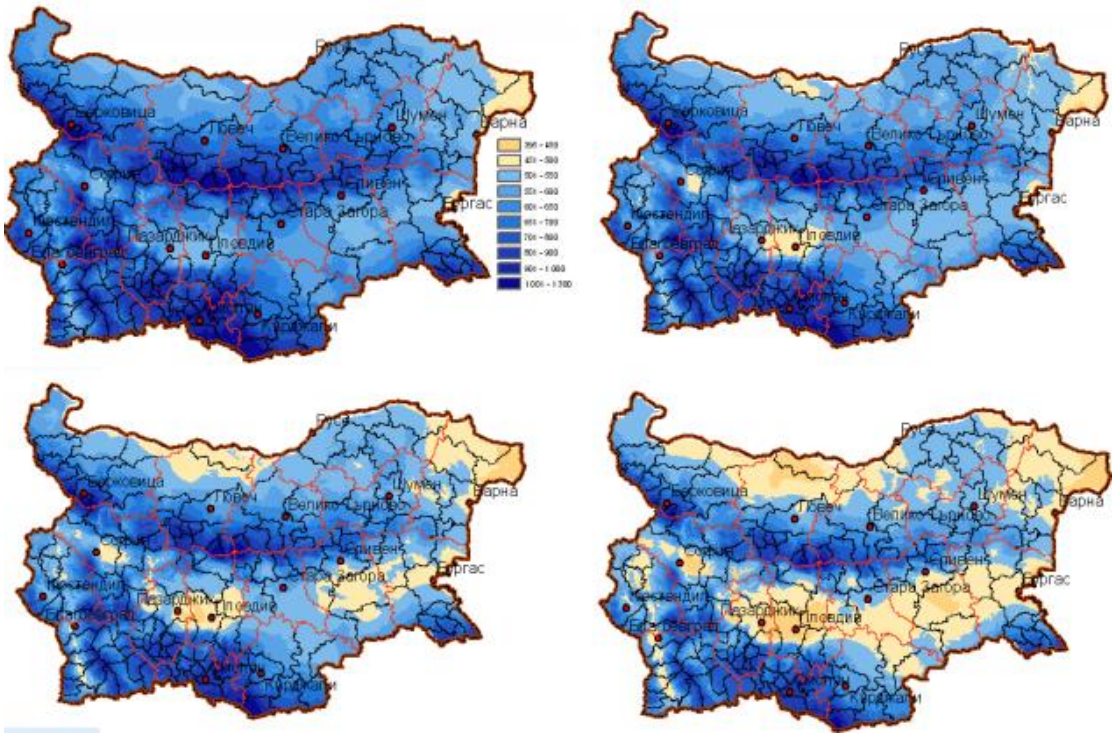
Climate in Bulgaria became drier in the last few decades. The annual precipitation however varies considerably from year to year. In some years, low annual precipitation caused droughts of different intensities as during the 1940s and 1980s while in others (1990s), heavy rainfalls caused severe floods and damage (Alexandrov et al, 2004).

In addition to changes in precipitation models, increased temperature cause snowmelt which decrease the possibility to use water stored in snow accumulated during the winter season for irrigation during the warm season (Lipper et al, 2018).

For the period 1931-2000 a widespread fall in winter precipitation was observed. The irregular snowfall and the abrupt change in the temperatures which were experienced in the last five years in the North East region had damaging effect on the newly seeded crops. The absence of snow covers to prevent fragile plants caused soil freezing and crop losses[3].

[3] https://www.bgfermer.bg/Article/8117662

Figure 3: *Annual precipitation in 1961-1990 (a), 2020 (b), 2050 (c), 2080 (d) under pessimistic climate change scenario*



Source: V.Alexandrov, 2020

3) ***greenhouse gases and aerosols increase***

Greenhouse gases (GHG), aerosols and CO2 distribution in the troposphere are directly linked to the air quality, sun radiation, temperature and humidity, and hence impact strongly the life-cycle of the plants (including crops and vegetation with agricultural importance). According to recent studies, the GHG have statistically significant positive trend in the beginning of 21st century, which leads to more significant greenhouse effect and corresponding raise in the average temperatures (Nojarov, 2016).

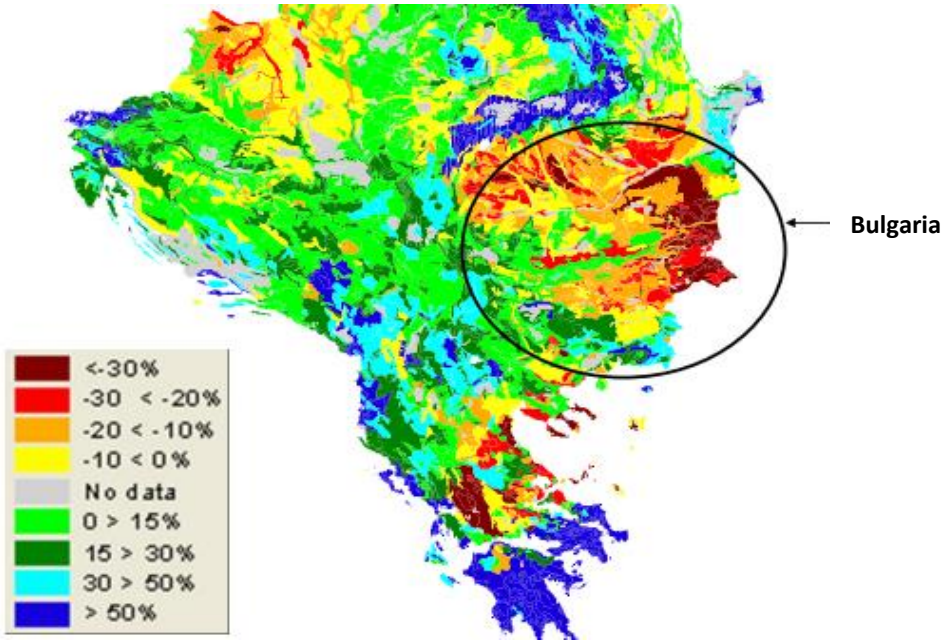
4) increased probability of extreme events

Climate change expressed in overall increase of the average temperature is likely to shift the climatic distribution that will increase the probability of extreme events, such as heatwaves, torrential rainfalls, damaging storms, tornados and coastal flooding. In the North East region of Bulgaria, for example in June 2014, a heavy rainfalls lead to a significant flooding of residential and agricultural areas, leading to loss of human lives, damaged homes and ruined harvests. As per a recent research lead by L. Boncheva and P. Simeonov (2016), there was 58 recorded cases of tornadoes on the territory of Bulgaria for the period 2001 – 2016, a rare abnormality for our country, which becomes more frequent due to climate change impact.

The forecasts are that the trends in weather shifts observed on the territory in Bulgaria will prolong in the future. Extremely high summer temperatures are projected to become the norm by 2070-2099. The heat waves will intensify and increase in duration. Day time maximum temperature will likely reach 35 °C. The precipitation in 2065-2094 will decrease with 7-17% compare to those in 2001-2011. The number and the intensity of rainy days on the Balkans is expected to decrease by 10-20 per year (Nojarov, 2015).

In short, the climate in Bulgaria will shift from continental to more sub-tropical and tropical-like, which will challenge in numerous ways the balance of the existing eco and agro-food systems. Traditional crops will have to adapt or be replaced with more dry-resilient varieties. Fig. 4 shows the projected drop in sunflower yield for the South-East region of Europe (incl. Bulgaria)

Fig. 4: *Forecast for the changes in sunflower yield for 2071-2080*



Source: Alexandrov, 2020, NIMH BAS

2.3. SWOT Analysis of Climate – Smart Agriculture in Bulgaria

Strengths

- ✓ Agricultural land is more than 50% of the territory of the country
- ✓ Diverse and fertile soils
- ✓ Long-term traditions in crops production and animal breeding
- ✓ A number of plant varieties well-suited to the local climate conditions and soils
- ✓ Institutes and universities for agricultural research and development with internationally recognized achievements in biogenetics and plant breeding

- ✓ Network of 80 secondary schools and 5 universities which offer specialization in agriculture and/or food production, thus ensuring availability of productive and well-educated labour resource for the industry
- ✓ Excellent conditions for organic food production
- ✓ Growing demand (both domestic and international) for bio, organic and climate-smart food products
- ✓ Established farms of various size (large, middle and small), mostly family-owned which facilitates the preservation of valuable genetic resources and production techniques.
- ✓ Availability of traditional local varieties of fruits, vegetables, essential-oil bearing plants, herbs and cereal crops which are appealing to the domestic market and marketable abroad
- ✓ Access to a number of financial schemes and instruments for organic, bio and climate-smart agricultural production
- ✓ Existing agricultural policies are aligned to the CAP of the EU, facilitating exchange of best practices between farmers and producers

Weaknesses

- ✓ Decreased precipitation in recent years leading to less options for irrigation, especially for water-intensive crops
- ✓ In the North East regions, despite the abundance of fertile soils, the agricultural activities are hindered by the scarcity of natural sweet waters (the region is one of the poorest as per surface river density)
- ✓ The urbanization trend leading to leakage of resources (including financial, administrative, human, educational, research capacity etc.) from the rural areas
- ✓ Part of the agricultural land has been abandoned
- ✓ Loss of organic matter and deterioration of soil structure due to wind and water erosion
- ✓ Increased usage of invasive chemical pesticides and fertilizers which alter the natural balance and increase the sild acidity in a long term as a result the land suitable for organic farming decreases
- ✓ Production form local varieties is labour intensive and not suited for mass production and marketing
- ✓ Career paths in agriculture became less attractive in the recent years for younger people leading to shortage in qualified labour market supply
- ✓ Low bargaining power of producers who are forced to comply with less profitability for their products
- ✓ Unfair competition between small, local producer and large farms. Most EU programs benefit big-scale agri-cooperatives, and very few are applicable to small-size farm producers.

- ✓ Underdeveloped system of geographical recognized brands such as PDOs and PDIs which leads to lack of incentive for traditional variety production and loss of financial benefits.
- ✓ Loss of traditional markets in the post-communist period

Opportunities

- ✓ Climate change may lead to weather shift enabling multi-harvest crop production
- ✓ Introduction of new crop varieties as a result of the milder weather
- ✓ Organic products demand will continue to increase, both domestically and globally
- ✓ The consumers are increasing their awareness towards methods and regions of production, especially concerning food products. They will demand more for locally raised produces
- ✓ Scientific development and new technologies, leading to more resilient crop varieties and plants
- ✓ Certification opportunities: such as bio, organic, climate-smart agriculture labels etc.
- ✓ EU envisages new programs to support small-scale producers, organic and bio and climate-smart agriculture.
- ✓ Introduction of new profitable plants in the Bulgarian farms such as saffron crocus, lavender, plants, herbs, spices and exotic plants and breeds
- ✓ Establishment and raise in popularity of farmer's markets which might be a tool to cut the market chain and to increase the profitability of the local producers.
- ✓ Creation of alliances, cooperatives and other organisations of argi-producers for support, lobbying and marketing purposes
- ✓ Creation of regional international alliances for common branding and marketing activity and for transfer of best practices and know-how
- ✓ Use of renewable energy sources to cut the energy costs
- ✓ On-line sales as a direct sale channel and a tool to reach and establish long-term relationship with the final consumer

Threats

- ✓ Global warming and dryness which threaten to turn fertile lands into deserts
- ✓ International competition in terms of foreign producers
- ✓ Continuous depopulation of rural areas due to migration and aging
- ✓ Diminishing purchasing power of the Bulgarian population leading to demand of low-quality foods and produces. This also is a challenge before the development

of organic market and introduction of branded, high-quality goods and produces.

- ✓ Insufficient funding for research and innovations.
- ✓ EU programs are available mostly to big producers leading to disparity in financial sources distribution. Part of the problem is based on the low capacity of smaller farmers (such as lack of education or information) to initiate the application process
- ✓ Agricultural producers are underrepresented in the policy making activities, thus their interest protection is not guaranteed.
- ✓ Domination of big wholesalers and international food chains on the market and trade barriers for smaller, local producers

3. Research Methodology

3.1. Background Analysis

In Bulgaria, the climate-smart agriculture is still on its introductory phase. On academic level there are few documents developed as research papers by the Agrarian or Geography departments of the reputable universities such as Plovdiv or Sofia universities. Most of those papers focuse on climate change from a physical, meteorological or socio-economic prospective. Researches dedicated to climate change in relation to farming, forestry, biodiversity and agriculture are rather limited. Some of those papers are listed in the References at the end of this document.

For the purpose of this Feasibility Study, two independent researches were carried out:

[1] Research on the attitudes towards the potential of climate-smart agriculture development in Bulgaria
[2] Research on the consumers' attitudes and perceptions towards branding and brand strategy of climate smart agricultural products in BSB

Research N 1 was conducted through a complex methodology, in a combination of several research instruments: a) survey of the potential consumers (via on-line based questionnaire), b) interviews with various groups of stakeholders including farmers (producers), academic/research representatives and local or regional authorities and other organizations; c) focus group with moderated discussion when various stakeholders were invited and shared their opinion.

During this research more than 300 respondents were reached and around 35% of them participated in the study.

The main purpose of this research was to define the degree of awareness and acceptance of the CSA concept within the various stakeholder groups in Bulgaria.

Questionnaires aims at revealing the respondents' attitude towards climate smart agriculture and their willingness to support common branding strategy of the CSA products. They consisted of multiple-choice and open questions and were focused on gathering socio-demographic data, as well as specific information related to CSA such as:

- ✓ benefits of CSA adoption,
- ✓ personal engagement with the CSA objectives,
- ✓ readiness and motivation to support CSA regional brand and
- ✓ sacrifices willing to make to obtain CSA labeled products
- ✓ general interest in CSA and need for further educational/ raising awareness initiatives in this direction

The questionnaires and interviews were disseminated on-line: either via e-mailing to a large data-base of pre-selected matching contacts, or through social networks, so

it could reach a large scale of responsiveness and representativeness. The answers were processed and analyzed in google form (quantitative analysis) or through a content analysis (for the interviews).

Research N 2 was designed as an additional instrument for the purpose of the Branding strategy of the CSA products. This is a questionnaire-based study aimed at potential consumers of foods and agricultural products in order to assess their preferences and attitudes towards a future CSA brand. The questionnaires were distributed on-line via e-mails to a broad and diverse contact group within the region of the BSB eligible territory in Bulgaria.

3.2. Research results

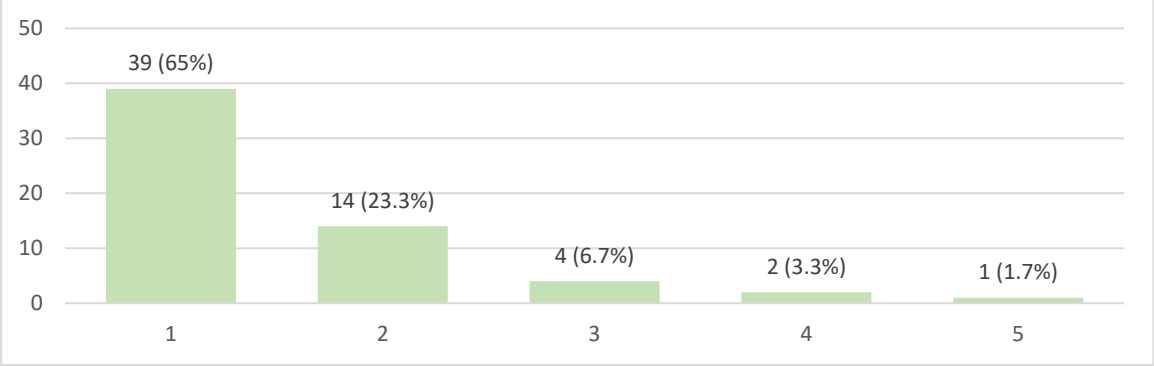
The results of the ***Research N 1*** reveals the following data:

The respondents (those who demonstrated interest in CSA problematics) are mainly younger people (90% are under 50 of age)

Most of them reside in North East region of planning and more specifically, the cities of Dobrich and Varna. There are however representatives of other regions of the country, including South East.

The majority of the respondents have higher education and almost all agree that the CSA is important and should be developed on the territory of the country (95% agree, while 5% are indecisive).

The respondents agree strongly on the need to increase the productivity of the agricultural sector in Bulgaria (85%) and sustain the notion that intentional efforts should be made to for making the Bulgarian agriculture adaptive and resilient to the inevitable climate changes. The chart below visualises the degree of consent to this statement (when 1 is “strongly agree” and 5 is “strongly disagree”)



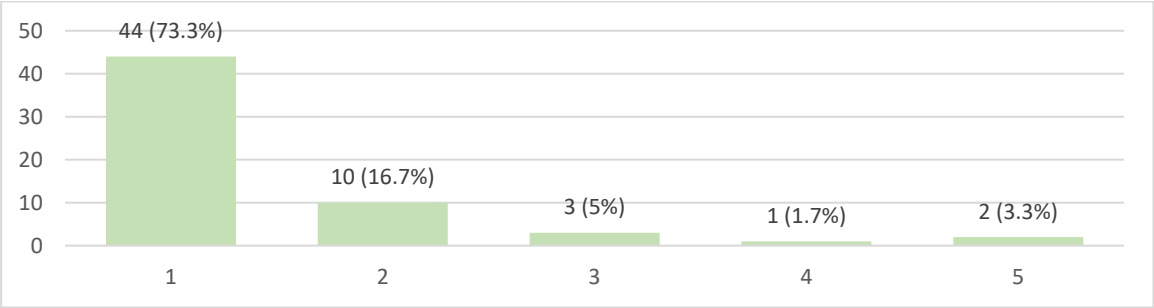
The Greenhouse gas effect was defined by most respondents (80%) as a major issue that need to be counteract strategically.

Considering the benefits of the CSA, the potential consumers have outlined the following:

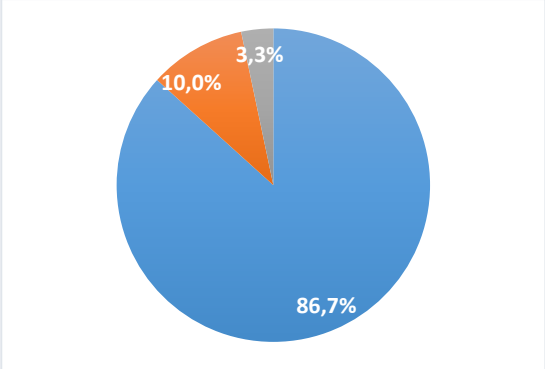
- crops diversification (67%)
- more income for the farmers (48.3%)

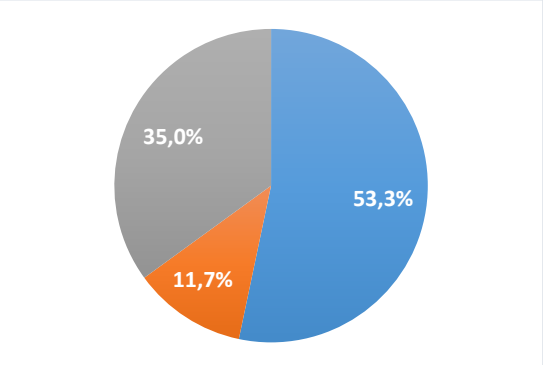
- positive ecological impacts (65%)
- cheaper/ more affordable produce for the end consumers (30%)
- increased productivity of the farmers (45%)
- better use of land resources (48%)
- increased competitiveness of the agricultural sector (40%)
- healthier foods (55%)
- farming will become more attractive for younger people (48%)
- enhanced regional development (48%)

The respondents are ready to support the CSA development in their region (90% either agree or strongly agree – as shown on the chart below)



86.7% of them affirm that the CSA produce should have special designation (brand or label) in order to be recognizable on the market (see the chart on the right – where blue stands for "yes", red for "no" and orange for "not sure")





Almost 82% of the respondents would buy products branded with CSA label.
More than half of the respondents are willing to make certain sacrifices (in this case to pay more) in order to obtain CSA branded products (see the chart on the left where blue stands for "yes", red for "no" and orange for "not sure")

55% of the respondents stated their further interest in the CSA topic and demanded to receive additional information when available.
Regarding the answers on the open question about recommendations and sharing a personal opinion on CSA, one respondent underlined the need for specific legislative instruments in this area for the future development of the climate smart agriculture,

while another expressed doubts about the health benefits of the CSA and its connection to GMO products.

Contents analysis of the interviews:

The interviewees are farmers/producers or representatives of the local authorities and academia. The majority of the farmers are small or medium sized (cultivating up to 50 ha of land), but there are some who are working 2000 ha and more. The smaller farms have up to 5 employees, while the biggest employ 35 workers. There are producers who work on their own not engaging additional farmhands. The main crops grown on their fields are maize, wheat, sunflower, barley legumes (beans), beet, sweet corn, alfalfa, lavender, immortelle, etc. The majority are operating for at least 10 years, but there are some who have just embarked on the farming in the last three to five years.

There are also smaller producers who are engaged in greenhouse production of vegetables (such as tomatoes, cucumbers, peppers, herbs, green onion, broccoli etc.) and some who grow orchards (plums and cherries) and fruit shrubs (such as raspberries).

A great share of the farmers is aware of the CSA concept and are trying to implement it in practice. The CSA measures and techniques they are apply are as follows:

- growing crops and plants with local genetic origin (as those crops are less susceptible and more adaptive to the local climate specificity)
- using greenhouses and windshield nets
- constructing irrigation system for vegetable and fruit growth.
- laying grass sods around the fruit trees
- no-till or strip-till technology
- avoiding pesticides and chemical fertilizers
- buying and using locally produced seeds (including from agricultural research institute)

There are however farmers who have no previous knowledge about the climate-smart agriculture and for them participation in the study had an informative and educational value, since they were encouraged to research more about this concept.

The respondents are encouraged to further increase their CSA production, because they perceive it as way to meet the market demand for more green and sustainable food products and because they believe that the CSA will play more and more important role in the future. They also regarded CSA as an “intelligent, sustainable and responsible agriculture”.

The biggest advantages of the CSA approach are clean and greener environment, healthy people, high-quality products, greater productivity, less susceptibility to climate changes, lower costs of production.

Some of the listed challenges of CSA application include limited awareness and thrust among the farmers; dry weather; late spring frosts.

The measurements for CSA development on the local level proposed by the interviewed farmers included:

- proper soil treatment
- clean production
- improved accessibility to the local markets

Some of the farmers are optimistic about CSA development in their regions and share their observation that CSA as a practice is gaining popularity. Others however think that the CSA's feasibility is very limited at this stage and that information and raising awareness campaign should be carried out in order to enhance its impact.
All of the farmers agree that CSA should be supported on regional and national level, including via national CSA policy and special financial or other incentives.
They affirm that CSA brand and label will be beneficial for the market recognition of the CSA products and that the consumers will be encouraged to look for and buy CSA branded products.
Some respondents believe that a common branding policy will increase the competitiveness of the CSA products and that the producers should try to reunite their efforts in various formal or informal structures for promoting CSA development, but there are others who doubt the feasibility of this approach at the moment and under the present circumstances.

The data received from the interviews with the academia and local authorities' representatives reveal that CSA popularity in the region is low and more information and awareness raising activities should be scheduled on a local and national level. There is however, an opinion that CSA even though not precisely defined, is being implemented for a long time in the region and the presence of agricultural research institution (such as "Dobrudzha" in the village of General Toshevo) has facilitated the spread of CSA techniques and approaches among the producers. The respondents are rather unsatisfied by the stage of the CSA policy development and urged that more precise definition of this concept should be outlined. They agree on the need for governmental support (financial, technical, training know-how or information) directed towards CSA farmers and producers and believe that CSA should be encouraged as a prospective and beneficial approach towards sustainable agricultural development. They also encourage the creation of regional alliance and common CSA brand strategy as a tool to enhance the agricultural competitiveness in the BSB region.
When asked about the current state and the future of the CSA, one of the respondent replied:
"The degree of CSA development, both locally and nationally, is very low. The main problem is the lack of expertise in the relevant regulatory bodies and the fact that the appointments there are often on a political and not on an expert basis. Unfortunately, at this stage there is no evidences of change of this negative trend."

The results of the ***Research N 2*** (on the Feasibility of the CSA brand strategy) are as follows:
The majority of the survey participants are young and middle aged people /31-45 (52%), 46-60 (25%), 19-30 (15%)/ residing in a city/urban setting (85%).

***Fig. 5**: Age distribution*

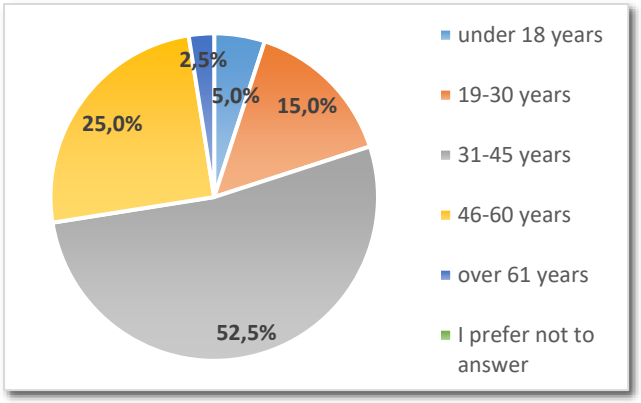
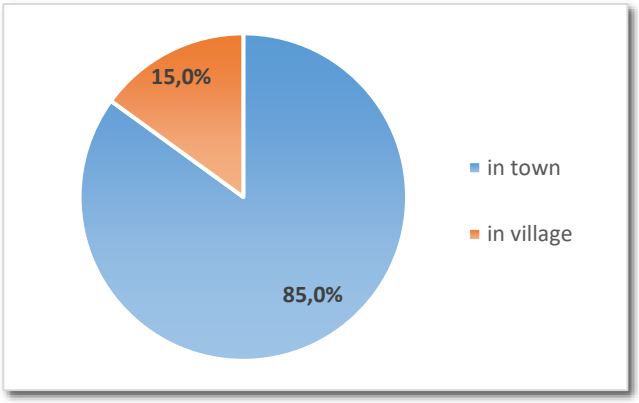
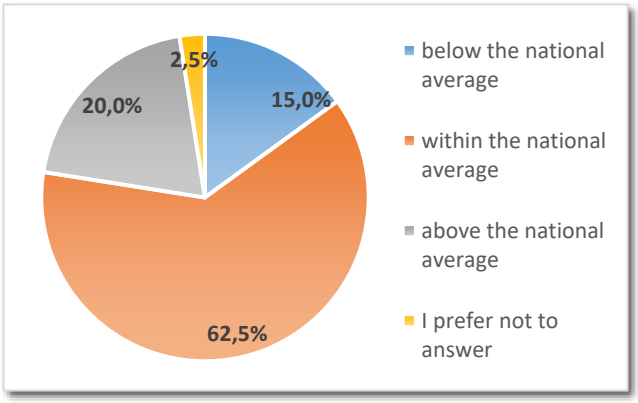


***Fig. 6**: Place of residence*



The income of the respondents are mainly within the countries' average (62,5%), 20% are above the average, while 15% are below.
***Fig. 7**: Income level*



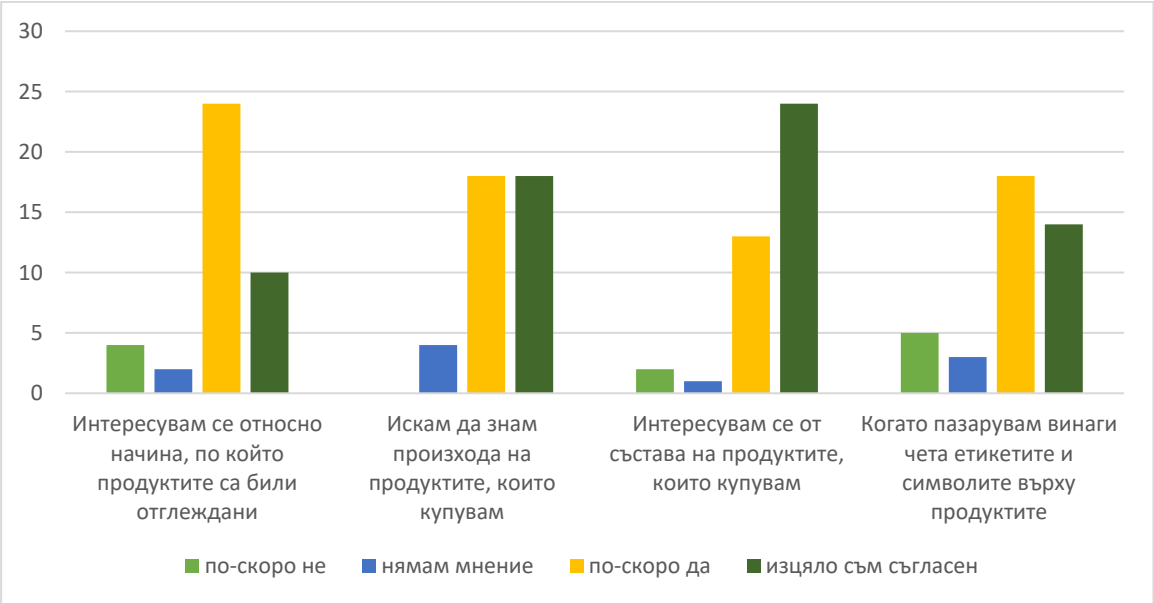
The analysis of the data about the consumers' buying patterns reveals:

- their preferences to buy from large supermarkets (58%) and smaller local farmers markets (42%) are split.
- 85% prefer to buy directly from the producer when possible
- 75 % prefer to buy local foods over imported ones
- 90% would prefer to be able to choose each product individually
- 82% declare that they would rather prefer quality over price

The respondents demand that the following elements are stated (implicitly or explicitly) in the brand:

- 85% would like to know how the produce/ food was cultivated/raised, thus including employment of CSA protocol
- 90% would like to know the origin of the food and food products they are buying
- 92% are interested in the contents/ ingredients of the food products
- 80% claims that are regularly reading the information on the food products' labels

***Fig. 8**: Preferences about the information that should be evident in the brand/label*



81% have indicated strong positive attitude towards buying goods branded as CSA products. 19% are indecisive and there is 0% of negative responses (people who would rather not buy CSA products).

The successful CSA brand should have the following most important elements as per the respondents' opinion:

- To show that the product is green/sustainable (72,5%)
- To show that the product is contributing to the local economy (70%)
- To show the origin of the product (65%)
- To demonstrate a high quality of the product (52,5%)
- To show that the product was produced in a natural way (50%)
- To show that the product is certified by a controlling institution (50%)
- To show that the product is preserving and enhancing the local traditions (47,5%)
- To show that the product is economically effective (40%)
- To show the use of new technologies in the production process (17,5%)

Fig. 9: *Brand contents*

The brand visual elements were defined by the potential consumer as follows:

- Preferences were given to nature and agriculture related symbols (55%) such as fruit, wheat, tree and nature; 25% asserts that the brand should also contain Black sea graphics elements
- 55% claims that the brand should contain national symbols or other graphic elements associated with the country's origin
- 45% of the respondents agree on "earth" colors (green, brown, yellow) as a main color for the visual brand while 32,5% prefer a color combination between earth and sea colors
- 37,5% prefer mild (pastel) over strong (bright) tones and shades
- 25% are for symbols that convey high quality, while another 25% would like to see graphic visuals depicting support for the local population
- Nearly 28% think that the wording should include the whole name of the brand (example: "Product of Climate Smart Agriculture) rather than an abbreviation such as "CSA"

The respondents claim that the CSA products should not be more expensive than the regular (non-branded) products (47,5% vs. 22,5%). 30% are inconclusive.

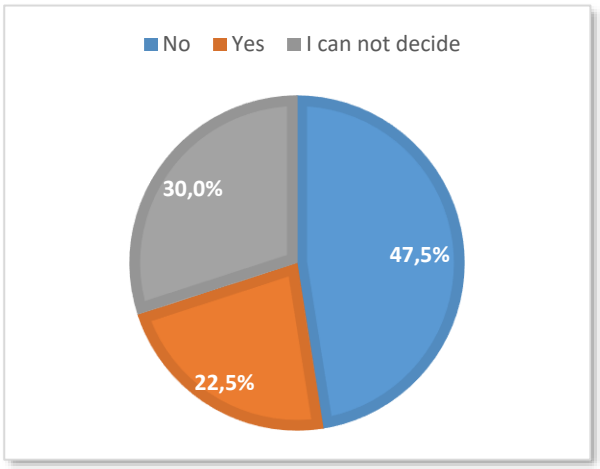
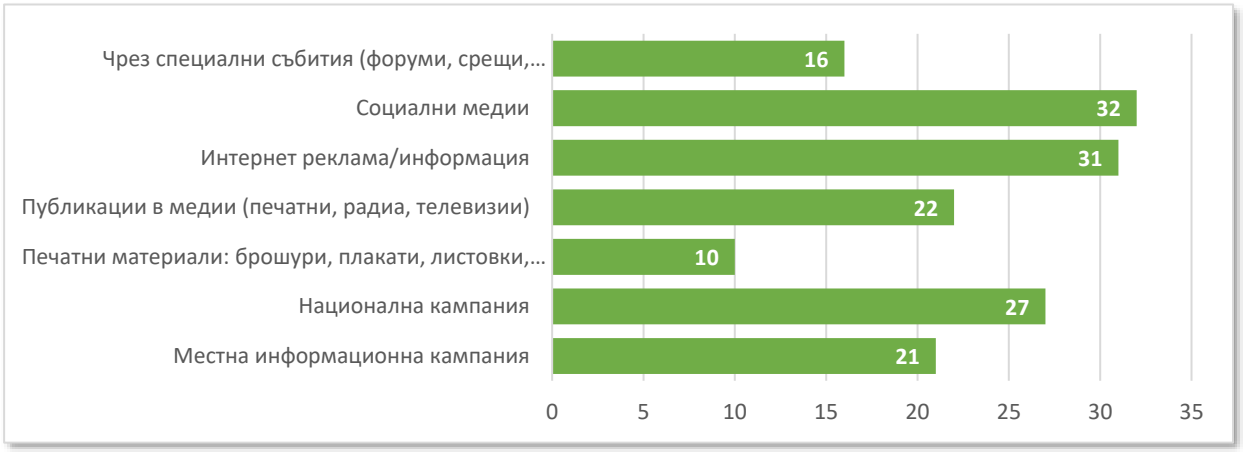


Fig. 10: *Price level of the CSA products*

According to the respondents, The CSA brand should be promoted via:

- Social media (80%)
- Internet and online ads (77,5%)
- National awareness campaign (67,5%)
- Media coverage (newspaper, magazines, TV and radio) – 55%
- Local informational campaign (52,5%)
- Special events (focus groups, forums, debates and discussions) – 40%

***Fig.11**: CSA brand promotion*



According to the respondents, the CSA branded products should be sold at:

- local farmers' markets (75%)
- Grocery stores (67,5%)
- On-line (67,5%)
- Fresh produce markets (65%)
- In specialized trading locations (50%)
- Large chain supermarkets (47,5%)
- Via home delivery (37,5%)

***Fig. 12**: CSA products sales*

In addition to the conducted survey, an internal, focus group discussion was carried out by project experts and researches at DABS. The group debated over the feasibility and design of CSA brand creation and promotion. The results of the questionnaire study were analyzed and conclusion were made on the attitudes and perceptions of the general consumer on a national level towards CSA label.

The results and final conclusion based on both, the primary study (via questionnaires) and the internal focus groups are as follows:
There is a huge potential for adopting a new CSA brand on the Bulgarian market. The consumers are in general eager to know the origin of the products they buy and the methods of production, which aligns perfectly with the CSA core benefits. They are interested in consuming clean, natural products raised or grown locally with proven health benefits. The support of the local producer is another great incentive. The consumers are prioritizing the quality over the price. CSA could be another instrument for quality control and monitoring which they would trust if endorsed by a recognized certifying authority.
The brand slogan and content should focus on origin, sustainability, quality, health and support for the local economy.
The brand visuals preferences are for graphic symbols related to nature/land and sea with colors ranging from green/brawn and yellow to blue, teal and azure. An explicit text "Climate Smart Agriculture" should be presented rather than the "CSA" abbreviation.
The brand promotion should be nation-wide and should include a range of communication channels such as media, on-line resources, printed materials and awareness events.
The products should be placed via diverse channels of distribution ranging from general grocery stores to specialized trading centers and markets.

3.3. Research Limitations

The conducted researches faced several challenges such as the limited ability to access respondents of various stakeholders' groups due to the restrictions imposed by the COVID 19 regulations. The envisaged face-to-face interviews and on filed visits were postponed and most of them were conducted via on-line methods or cancelled. Some of the pre-selected responders were unavailable because of sick leave, or other reason, the communication with them was impaired and the number of filled in forms were less than planned. One of the biggest problems concerning on-line interviews and survey is the fact that the majority of farmers are senior people (aged 60 and above) who are not comfortable with modern methods of communication. Their computer skills are rather limited and filling-in on-line document is out of their zone of comfort. This might be one of the reasons for younger and middle-aged respondents predominance in the research, which is not a correct presentation of the agricultural producers' age distribution. The same problem was encountered in relation to the

place of residence. People who lived in urban setting (cities or towns) were more prone to complete on-line based-survey than those who are situated in rural areas, which might have leaded to a certain distortion of the research results.

Because of the COVID 19 pandemics, no visitation on local markets were made and the purchasing patterns of the consumers could not be verified in a real-life setting but was derived only from the statements in the surveys.

Other limitations were based on the fact that the researches were carried out in the winter season when most of the agricultural activities are dormant and the respondents' proneness to cooperate with the researchers is naturally lower than usual. Also, because of the season, there were fewer opportunities for on-site visits, observation and taking photos of CSA activities and techniques.

4. State of Organic Farming and Sustainable Agricultural Practices in the Region

4.1. Country - specific conditions for sustainable agriculture implementation

Aa discussed in the previous sections, the advantages of the Bulgarian agrarian sector are:

- ✓ Favourable natural conditions for the cultivation of a wide variety of crops, fruits and vegetables
- ✓ The farming land occupies roughly 50% of the territory of the country
- ✓ Large diversity of clean, fertile and unpolluted soils
- ✓ Most of the production is organic. GMOs are banned.
- ✓ High health and environment protection standards which guarantees the quality of the Bulgarian food products
- ✓ Availability of EU funded programs and in the sector as an incentive for growth of investment in the agricultural business
- ✓ Strong traditions in farming and husbandry
- ✓ A network of public and private Research centres working towards enhancement of the quality of the crops and food produce.

Key elements of the Bulgarian agricultural sector:

- The value of agricultural output was 3.6 billion in 2018, with crop production accounting for 71% of all agricultural output.
- Steady increase in the foreign direct investment (FDI) in the sector: from EUR 0.3 million in 2014 to EUR 11.6 million in 2018
- Out of 202 720 farms, more than 82% are small-sized family farms (<2 ha), while large commercial farms (>100 ha) account for less than 2% of total farms.
- Livestock production has been declining and accounts for 22.8% of the agricultural output in 2018
- The workforce is progressively aging, with young farmers (below the age of 40) representing just 14% of the Bulgarian farmers
- The income from the agriculture has been increasing over the last 10 years, but it is also a subject to higher fluctuation.

Source FiCompass,2020

4.2. National Capacities

The organic production in Bulgaria is developing rapidly with a tendency to increase in the number of operators and the output. The motivation of both producers and consumers comes is driven by environmental sustainability and health factors

Consequently, the areas of organic production (or in transition) has increased as well as the lands certified as ecologically clean areas for wild growing crops like mushrooms, herbs and berries are harvested. In 2016, areas within control system (either in transition or undergone transition towards organic production) occupied a 3.2% share of total utilized agricultural area in the country (see the figure below). More than 90% of the domestic organic produce is exported to EU countries such as Germany, Switzerland, France and the Netherlands.

***Fig. 13**, Harvested organic areas in 2016, ha*

Type of crops	Areas that underwent transition period	Harvested areas
Grain and cereals, including rice	8 837	2 838
Industrial crops	6 179	5 184
Fresh vegetables. Melons, strawberries, cultivated mushrooms (total)	1 153	1 086
Permanent plantations	11 372	7 409
Permanent pastures and meadows	5 826	3 601
Forage crops from arable lands (green crops)	1 740	1 621

Source: MAFF, according to organic production control entities' annual reports data

Bulgaria has good prerequisites for organic production development including:

- ✓ Well preserved, unpolluted areas (about 90% of the land in Bulgaria is suitable for organic farming)
- ✓ Mild climate and abundance of naturally fertile soils
- ✓ Ban for GMO products
- ✓ Sector's development is being stimulated by support opportunities for organic producers under Rural Development Programs
- ✓ The increasing number of producers, processors and merchants joining organic production control and certification system
- ✓ Consumers' interest towards organic goods shows that more and more people realize this type of production benefits.

The organic production is monitored by control institution, officially approved by the Minister of Agriculture and Food. Examples include: Bulgarkontrola PLC, CEREC - Certification of Ecological Standards Ltd, Lakon – Private Institute for Quality and

Organically Produced Food Products Certification Ltd, Agro Organic Control Ltd and others

The most important organic plant production, is that of grains and cereals (wheat, corn, barley and oats), herbs, medical and essential oil plants, and fresh vegetables and fruits. There are evidences of increase interest in organic nut production (walnuts, hazelnuts, almonds and chestnuts), as well as the organic vineyard cultivation (including both, wine and table grape varieties). Organically cultivated non-traditional crops, such as artichoke and kiwi, though occupying small areas (741 and 6,7 ha respectively), indicated organic producer's efforts to meet market demands and diversify their production.

A growing number of food companies certified by special label (bio, organic or natural) has emerged. Many stores have special isles on which certified foods are sold. Usually they are more expensive than regular foods. At the end of 2016, the total number of organic operators registered in the Ministry of Agriculture and Food was 7,262 - by 1,089 more than in the previous year. In this number, 6,961 are producers, 3 aquaculture producers, 177 organic production processors and 121 traders (importers, exporters, wholesalers and retailers) (MAFF, 2017).

Bulgaria as a member of the UPOV convention of 1991, has developed a number of cultivars created in the net of high-level breeding institutes. There more than 500 varieties in different field crops, vegetables and fruit trees were selected and registered. This ensure the domination of nationally-bred varieties. In the Maritsa Vegetable Crops Research Institute alone, over 260 varieties have been bred since 1930. Other breeding institutes of high repute are the Institute of Sadovo and the Institute of Wheat and Sunflower Research 'Dobrudzha.'[4]

The breeding institutes are financed partially by state and partially by income from their main activities (sales and research). They also profit from a number of programmes and continue their work to produce new varieties with specific characteristics such as climate, disease, pests and stress resistance, genetic or biochemical markers, commercial features, nutritional value etc.

4.3. Existing Policies and Instruments for Funding

In Bulgaria, there are no specific policy dedicated to the climate-smart agriculture. CSA as a direction for development is mentioned in several strategic documents and research papers which goal is to outline the current state of the problematic and to serve as a foundation for future analysis and plans for action.

In Bulgaria, the Ministry of Agriculture, Foods and Forestry is responsible for the development and implementation of national strategies related to the agriculture and food production.

[4] http://www.fao.org/3/y2722e/y2722e0m.htm#TopOfPage

Some of the relevant documents include:

- ✓ National strategy for bio products development
- ✓ National program for sustainable development in the agricultural, alimentary and forestry sector
- ✓ Strategy for the digitalization of the agriculture and rural areas of the Republic of Bulgaria
- ✓ CAP (Common Agricultural Policy) plan for the period 2021-2027

The possible financial sources in CSA are:

- ➢ State/ national and municipality budgets
- ➢ EU OPs under the CAP, Regional development policy, Environmental protection polices, Rural development policy, Research and development programs, Cross border cooperation programs such as BSB etc.
- ➢ International funds and programs (including multilateral development banks, non-governmental sustainability organizations, FAO etc.)
- ➢ Private donors
- ➢ Bank loans and sources from other types of business investors

CAP for example provides for 30% direct payment for so-called "green direct payments". The organic producers may receive financial assistance via this scheme for areas within control system.

Under the Regulation of the European Parliament and of the Council on support for rural development by the European Agricultural Fund for Rural Development for the period 2014-2020, Bulgaria has developed a separate measure: 11 "Organic Farming" for the Programming period 2014-2020. Under this measure two sub-measure are implemented (MAFF, 2017):

- ✓ Sub-measure 11.1 Payments for transition to organic farming for hectare UAA;
- ✓ Sub-measure 11.2 Payments for support of organic farming for hectare UAA.

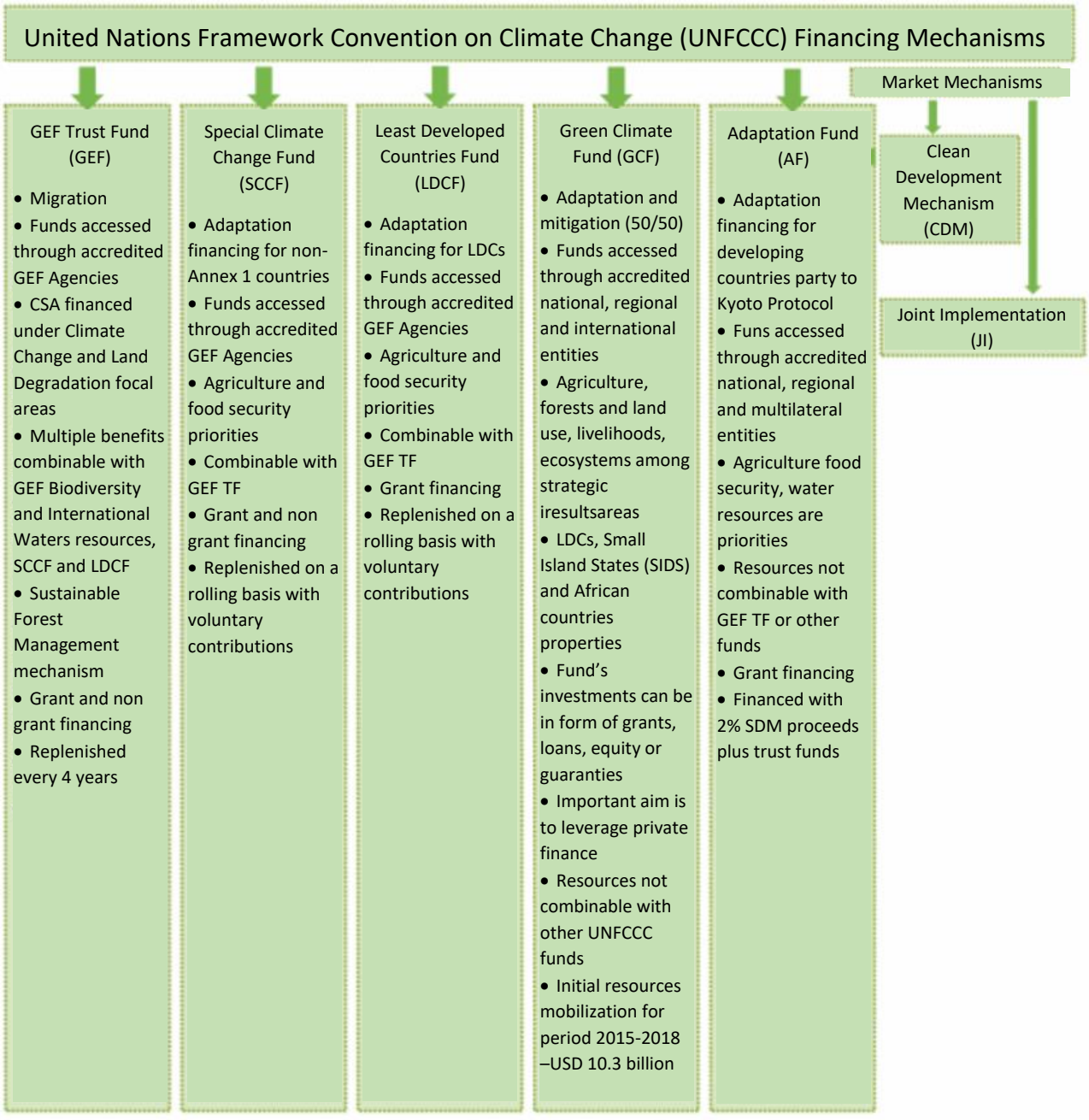
The measure is expected to have a positive impact on the sustainable development of rural areas, by contributing to the environmental protection and mitigation of the climate change. It is also intended to support small and medium-sized farms, the majority of which are family-owned.

The Ministry of Agriculture, Food and Forestry is dedicated to continue working on developing state policy instruments regarding organic farming and sustainable agriculture, including CSA, within the framework of the European and National legislation

On global level, CSA financing is complex and continuously evolving and is closely linked to climate change mitigation and adaptation mechanisms for support. Funds are procured through multilateral, bilateral and national channels, dedicated climate change funds and private sector which is by far the largest estimated source of CSA

financing, accounting for more than 62% of the climate investments (Buchner et al, 201). The following chart visualizes the various financial mechanisms suggested by the United Nations Framework Convention on Climate Change (UNFCCC).

***Fig. 14:** UNFCCC climate financing mechanism*



Source: FAO, 2021[5]

[5] http://www.fao.org/climate-smart-agriculture-sourcebook/enabling-frameworks/module-c4-finance/chapter-c4-2/en/

4.4. Domestic and International Markets for Climate-Smart Agriculture

The contribution of the agrarian sector to the country's foreign trade is significant: 17,1% of the total export, 10,9% of the total import and 13,8% of the trade flow of the national economy. The balance between the exported and imported goods and commodities is positive. The Table below outlines the main features of the import and export in 2016 as per NSI data

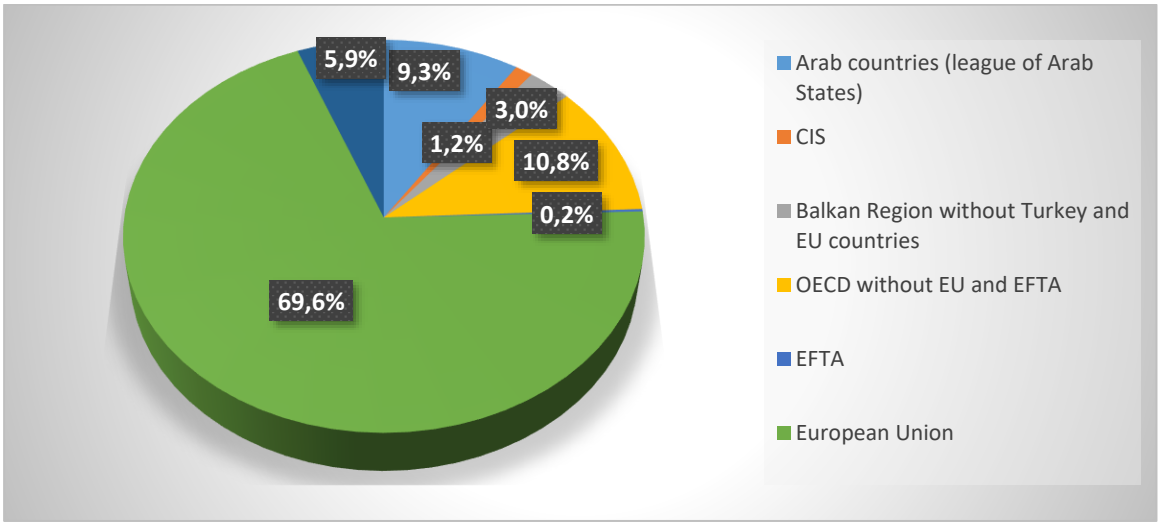
Table 4: *Agricultural goods relative share in Bulgarian foreign trade in 2016, in thousand EUR*

	Total for Bulgaria	Agricultural Sector	Share of the agricultural sector
Export	23 575 817	4 036 993	17,1%
Import	26 090 153	2 839 205	10,9 %
Trade flow	49 665 970	6 876 198	13,8 %

Source: MAFF, 2017

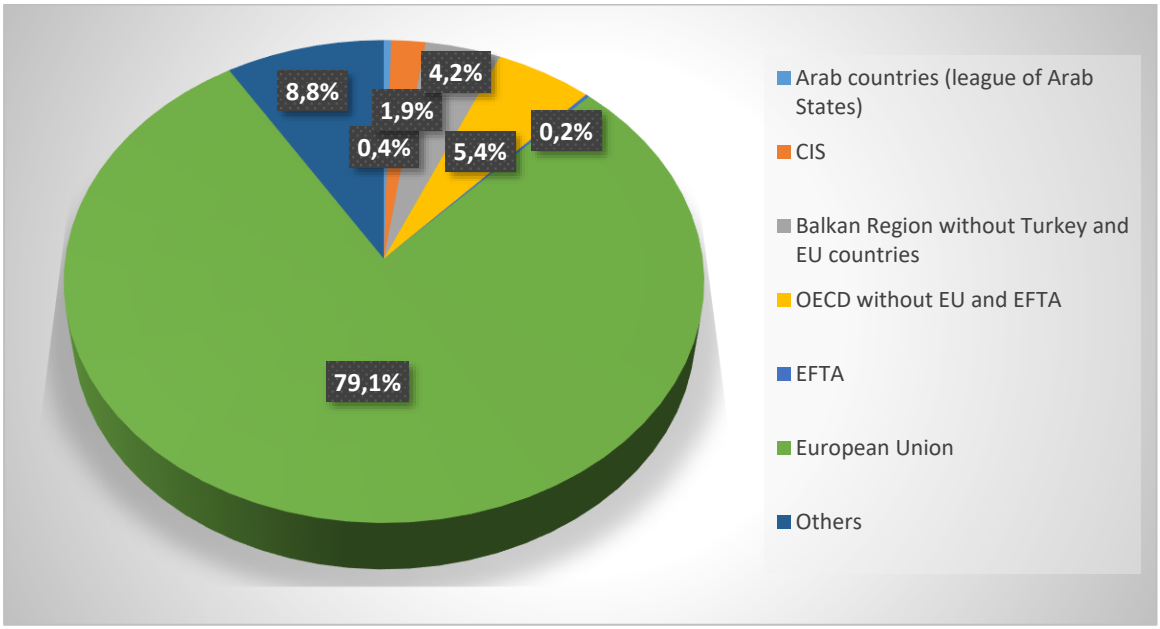
Countries in the European Union are Bulgaria's main partner in agricultural commodities trade (70% of the total export and 88% of the total import), due to advantages caused by the single European market policy. Other international markets of paramount importance are OECD (excluding EU) which accounts for 11% of the agrarian export and 5,4% of the import in 2016. For the same period Balkan region (excluding EU countries and Turkey) accounted for 3 % of the export and 4% of the import. The Arab countries are important export region contributing to 9,3% of the export and only 0,4% of the import of agricultural goods and services (NSI and MAFF, 2016)

Fig 15. *Bulgaria's agricultural export structure by economic communities for 2016*



Source: MAFF, 2016

Fig 16. Bulgaria's Agricultural import structure by economic communities for 2016



Source: MAFF, 2016

The following countries are among the top EU markets for Bulgarian agricultural production: Greece, Romania, Germany, Spain, Italy, the Netherlands and France, while the import is done mostly from Turkey, Greece, Romania and Poland.

The most important agricultural products exported outside our country are cereal (wheat, maize and barley) , oil-bearing plants and seeds, tobacco and fruits.

4.5. Benefits of Climate – Smart and Green Agriculture

The benefits of the climate-smart and green agriculture as outlined in the primary research and the review of the existing documents, strategies and academic papers are as follows:

- ✓ Enhanced environmental sustainability (less GHG and CO2 emissions, less use of harmful pesticides, fertilizers and other chemical substances for soil and weed treatment; improved ecological balance affecting plants, wild animals and insects)
- ✓ Decreased susceptibility to adverse climate change impacts
- ✓ Achieving greater productivity (harvests output) and hence more financial profit for the producers
- ✓ Optimizing costs for production by employing climate-smart, natural, non-invasive, and less expensive techniques and methods of production
- ✓ Preserving traditional agricultural techniques
- ✓ Providing social benefits as social inclusion, fair and ethical employment opportunities for marginalized and vulnerable groups.
- ✓ Improvement of the quality and nutritional value of the agricultural produce

- ✓ Achieving numerous health benefits and other advantages for the final consumers

4.6. Challenges before the Implementation of CSA Practices

There are numerous challenges before the CSA implementation in Bulgaria, including but not limited to biophysical, social (behavioural), informational, technical, financial, institutional and policy constraint.

The ***biophysical challenges*** for example are those related to environmental inputs such as climate conditions, relief, soil composition, rivers and underground waters density etc. As stated in the primary research analysis, some of the respondents outline as CSA challenges factors such as dry weather, scarcity of natural waters (particularly in North East region etc.)

The ***social or behavioural constraints*** are challenges related to the lack of social support, consumer preferences and market choice. Adopting CSA calls for change of the existing paradigm for all stakeholders involved, including communities and end consumers. It might be possible that they are suspicious to new approaches and boycott or ignore efforts towards adopting climate-intelligent solutions for CSA production. Those might be manifested in low or zero demand for CSA products based on potentially higher price of the latter. It might also be induced in the lack of interest and general indifference towards CSA policies and strategies. On behalf of the farmer/ producers, the behavioural constraints might be refusal to adapt new crop models or cultivation techniques, based on the assumption that time and efforts invested in transition to CSA won't pay off even in a long run.

Informational challenges are rooted in the low level of awareness amid farmers and final consumers towards the climate-smart concept as a whole. This problematic was also confirmed by several respondents during the primary research. Evidently, a national-wide informational and educational campaign is needed to meet adequately this constraint.

Limitation within the ***available technology*** is another possible obstacle before CSA development. The adoption of CSA-proof technologies requires financial investments, skills and knowledge and could be a risky endeavour that may discourage many producers. This could be especially relevant for bigger farmers whose level of mechanisation and tangible assets in standard agricultural equipment are rather considerable. They might be less flexible and since they already have established market positions, they are likely to have less incentives to undergo transition towards CSA. On the other hand, the smaller producers are more prone to experiment and try new production models, but might experience difficulties to dedicate financial resources for new equipment and technological improvements.

Financial constraints are obviously a challenge, since the new technology adoption requires investments in both material and human capital. Financial needs can be met via various instruments and support schemes including national, EU and international funds as discussed earlier.

Institutional and ***policy constraints*** are based on the existence and efficiency of relevant bodies and authorities to regulate and assist CSA activities as well as to draw a strategic framework for future development.

5. Climate – Smart Agricultural Practices and Crop Models in the Region

Name of Organization: Chudnata gradina ("Wonder Garden"), agricultural social enterprise operated by "Saint Nicholas the Wonderworker" foundation.

Region of Operation: Dobrich

Size of cultivation: 0,4 ha

Number of employees: 22

This company is unique for it is considered to be the biggest and best developed social enterprise in Bulgaria. The farm was launched less than two years ago in an abandoned lot near Dobrich main street. The founder is the non-profit organization "Saint Nicholas the Wonderworker" which CEO Mrs. Maria Metodieva was actively seeking for employment opportunities suitable for intellectually challenged adults. The land was provided by the municipality and the noble endeavour soon draw many supporters. As for now, several public institutions, private companies and individual sponsors are providing assistance in various ways: the water for irrigation is paid by Dobrich municipality, a local investor donated an automobile for transportation of produces, etc. Families and friends are also involved in the daily work of the garden as volunteers.

The farm employs 22 men and women with different degree of intellectual disabilities. For some of them this is their first job and sole chance towards independence and social acceptance. Unfortunately, in Bulgaria the degree of inclusion of people with disabilities, especially concerning mentally impaired persons is very low. In practice they are shunned from the society. Some of them are deprived of human rights via so called "guardianships". The mission of the "Wonder Garden" founders is to fight on their behalf by working towards changes in the existing policies and jurisdiction. As a result, several guardianships were removed, enabling people to gain personal independence and social status.

Upon its start the garden inherited an overgrown plot of land with wild shrubs and hedges, stony foundation and scarce soil coverage. The land was cleaned by heavy construction machines and new soil was piled on the empty spot. Thanks to the perseverance and dedication of employees and social workers the plot was miraculously transformed. Today, it has four neatly built green houses, 200 sq. m. each which are used for early vegetable production (mostly tomatoes, cucumbers, lettuce and herbs) and as a nursery for the young seedlings.

On the open areas, three variety of white cabbage are grown and a specially designed irrigation system is constructed. Bio wastes, grass and leaves clippings are piled in a large composter intended to be used for enriching the existing soil.

The garden is operating for very short time, but the success is more than evident. The produce output is growing considerable and the vegetable harvest is abundant each year. The farm has won the trust of the local community, and residents of Dobrich and the nearby towns and villages are loyal clients of the company. They are motivated not only by the noble cause which stays behind the enterprise, but also by the excellent qualities of the produce. The farm in practice has ensure the market for its production by repeated customers and gross sales to several bigger institutions (such as Dobrich municipality) and restaurants. Despite this success, the revenues from sales are not sufficient to provide for the workers' compensation and the managers are constantly applying for participation in programs for state assisted employment.

The founders admit that their focus is providing social services to disadvantage groups of people, rather than developing a prosperous agricultural business. They have found that farming is an excellent match for providing opportunity for developing various skills and competences. The employees have advanced greatly in terms of professional aptitude since their first day of work. Their performance has exceeded even the most optimistic expectation. They have developed expertise in farming, landscaping and greenhouse construction as well as soft skills for team building, work ethic, responsibility and discipline. Here, the people with intellectual disabilities has found

a safe environment which encourages personal growth and social acceptance. As social inclusion is one of the CSA pillars, this farm is an excellent example of CSA best practice by providing numerous benefits and employing innovative approaches in a sustainable way such as:

- ✓ Social inclusion and providing employment opportunity for marginalized people
- ✓ Application of the principles of conservation agriculture (minimum mechanical soil disturbance/ no tillage; permanent soil organic cover with crop residues, etc.)
- ✓ careful selection of crop variety and seeds. Various sorts of vegetables and seed providers were tested in order to choose the best match for the particular soil and climate
- ✓ spare use of fertilizers and minimal use of pesticides. The weeding is done mostly manually since it is a part of the therapeutic activities and help developing physical stamina
- ✓ crop diversification by including more vegetable varieties, legumes, greeneries and flowers
- ✓ Ingenious irrigation scheme where water is transported in cisterns from distant natural springs. The water has undergone checks for health safety and environmental cleanness
- ✓ Soil amelioration techniques including usage of natural fertilizers, “lasagna layering” and composting of organic wastes.
- ✓ Protected growth in greenhouses to combat pests without chemicals and maintenance of the optimal temperature and humidity
- ✓ Direct sale to the end consumer and constant communication (via social media or regular PR activities)

Name of Organization: Agroproduct Stoikovi Ltd

Region of Operation: Lukovit Municipality

Size of cultivation: 480 ha (rented and owned)

Years of operation: 9 years

Number of Employees: 7 directly employed (including two executive and administrative managers)

The company produces mainly cereal crops such as wheat, maize, sunflower, barley (for brewing and fodder), alfalfap fodder peas, chickpeas and rapeseed.

After the changes in the European legislation in 2017 the company is obliged to keep part of the areas with nitrogen-fixing crops in order to be able to obtain the maximum of the European subsidies. Also over the years the producers have sown a second crop / corn and sunflower /. Average annual crop yields varies depending on the specific weather for a given year. For example, wheat yield fluctuates from 350 kg per decare to 650 kg per decare.

The output of oil-bearing sunflower was increased by diversifying corps with new high-yield hybrids with a richer content of olic acid. The annual sunflower yields vary in the years from 120 kg per decare to 220 kg per decare. Other type of sunflower intended mainly for export include multi-coloured sunflower and the varieties Pioneer and Iregi. Corn is the most profitable plant in grain production. There, too, the yields are very different, starting from 200 kg per decare and reaching 950 kg on average per decare.

The harvested quantity depends mainly on the climate, including temperature regime, rainfalls, unfavourable events such as hailstorms etc. The weather also enables timely planting which determines whether the crop will have the necessary technological time to develop and reach its maximum capacity for maximum yield.

Some of the CSA approaches applied by the producer include:

- ✓ Innovations in mechanical treatment of the soil. For example, plants are used instead of agricultural machines (radish for example which is planted in 0.30-0.40 m. depth can replace mechanical tillage)
- ✓ Conservative use of invasive chemicals and pesticides which destroy the humus content in the soil
- ✓ Strip-till or no-till techniques with special care for the soil-protection and least disturbance
- ✓ Composting techniques for bio-degradable wastes

Presently the company is cultivating 20% of its land capacity using the above mentioned CSA techniques. The preliminary estimates show that these methods are

effective and economic sound and the farmers will envisage an increase up to 40% in the nearest future.

The main advantages include low-cost of production while maintaining similar yield and financial profits. The main challenges and drawbacks are the need of additional investments in special agricultural equipment (such as precision strip-till planters); financial risks and alternative costs.

Name of Organization: Research Breeding Institute "Dobrudzha"

Region of Operation: General Toshevo,

Years of operation: 70

Dobrudzha Agricultural Institute is a national research centre for selection and breeding of field crops. It is the largest unit in the system of the Bulgarian Agricultural Academy and is located in North East Bulgaria.

The institute was founded in 1941 as an experimental field and have developed in the course of the years as a complex scientific unit with a wide range of research activities. The Breeding centre is engaged in solving various CSA related challenges via:

- ✓ Creation, testing and implementation of new varieties of crops
- ✓ Crops alternation
- ✓ Precise tillage techniques
- ✓ Pest, weeds and disease control
- ✓ Fertilization
- ✓ Improving the breed composition in animal husbandry
- ✓ Scientific research in animal husbandry (poultry, pig, cattle and sheep).

Since 1962 the Institute is specialized in wheat and sunflower selection and breeding. The Research centre has created several iconic variety of wheats (such as Pliska, Priaspa and Yantar) which are high-yield, frosts - and stress resistant, suitable for mechanical harvest and with high protein contents

The Center has several research laboratories including biotechnology, phytopathology, entomology and cytogenetics. Their main activities include:

- ✓ creation of new advanced cereals and legumes, varieties and hybrids of sunflower and development of modern technologies for their cultivation;
- ✓ development of new biotechnological methods in the selection of field crops;
- ✓ collection and research of genetic plant resources;
- ✓ production of basic seeds with guaranteed origin and quality
- ✓ selection of elite breeds animals

Due to the dedicated efforts of more than 300 research associates, specialists, laboratory assistants, agricultural technicians and workers (involved in the overall activities), Dobrudzha Agricultural Institute has gained national and international prestige and recognition in the field of new breeds development

Source: http://www.dai-gt.org/

Name of Organization: Zelenata Porta (Green Gate) Farm

Region of Operation: Dobri Dol, Parvomai

Size of cultivation: 0,4 ha

Years of cultivation: 6

The bio farm was created by a young family originally from Dobrich. They moved into the small village of Dobri Dol (near Plovdiv) and turned the abundant 4 decare yard into an oasis via methods of sustainable production and permaculture. They produce several types of vegetables which are selected as per their adaptive qualities and are grown seasonally in the open. Those vegetable include spinach, reddish, lettuce, green onion and garlic, cucumbers, zucchini, egg plants, peppers etc.

The young producers are rather enthusiasts than professional farmers. They have agricultural education or background but have completed a training course in permaculture design and imply the sustainability principles in the gardening and their everyday life.

They dedicate special care for soil enrichment and structure enhancement. Some of the permaculture design principles include learning from nature and attempting to sustain harmony in a way that regeneration of degraded land is enabled as well as creation of natural food systems. Permaculture science is a mix of various research fields such as soil science, hydrology and engineering, biology, geology, climatology, botanic etc. The permaculture is centered around five main elements: 1) water cycle; 2) sector analysis of the areas in regard to the impact of sun, wind, rain,

flood zones, fire danger, landscape view, wild life, etc., 3) zone planning 4) workflows and 5) access[6]

The farmers transport on a weekly bases their produce to a local farmers' market in Plovdiv. They also make home deliveries upon request and already have a list of regular subscribers who are benefiting from the convenience of this option.

An interesting innovation implemented by them is the so-called "chicken tractor": a groups of hens are kept in a closed cage without floor and are consequently moved from one area to another on the farm plot. They forage the fresh vegetation eating also bugs, slugs, snails and other pests and produce manure that serves as a natural fertilizer rich in nitrogen and phosphorus. In addition, the chickens are scratching and surface ground similar to a tiller, leaving a patch of land ready for planting.

***Source of photo**: modernfarmer.com*

The Green Gate also organizes short training classes in sustainable gardening, forestry and environmental protection. The groups are up to 15 and the participants are expected to take part in agricultural activities, discussions and training in permaculture design.[7]

Source: https://agrovestnik.com

[6] https://www.permaculturenews.org/2017/09/05/permaculture-design-5-steps/
[7] https://pcabulgaria.weebly.com

Name of Organization: Hot Farm Rodinovi

Region of Operation: Strashimirovo village, Varna county, North East region of planning

Size of Cultivation: 0.9 ha

Years of Production: 18 years

The unique farm is strategically situated in a close proximity of the Sea capital of Bulgaria – Varna. It specializes in the production of hot chili peppers and their food products such as sauces, canned, dried, marinated peppers and pastes.

They were established as the first hot pepper farm in Bulgaria and has started as a small family business. Eventually their production grew and they began to attract consumers and tourists for short tours around the farm land and production premises.

In the farm around 150 varieties of chilli peppers are cultivated. They production cycle is closed: from planting of the best selected seeds to the harvest and processing of grown peppers. The CSA approaches implemented by the company include:

- ✓ careful selection of seeds and use of heirloom varieties for multiple production
- ✓ early preparation of the seedlings (Mid December)
- ✓ greenhouse climate-and temperature-control and pests-safe environment
- ✓ minimal fertiliser usage
- ✓ selection of produce of supreme nutritional and visual qualities

Recently the farm opened its premises for guided tours for visitors. The vicinity to major Black sea coast resorts such as Golden sands, Albena and Varna eased the flow of tourists who are interested to know more about methods of production and to taste and buy some of the various products manufactured on place.

Source: https://hotfarm.eu/za-nas/

6. Conclusions

CSA is a sustainable agricultural approach towards enhancing productivity, maintaining or restoring soil fertility, increasing the efficiency in the management of water and energy resources, conserving genetic resources, strengthening rural communities and promoting equity and social well-being.

The present Feasibility study reveals that climate smart agriculture has numerous ecological, economic and social benefits recognized by all stakeholders involved (including producers, consumers, research and local authorities' representatives). Its development should be made a priority and support scheme should be made available.

Designing and introducing a regional brand of CSA products is encouraged by the existing consumers' preferences (confirmed also by the conducted research as part of this study). The society welcomes foods produced in a natural, environmental-friendly way from local origin and with excellent nutritional and health benefits. Promoting a CSA brand in the countries of the BSB region will also raise awareness among the community and is likely to instigate institutional engagements towards CSA policy making and implementation of strategic development plans on regional and national level.

References

Alexandrov V., Schneider M., Koleva E., Moisselin J-M. (2004), Climate variability and change in Bulgaria during the 20th century, Theoretical and Applied Climatology N 79

Lipper L., McCarthy N., Zilberman D., Asfaw S., Branca G. (2018), Climate Smart Agriculture, Building Resilience to Climate Change, Springer

Ficompass(2020), Financial needs in the agriculture and agri-food sectors in Bulgaria, Study report, available at: https://www.fi-compass.eu/sites/default/files/publications/financial_needs_agriculture_agrifood_sectors_Bulgaria.pdf

Boncheva L, Simeonov P. (2016), Tornado cases in Bulgaria in the 21st century – creation of database and analysis, 3rd National congress of physical science, Sept-Oct. 2016, Sofia

Buchner B.K, Oliver P., Wang X., Carswell C., Meattle Ch., Mazza F. (2017), Global Landscape of climate finance 2017, Climate policy initiative

Nojarov P. (2020), Climate and its change in the period 1979-2018 in selected model karst regions in Bulgaria, Project: Current impact of global changes on evolution of karst (based on the integrated monitoring of model karst geosystems in Bulgaria), Bulgarian Academy of Sciences

Nojarov P. (2016), Temporal and spatial trends in greenhouse gases and aerosols in the atmosphere over Bulgaria

Nojarov P. (2015), Circulation factors affecting precipitation over Bulgaria, Theoretical and Applied Climatology

Velikov Y. (2013), Development in agriculture and rural areas of Bulgaria, Friedrich ebert stiftung EFFAT

Wold Bank (2018), Bulgaria – Climate Change Adaptation: Bulgaria, https://thedocs.worldbank.org/en/doc/336901539798319342-0080022018/render/CCAFactsheetsEN2018Oct17.pdf

The editor of the material: Dobrudzha Agrarian and Business School (DABS)

Address: Bulgaria, 9300 Dobrich, 3 Bulgaria str.

Phone: +359 58 655 626

E-mail: dabs.projects@gmail.com

Website: www.dabu-edu.org

Joint Operational Programme Black Sea Basin 2014-2020
Dobrudzha Agrarian and Business School
April 2021
Joint Operational Programme Black Sea Basin 2014-2020 is co-financed by the European Union through the European Neighbourhood Instrument and by the participating countries: Armenia, Bulgaria, Georgia, Greece, Republic of Moldova, Romania, Turkey and Ukraine.
This publication was produced with the financial support of the European Union. Its contents are the sole responsibility of Dobrudzha Agrarian and Business School and do not necessarily reflect the views of the European Union.