Introduction

Within the support of Japanese Government in JFY 2010/11 a project entitled with “Impact of Climate Change for Food Production in Western Balkan region” is being implemented. The project aims to review and increase the level of data availability on the projections of climate change in the region; and apply the projections to model the impacts of climate change on food production for the years 2020 and 2050. It is to contribute the decision makers to acquire the knowledge and models to develop long term strategies for adapting the food production sector to the current and foreseen climate change impacts.

The workshop on “Adaptation to Climate Change in the Agricultural Sector of South Eastern Europe (SEE)” organized by the REC served as stocktaking on the context of knowledge/available information about the impacts of climate change in agriculture sector and the water management, which is closely related to conditions for food production.

Objective

The ultimate goal of the workshop was to contribute to and to encourage the process of developing adaptation strategies in the region. The concrete objectives were: to provide an overview of the state of knowledge on climate impacts and adaptation options in the SEE region focusing on the agriculture and water sector, as well as to raise awareness and facilitate communication and exchange of knowledge among the participants.

The workshop was carried out in close cooperation with the members of the Methodology for Effective Decision-making on Impacts and Adaptation (MEDIATION) research project. Their work is closely related to the purpose of the workshop and primarily focuses on assisting decision-makers and communities in developing their own adaptation solutions.

Participants included climate modeling and adaption experts from universities, governmental and international research institutions, representatives of ministries, local farmer communities, international organizations and NGOs from the Balkans, Central, Eastern and Northern Europe sharing their expertise and exchanging views.

Presentations were subdivided into 5 thematic sessions:
Western Balkans under the Climate Change;
Impact of climate change in the water sector
Impact of climate change on the agriculture
Scientific studies for adaptation decision-makers
Stakeholder consultations on how to assist adaptation decision-makers in Serbia

Every session also included discussions of the presented information, which addressed such issues as stakeholder participation in policy research and development, implementation approaches and constraints, the costs of adaptation and methods of risk assessment.

Summary of main issues discussed

Session 1: Western Balkan under the Climate Change
Mr. Milan Dacic, Director of the Hydromet Service of the Republic of Serbia (RHMSS) informed the workshop about the projected changes in climate in the Western Balkan region until 2100. He started off by explaining the general principles and usability of regional climate modeling.

Overall according to research results, as temperature increases, precipitation is likely to decrease in the region and more frequent droughts are to be expected in Serbia. It was shown how regional and local impacts of climate change can be predicted on the example of hydrological changes in River Moraca and the shift in distribution of environmental conditions suitable for wine growing in Serbia.

He summarized the services provided by the RHMSS which enable adaptation to upcoming climatic events. These include: long-range and ensemble seasonal forecasts for 1 month and 7 months respectively, early warning of temperature and precipitation anomalies.

The presenter informed that the RHMSS is working on the accuracy of their models and forecasts. In the future it is planned to further strengthen regional co-operation with the help of the WMO (World Meteorological Organization) Programmes.

In the next presentation titled “Agricultural sector under the climate change: the main factors of impact “ Mr. Sandor Szalai of Godollo University (Hungary) re-iterated that heat stress and water deficit will have increasing impacts in Southeast-European agriculture. Crop yields and the total area suitable for cropping will significantly decrease.

He then introduced the FAO approach to understanding vulnerability and fostering adaptation (the Nairobi work Programme on impacts, vulnerability and under the UNFCCC). These included, inter alia, (Food Agriculture Organization) promoting the understanding of climate change impacts and including traditional knowledge in managing climate-related risks. He gave examples of how vulnerability of a nation can be determined taking into consideration both the natural environmental and socioeconomic factors.

Protection of aquatic ecosystems, on which societies depend becomes extremely important in the context of climate change. The speaker highlighted the main fields of work in protecting ecosystems under the EU Danube strategy and in the Carpathian basin. Finally, the need to reform EU Common Agricultural Policy (CAP) in accordance with the new climatic conditions was highlighted. During its upcoming EU presidency, Hungary will lead the discussions on, inter alia, common energy efficiency policy the CAP and water resources.

Ms. Andreja Susnik, Drought Management Centre for Southeastern Europe (DCMSEE), concluded the session by giving an overview of the extent of the documented drought impacts on agriculture. Recent drought events have shown that Southeastern Europe in general and its agricultural sector in particular are more vulnerable and poorly prepared for droughts than other parts of Europe. One of the reasons is a comparatively low water use efficiency. At the centre crop yield models known in the scientific community have been applied to in order to provide information on irrigation requirements under given climatic conditions. In addition, drought needs to be monitored effectively. Thus the DCMSEE aims to collect data and standardize it using the Standardized Precipitation Index across the region. Further work of the DCMSEE in supporting agricultural adaptation includes: preparing early-warning systems, building regional co-operation and supporting decision-makers in developing adaptation strategies.

During the question and answer session the ways of communicating research results and recommendations to end users were discussed, inter alia. Milan Dacic and Andreja Susnik both agreed that communication with end users was an important component of adaptation, and is part of the work of both organizations. However, further constant efforts are needed to ensure a good communication with the end users and ultimately the application of research results to real life situations.
Session 2: Impact of climate change in the water sector

Building on the presentation of his colleague from RHMS, Mr. Goran Pejanovic presented on the projected changes in the hydrological cycle due to climate change. He reiterated that water scarcity may become more widespread and severe in Southeastern Europe. As clearly indicated by existing evidence and climatic models, precipitation in the region will decrease, and evaporation increase with resulting decreases in river runoff. However, in some areas an increase winter runoff is likely due to a shorter snow cover period.

Ms. Tatiana Dishnica from the Albanian Ministry of Agriculture, Food & Consumer Protection, in her talk “Adaptation to climate change in the water sector” presented the ministry’s view on the problem. Agriculture is one of the most important sectors in Albania’s economy, comprising 20% of the GDP and also one of the main consumers of water. Climate change will cause water shortage, higher temperatures, and more frequent extreme weather events, similar to other countries in Southeast Europe. Other environmental issues aggravate the problem, while small farm sizes make it difficult to implement agricultural policies. The government plans to update agricultural technology and practices in order to increase productivity in the sector. Improving irrigation and drainage methods is also part of this strategy. Furthermore, with the support of the World Bank a number of measures are planned to address climate change, such as: mainstreaming climate change into existing agricultural policies, risk assessment and identification of best adaptation options.

Ms. Dishnica underlined that countries in the Mediterranean would benefit from a stronger co-operation in facing similar climate-related challenges.

Representing the Hungarian Environmental and Water Management Research Institute VITUKI, Ms. Adrienne Hunyady presented their research within the ECCONET and CLAVIER projects. Changes in discharge of the Tisza River and the Danube catchment were modeled until 2050 based on the IPCC A1B scenario. An increased mean seasonal discharge can be expected for winter months, whereas the opposite is true for spring and summer months in the south of Hungary. For most basins within the two river systems no change in mean annual runoff was predicted, with the exception of a few, which were likely to decrease in runoff. However, modeling studies are always subjected to uncertainty. For example, the abovementioned analysis of the VITUKI misses the so-called flash floods, which occur within several hours due to insufficient time resolution. Factors, such as the individual characteristics of the river networks could not be accounted for. In addition, the ability of drought impacts to affect groundwater aquifers and to add up over years was not considered. Ms. Hunyady explained that studying impacts of past hydrological events can provide valuable information which would minimize existing uncertainties.

Moving on from research results to practical issues in the Polish Wielkopolska Region, Mr. Andzej Kedziora from the Institute for Agricultural and Forest Environment, Polish Academy of Sciences, presented the existing and developing environmental problems. In Wielkopolska too, climate change will lead to an increasing water deficit and will put ecosystem services upon which agriculture depends under a greater pressure. Such impacts can be exacerbated by depletion of soil organic matter, pollution and decline of biodiversity. These problems can be tackled together. Seasonally abundant water resources need to be harvested and stored. In addition soil organic matter should be enhanced in order to improve the water retention in the soil. And finally, landscape complexity should be restored, or planned when new agricultural fields are being developed. This can be done, for example, by restoring small water bodies, planting so-called windbreaks or shelterbelts. Such measures decrease water use on the plantation, increase soil fertility and improve habitat quality for small animals and birds.

The last speaker of the session Ms. Consuelo Varela-Ortega, Agricultural Economics and Social Sciences faculty of the Polytechnic University of Madrid, gave a talk on Water issues in the river basins of Spain. While having to fulfill an internal policy objective of
providing a sufficient water supply for all sectors, Spain also has the obligation of maintaining
good ecological quality of all watercourses. Decision-makers in Europe and beyond need to
determine the right balance between nature protection and satisfying the water demand.
Ms. Varela Ortega emphasized the role of public participation in developing socially
acceptable and lasting solutions. On the example of some projects, she explained the
process of public participation. With the help of such tools as spidergrams, fuzzy cognitive
maps, inter alia, stakeholders expressed their views, exchanged ideas on the future of the
basin and provided feedback for the use of researchers and water management planners. In
addition, such events may improve understanding between water users form different
sectors. Within the MEDIATION project, climate change adaptation in agriculture and water
management will be explored using similar tools to involve farmers in their evaluation.

After the presentations the following topics were discussed: bottom-up drivers for
implementation, the appropriate level to address for implementation in the Wielkopolska
Region as well as the willingness of farmers to restore small water bodies and the sensibility
of this measure.

Some participants expressed the view that the national government should be asked to
financially support and initiate adaptation. However, another comment provided an example
of bottom-up pressure from local NGOs being the driving force for environmental political
decisions.

In a region like the Wielkopolska where no single authority is responsible for the landscape
governance, it is most appropriate to approach multiple levels from communities to national
government in order to facilitate adaptation in agriculture.

Responding to a question, Mr. Kedziora explained that small water bodies are natural traps
for runoff water, which is present in excess in winter. Keeping in mind that winter runoff will
likely increase in the future, whereas summer precipitation will decrease, these measures will
save water, decrease erosion and improve ecosystem health. Although willing to benefit from
such measures, farmers are often not prepared to modify their own land.

Session 3   Impact of climate change in the agricultural sector

Ms. Branislava Lalic from the Serbian University of Novi Sad
opened the session by
introducing the listeners to the accomplishments of the ADAGIO ( Adaptation of agriculture in
European regions at environmental risk under climate change ) project. The project goal was
to identify vulnerabilities to climate change in agriculture and identify appropriate adaptation
measures. This was done by encouraging co-operation between crop modellers, climate
modellers and final model- users. Literature, expert meetings and questionnaires for farmers
were the sources of information. The project showed that differences in farm structure and
socio-economic structure and expected climatic impacts across Europe also require different
adaptation strategies. Some adaptation needs, like capacity building and improving
monitoring systems are common for most countries. In the Mediterranean region priority
should be given to improved water use efficiency, whereas in Eastern Europe improving
irrigation systems and socio-economic measures should be the main focus.

The recommendations of the ADAGIO project were not implemented. In Serbia it was due to
a lack of interest among Serbian decision-makers. The information collected was used in the
lectures of the Agricultural Faculty of Novi Sad.

Ms. Vesela Lambevska – Domazetova representing the Ministry of Agriculture,
Forestry and Water Economy of Macedonia,
presented the perspectives of adapting
Macedonian agriculture to climate change. As in other Balkan countries, rising temperatures
and decreasing precipitation are projected to severely affect agricultural yields, particularly in
the Macedonian Mediterranean agro-ecological zones. The optimal conditions for cropping
will shift to higher latitudes. The ministry identified four groups of potential adaptation measures: 1) those which increase the share of drought resistant crops, 2) improve water holding capacity of soil, 3) conserve water and soil and 4) improve the efficiency of irrigation systems. The success of such measures strongly depends, among other things on awareness among all stakeholders of the impacts of climate change and the need to adapt.

**Mr. Giacomo Trombi, University of Florence, Italy**, gave a concrete example of projected impacts of climate change on the wine growing industry. Research carried out within the MEDIATION project in Tuscany aims to identify adequate responses to upcoming climate impacts.

Yields of wine will decrease in the region, and the conditions required for high quality wine will shift to higher latitudes and shrink, affecting farmer’s incomes. Responses to these changes may include water-saving technologies and change of cultivated grape varieties. Stakeholders will help determine the most suitable adaptation options.

An important component of the research is the estimation of the value of vineyards as part of the local landscape. The first results of surveys carried out among tourists, have shown that the view on vineyards generates significant income for hotel keepers. It is planned to use the results of the research to evaluate the indirect effects of investments and subsidies in the wine growing industry and to help decision-makers find rational solutions to climate change.

**Ms. Galena Is (WWF)** made her presentation on “Turkey’s Tomorrow Project”, which has been focusing on Climate Change Adaptation in Agriculture in Konya Closed Basin. She argued that the water has not been used sustainable in Turkey, especially for agriculture, industry and urban cities. The reported agricultural income loss in Turkey has been 2.5 billion € loss in 2007. In the future, more heat waves, more floods, more frequent and intense droughts, more and longer forest fires, and biological diversity loss is expected due to climate change. The importance of Konya basin in the nationwide agricultural sector, and the challenges to continue the agricultural activities in a sustainable way have been presented. The Region has been declared by WWF International as one of the 200 worldwide ecological areas important for biodiversity. Also, it is one of the important production areas of Turkey in terms of agriculture and economy. The Region’s water resources have been challenged by decreasing precipitation, increased illegal ground water withdrawal, increased cultivation of thirsty crops and over irrigation.

Based on the outcome of the project different adaptation scenarios have been developed. None of the scenarios could provide sustainable water usage in the Basin. The suggested options have been dominated by less water dependant crop cultivation and water efficient irrigation techniques. Ms. Is suggested the solution would be a combination of all the possible solutions including awareness raising for different stakeholder groups in the Basin.

**Session 4: Science for adaptation decision making**

**Mr. Rob Swart from the Alterra Institute, University of Wageningen**, the Netherlands, started off the session by presenting the main goals and the concept of the MEDIATION research project. The ultimate goal is to help decision-makers find their own adaptation strategies and solutions to problems arising due to climate change. The project team aims to prepare toolkits for assessing impacts, vulnerability and adaptation options. There are many kinds of methods in the scientific community, e.g. hydrological and crop models, participatory methods, which can be suggested as tools for solving particular problems. Once a problem caused by climate change is identified, one can start looking for a
solution. To facilitate this process, available methods will be linked to problem types in online software, the MEDIATION toolbox serving also as a common platform for exchange of experiences and stakeholder communication.

Mr. Stefan Pfenninger, IIASA, (International Institute for Applied System Analyses) introduced the work on good practices in adaptation measures and strategies. The issues adaptation decision-makers face, were investigated in 8 countries across Europe. The investigation showed that there was a need for: improved exchange of information between stakeholders, across policy levels and geographical boundaries and an improved science-policy interaction. An example of a good practice, which addressed these issues, was the initiative of the UK Climate Impact Programme. It is currently building a lasting process involving stakeholders from business, policy-makers and scientists.

Mr. Keith Williges, IIASA, continued explaining how developing a toolbox or a set of models, methods and metrics for the assessment of the impacts, vulnerability and adaptation options. Previously developed toolboxes were not used in practice due to a number of shortcomings. Mr. Williges and his colleagues will attempt to overcome these by, inter-alia, responding to stakeholder needs while creating an easily accessible and policy-based toolbox. He emphasized the importance of making scientific information understandable for policy-makers and other stakeholders in this process.

Mr. Markus Wrobel introduced the concept of one of MEDIATION’s key deliverables the online common platform. It will combine a compilation of exemplary case studies, geographically specific information and the toolbox. The key feature of the platform will be that problem types will be linked to solution methods and tools. The platform will guide the user in identifying the type of problem she or he is facing, and provide information step by step in order to assist in finding appropriate options to adapt to climate change. With the help of the platform it will also be possible to find information for evaluating socio-economic impacts of adaptation impacts.

Mr. Jan Sendzimir, IIASA, addressed the topic of intelligent anticipation and preparedness for climate-related disasters. On behalf of the members of RESPONSES project, he explained the function of the CatSim. CatSim is a software which can assist policy-makers in financially vulnerable countries to access the risks of potential disasters. Often decisions need to be made on how to deal with and how the burden of the risks can be shared. CatSim enables the decision-maker to see the current development trajectory of their country and how disasters can put them off this trajectory. The direct financial costs and the opportunity costs of preparation measures can be evaluated with the help of this tool. In co-operation with Mr. Kedziora, RESPONSES researchers will apply this simulation to different flood disaster scenarios in Poland. Funding needs to deal with floods will be determined during this evaluation.

Discussion

The participants asked the speakers to clarify some of the presented material. The upcoming common platform, the CatSim software and shorter term climate variability modelling as well as the availability of information on adaptation options were some of the topics discussed.

Session 5: Stakeholders consultation focusing on Serbian case

Masha’s part: the discussion she chaired should be inserted here

There are several activities going on to try to provide with a sound scientific base for decision makers also in the field of adaptation to climate change. Guidelines for politicians are based on case studies and following a democratic process stakeholders are to be involved when analyzing the case studies. In the last session of the workshop the process of
organizing stakeholder consultation were discussed following two speakers’s presentation giving examples of concrete actions in Serbia.

**Mr. Nenad Brkic from the Serbian Ministry of Agriculture, Forestry and Water Management** introduced the work under the Serbia Danube River Enterprise Pollution Reduction Project (DREPR) to the workshop participants. Financed by the GEF and the World Bank in co-operation with the ministry this project aims to reduce nutrient load discharged into the River Danube and its tributaries from livestock (bovine and pig farms) and slaughterhouses. The activities are sub-divided into: supporting regulatory changes including synchronization of policies with the EU environmental aquis in Serbia and Montenegro; investment into nutrient reducing practices; awareness-raising among the general public on nutrient pollution effects on ecosystems, economy and human health. The researchers were faced with resistance from the farmers, who did not feel that changes in their practices were necessary. Water pollution may become a greater problem with decreasing runoff due to climate change. Therefore, it is crucial that the farmers understand the significance of the issue and the impact of inaction if environmental measures including adaptation are to be implemented successfully.

The last presenter of the workshop Ms. Radmila Stikic of the University of Belgrade, Republic of Serbia explained the benefits of an emerging deficit irrigation technique. Under deficit irrigation cultivated plants receive less water than they normally require during certain drought-tolerant life stages of these plants. This is done for example, by maintaining soil moisture at a relatively low level (so-called regulated deficit irrigation) or by irrigating only half of the root zone at a time (partial root-zone drying technique). During the latter treatment, the dry and irrigated sides are periodically exchanged. It was shown that deficit irrigation does not only increase water use efficiency, but also improves nutrient uptake by crops and the quality of the agricultural products. For example, tomatoes and grapes grown under deficit irrigation contained significantly higher amounts of vitamin C and antioxidants than the traditionally irrigated crops. Already being applied in China, this practice can be very helpful in adapting farmers to arid climates. Currently more plant cultivars are being tested in Serbia. However, the technique is not yet ready for application in the field, a methodology of irrigation control suitable for farmers should be developed in the near future.

**Discussion**

In a brief discussion, the participants were reminded of the water-saving value of wind-breaks. The feasibility of deficit irrigation in the long-term was addressed. Ms. Stikic explained that it was a new and promising technique, which is worth trying and is already applied in China for several years. On top of the concrete examples participants on some crucial points to consider at organizing stakeholders consultations, as:

- Adaptation challenge - to be identified
- Identify the drivers: why the policy makers might need your solution to their problem
- Impact assessment
- Identify your stakeholder groups
- Frame the research question
- Communication
- Awareness raising
- Replicability

**Concluding remarks**
Concluding the workshop, Ms. Zsuzsanna Ivanyi, Climate Change Topic Area of the REC, thanked the participants for their contributions and summarized the essence of the presentations and discussions. In this intensive day the participants managed to discuss numerous issues and questions related to adapting agriculture to climate change in Southeast Europe. Both the participants from the western Balkan and the MEDIATION project members exchanged their views and hopefully took some messages and inspiration from this experience. She expressed the concern about a significant gap which exists between research and decision-making on adaptation. She noted however, that this workshop has shown that there are efforts to close this gap in many projects and that such efforts needed to be strengthened further.