

Organic
agriculture

Green Agenda

Climate Change Adaptation in Agriculture – Crop Production

Country/Territory:

Republic of North Macedonia

National Expert:

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Scientific research

Climate change and Crop production

- Most crops are cultivated outdoors.
- The crops are highly exposed to climate change and weather events that are associated with climate change
- The crops are sensitive to shortages of water, increased temperatures and heat stress, and number of other issues related to climate change
- When sensitivity and exposure are high the negative impact of climate change is also high
- The level of vulnerability when there is high impact depends on level of the adaptive capacities in the country/region/municipality

Climate change and Crop production

- When vulnerability is high there are need to adapt to the new environment.
- Exposure can be reduced by mitigation measures that reduce GHG emissions.
- Sensitivity can be reduced by new crops and varieties, tolerant to drought, heat, etc. But there are no existing value chains for new crops.
- There is no land for moving crops upward, there is no space to move crops northward.
- Autonomous adaptation is risky

Climate change and Crop production

- The very important adaptation measures are building the adaptive capacities
- Building irrigation systems, drainage systems, and other massive infrastructure is expensive and under the pressure of environmental impact assessment
- Soft measures such as increasing knowledge and know-how are effective and can be implemented if there is sufficient level of knowledge
- Knowledge is generated by research and science
- Is the investment in research and science in climate change in agriculture sufficient?

Climate change and Crop production

- Is there sufficient human capacity to conduct the research required?
- Do we need intensification of regional cooperation and working synchronized in the region?

Therefore, let us work together

Climate change and Crop production

Is the insurance magic solution?

- The farmers will be compensated for the damages, but there will be a shortage in the production.
- Farmers will lose their market and their buyers
- Citizens will be exposed to increased food prices, food availability and accessibility and disturbed food security

Therefore let us work on adaptation

Climate change and Crop production

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Climate change and Crop production

Six excellent country reports

Big gratitude to the authors of the country reports (Endrit, Sabrija, Ylber, Zoran, Ana)

Country reports should be analyzed, and some regional conclusions and recommendations should be derived

Basic finding

- I believe that my country is highly diverse in climate, environment, and crop production, but Montenegro and BiH? Therefore there is a big diversity in environmental factors, crops, and technologies implemented in the region.
- The capacities for climate change analysis are at different levels of development
- But most of us are facing similar problems, gaps and I can see that we can propose valuable solutions for the future development

Analyse of the Meteorological data availability and accessibility

- The meteorological data are available, with high quality and good spatial and temporal resolution, collected according to the WMO recommendations
- The data gaps are obvious in Bosnia (data gap during the war) and Kosovo (almost restarted activities, low number of stations, not sufficient temporal coverage as well as spatial distribution)
- Unfortunately all countries are facing serious problems with data availability

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Analyse of the Meteorological data availability and accessibility

- The historical datasets are not available to the public and for the researchers
- This situation jeopardizes the development of climate change analyses based on the national circumstances
- Several countries just gave up using national data and started using international datasets (Serbia, North Macedonia)
- Nevertheless, such a situation is stipulated by legal documents

Analyse of the Meteorological data availability and accessibility

- For illustration if somebody wants to compare two climate periods (ex. 1961-90 with 1991-2020) in North Macedonia and analyze the changes in agrometeorological indices and crop response to changing weather the “**Tarif book for the height of compensation for and products from the National Hydrometeorological Service Archive**” is implemented
- According this tarife book the **direct cost induced by providing services for issuing the hydro-meteorological data**, daily data for six meteorological parameters for 26 meteorological stations is 468 000 EUR. Fortunately, still less than half of million euros!!!!

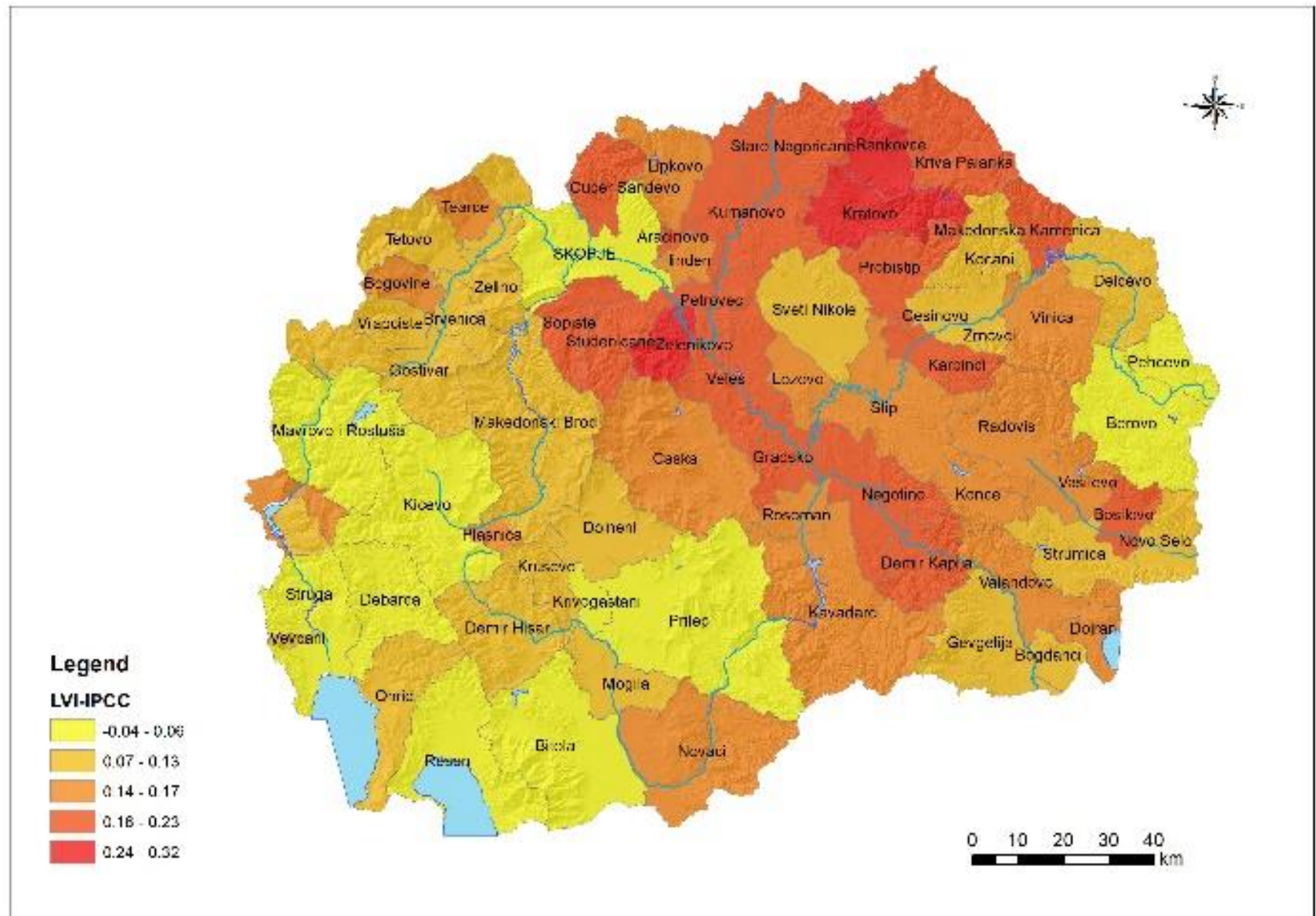
Analyse of the Meteorological data availability and accessibility

- Is the direct cost of 0,14 euro per number real???

Recommendation

- to harmonize future activities and to have a common methodology it will be beneficial to use international datasets (with the same spatial/temporal resolution),
- If decision makers agree with this approach we should discuss available datasets and make the choice of one gridded weather dataset,
- Further develop grids with soil and crop data (crop mask, soil mask), and
- Make an attempt to develop a Livelihood Vulnerability Index (LVI) for Western Balkan. Then we will know what is vulnerable regions and crops and target activities for adaptation in that direction

LVI for North Macedonia



Analyse of the phenological monitoring

- The Situation with phenological data is somehow similar in accessibility to meteorological data because this data is monitored by National Hydromets.
- Two countries did not report the existence of Phenological monitoring (Kosovo, Montenegro)
- There are gaps, not consistency and other problems, but to make them usable those should be accessible first of all.
- Not all of the BBCH crop stages are monitored
- Phenological datasets need further development to be usable for research purposes
- The phenological monitoring is conducted for wild flora, crops, vineyards, and orchards as well as for the growing season and period of start and end of the fieldwork

Analyse of the crop models used for estimating the crop response to the climate change

4 countries reported the use of agricultural models in Climate Change analyses

However all of the countries reported use of crop models in not sufficient extend, mainly in research, not in operational work

The models in use are similar, some empirical models (CROPWAT, Crop Yield Response to Water Deficit, USDA SPAW, Cropflex), water productivity models (AquaCrop), and rarely robust biophysical models (CropSyst).

Analyse of the crop models used for estimating the crop response to the climate change

- The choice of one model that will be used for our common activities is essential
- Most countries reported the use of AquaCrop and seems as good idea to start
- Later, with the building of the capacities in the region, the use of biophysical models such as WOFOST, CropSyst, or STIC is a logical development
- Aquacrop is not very friendly for spatial analyses, but there is some implementation as AquaCrop GIS or AgacCrop R.

Analyse of the extreme weather events

The extreme weather events can be accessed if not from the institutions from the newspapers and information portals. I

It is recommended to develop common database for extrem events in order to be able to estimate their frequency and spatial distribution in the region

Information on the most important crops sensitive to climate change

The sensitive crops reported are quite similar.

The perennial crops are considered more sensitive because one year of damage can cause losses in several seasons.

The winter crops are considered less sensitive due to ripening before the real summer start

Summer crops that should stay in the field for the whole summer are considered more sensitive because the exposition is very high

Information on vulnerable regions and crops and their combination

The big diversity of the specific regions with different agro-ecological conditions are reported for all countries

The most sensitive are considered regions with higher temperatures and bigger water limitation

In certain regions, very specific crops are cultivated (citruses, olives...)

The diversity of agro-environmental conditions causes discrepancies in crop exposure and sensitivity (different impact)

Further analyse with agro-economy group is required to determine adaptive capacities in these regions

Information on practices used by the farmers to protect their crops from damages caused by weather variability

the indigenous developed adaptation practices are rarely reported

Mainly practices supported by the national system for support of agriculture are used (hail nets, drip irrigation....)

Rarely some innovative practices developed by farmers are reported (as covering of the grape clusters with leaves to avoid sun burns, or using the polyethilen waste botels to control discharge of water into the furrows.

However, these practices should exists and researchers should cooperate with some experts from the field to discover some developments.

Brief analysis of the current infrastructure and systems for preventing and mitigating the negative effects of weather extremes on crop production

- Irrigation and drainage infrastructure exist in all countries.
- Even though this infrastructure is not developed as climate change adaptation it is an excellent tool for coping with drought and floods
- This infrastructure is old, in some cases devastated and rehabilitation is required
- Hydrotest issued alarms for extreme weather events, usually not targeted to the farmers
- The lack of information as provided by state the private initiatives are taking bigger role (Meteobot in North Macedonia)

Highlight the existing data availability and quality, data constraints, and data gaps.

Most of the reports highlighted the low accessibility of meteorological data

Bosnia and Herzegovina and Kosovo reported serious data gaps due to conflicts in the past

Most of the countries reported that meteorological data is of good quality and good spatial and temporal resolution and WMO standards are implemented (in some cases spatial distribution needs improvement)

Conclusions with key recommendations and priorities referring to crop production and adaptation to climate change.

Consider this activity today, as start not as the end of the regional work in climate change

A number of recommendations were provided during the presentation, I will not repeat

The potential of this group and the experts engaged is very high and use it for the benefit of the region

The next stage is the preparation of the regional report and regional aspects will be further developed