

The Norwegian Programme in Higher Education,
Research and Development in the Western Balkans
2010-2014. The Agriculture Sector (HERD/Agriculture)

PROJECT:

**The use of natural zeolite
(clinoptilolite) for the treatment of
farm slurry and as a fertilizer
carrier.**

2012-2014.

PARTICIPANTS:

University of Belgrade (Faculty of Agriculture and
Faculty of Technology and metallurgy - UBFA),
Serbia

University of Sarajevo (Faculty of Agriculture and
Food Sciences - USFA), Bosnia&Herzegovina

Norwegian University of Life Science, Aas (NMBU,
Faculty of Environmental Sciences and Technology),
Norway

The actions taken during project's realization:

Meetings,

Investigations (laboratories, fields)

Interpretation and publishing the results

Education of young associates

Contacts with farmers, dissemination of project results and achievements

6 workshops have been organized:

- January 23-25, 2012, Belgrade;
- October 9-11, 2012, Sarajevo;
- May 29-30, 2013, Zlatibor;
- September 11-13, 2013 at University of Life Sciences (UMB), Aas;
- May 28-31, 2014, Belgrade;
- February 23-24, 2015, Belgrade.
- several skype meetings (~ 2 per year).

Subjects investigated:

1. Ammonia adsorption, ammonia release and zeolite addition to cattle manure;
2. Chemical composition of soils;
3. Experiments on soil leaching
4. Pot experiments - four different experiments;
5. Field experiments (with chemical analysis of plants)
6. Microbiological investigations of manure and manure+zeolite;
7. Investigations on addition of zeolite to chicken manure for the production of mushrooms;
8. Microbiological and zeta potential analysis of soils from pot experiments.

Publications:

18 contributions already published:

- 3 articles in international journals;
- 9 articles in proceedings of international meetings;
- 5 poster contributions at international meetings;
- 1 monograph, (published by NMBU) as a final report of all results obtained during project's realisation

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- 2 articles submitted in international journals (under review)

Education of young associates

2 Master thesis were defended:

Gordana Lišanin, The use of natural clinoptilolite for ammonia removal and storage during the fermentation of farm slurry. University of Belgrade, Faculty of Technology and Metallurgy, 28.02.2013.

Salmir Dolovac, University of Sarajevo, Faculty of Agriculture and Food Sciences, 2013.

1 PhD thesis was defended:

Muamer Bezdob, Compatibility of grasses and legumes of temporary grasslands under different cutting regime. University of Sarajevo, Faculty of Agriculture and Food Sciences, September 2016.

3 PhD students worked on project subjects in Laboratory of Microbiology, UBFA:

1. **Jovana Vunduk** - Testing the influence of modified zeolite on the growth rate of medical edible mushrooms;
2. **Danka Matijašević** - Microbiological analysis of manure treated with the different concentrations of natural zeolite - clinoptilolite. Pot experiments - microbiology of soils;
3. **Vera Karličić** - joined the team in the third year of project realisation - microbiology of soils used in pot experiments.

PhD thesis are in progress (about to be finished).

Several research stays at

NMBU, Faculty of Environmental Sciences and Technology, Åas, Norway.

- 2012: **Milica Randjelović, UBTMF** - special courses, work in soil analysis - 9 months;
- 2014: **Muamer Bezdrob, USFA** - 3 months stay;
Iva Živanović, UBFA - 6 months stay, special courses, pot experiments;
Jelena Pavlović UBTMF - 3 months stay. Influence of the addition of the zeolitic tuff enriched with zeolite - clinoptilolite and its iron(III)-modified form on potassium and nitrate leaching from different types of soil (sandy, silty loam and silty clay) in column experiments.
- 2015: **Jelena Pavlović, UBTMF** - 3 months stay. Phosphorus adsorption on different types of soil and influence of addition of iron-modified zeolite on the phosphorus leaching from different soil types.
Iva Živanović, UBFA - PhD thesis, phosphorus transport soil-plant

Dissemination of project results:

- Contribution at meetings - 10 meetings, 14 contributions;
- Contact with farmers;
- lecture at "Kolarac People University", Belgrade - 17.12.2015: "The application of zeolites as organomineral fertilizers", Vesna Rakić and Aleksandar Simić
- web site: <http://zeofield.agrif.bg.ac.rs>

What we have learned/benefits from the project

- connecting professionals of different but complementary profiles from 3 countries
- multidisciplinary approach;
- project opened possibilities to work on new subjects;
- we could learn about different practices and knowledge;
- we have recognized that the problems (in the domains of economy, agriculture, education, for farmers) are similar in Bosnia and Serbia;
- We concluded that it is possible to use clinoptilolite as a fertilizer carrier and we proved that organomodified zeolite can alter the botanical composition, yield and the quality of forage, if applied on some soil types (!);
- We applied our forces to disseminate our new experiences among colleagues and farmers;
- In all these activities collaboration with colleagues from NMBU was of particular importance.

Thank you for your
attention!