HERD

The Norwegian Programme in Higher Education, Research and Development in the Western Balkans 2010-2015

Grassland management for high forage yield and quality in the Western Balkans

Novi Sad, 21 September 2016

Maja Manojlović and Branko Ćupina

University of Novi Sad

Faculty of Agriculture

Novi Sad, Serbia

Project partners:

- *The Norwegian Institute for Agricultural and Environmental Research –Bioforsk*
- Department of Plant and Environmental Sciences, *Norwegian University of Life Sciences (UMB)*
- *The Faculty of Agriculture, University of Banja Luka*
- *The Faculty of Agriculture and Veterinary in Prishtina*
- *The Faculty of Agriculture, University of Novi Sad*

Project leader: Peder Lombnaes

Aims and objectives:

- Capacity building of Balkan institutions through targeted activities for scientific staff and students at master and PhD levels
- Inventarisation of the current situation of grassland management (e.g. botanical composition, fertilisation practice, cutting/grazing regimes)
- Conduct field experiments to assess the effect on grass yield and quality (protein and mineral composition) and soil carbon sequestration as affected by: *i*) botanical compositions, ii) cutting/grazing regimes, and *iii*) different fertilisation practices

Aims and objectives:

- Economical evaluation of cost/benefit analysis for different grassland management strategies (i.e. cutting regimes, fertilizer input, botanical composition)
- Transfer new knowledge on innovative solutions and new research findings for improved grassland management through participating in national and international seminars/workshops and joint meetings between scientists from Norway and Balkan countries, and development of educational materials

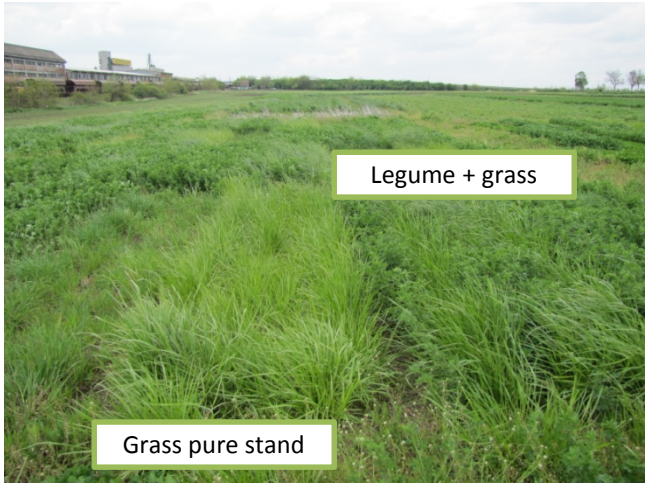
Working packages:

- 4 work packages

- *WP1 Inventerisation and phytocenosis*
- *WP2 Legumes / grass mixtures and cutting regimes*
- *WP3 Fertilisation practise*
- *WP 4 Economical analysis and transfer of knowledge*

1. GROWING LEGUME/GRASS MIXTURES IN TEMPERATE REGION

LEGUME/GRASS MIXTURES IMPROVES GRASSES QUALITY BY N FIXATION

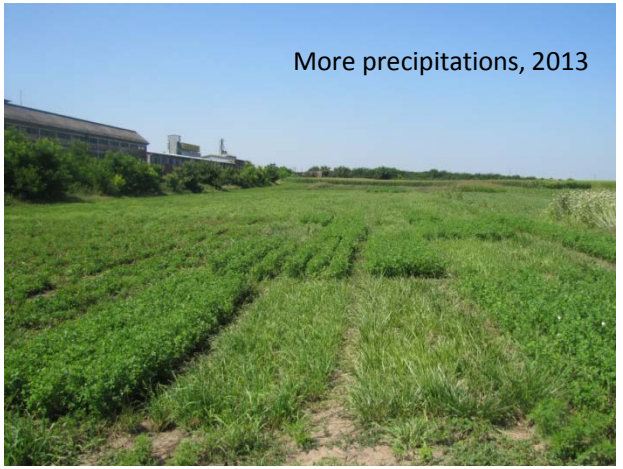


1st cut	Alfalfa+ Orchard	Alfalfa+ Fescue	Alfalfa	Orchard	Fescue
Crude protein	14.98	14.63	14.63	8.1	7.75
Crude fiber	35.71	34.36	35.8	35.18	33.03
Ash	9.72	9.95	9.64	9.05	9.3
NDF	53.52	48.53	46.55 (aver. 53)	59.13	60.25
ADF	39.89	36.67	40.13 (aver. 41)	38.5	35.92
Lignin	8.28	7.92	9.62	5.22	5.59

WEATHER CONDITIONS ARE IMPORTANT FACTOR IN GRASS PRODUCTION IN TEMPERATE REGION (EARLY AUTUMN, SUMMER)

↓

SELECTION OF SPECIES IN THE MIXTURE



2. PERMANENT GRASSLAND IN TEMPERATE REGION

CRUDE PROTEINS (AVERAGE 2012-2015)


Field experiment

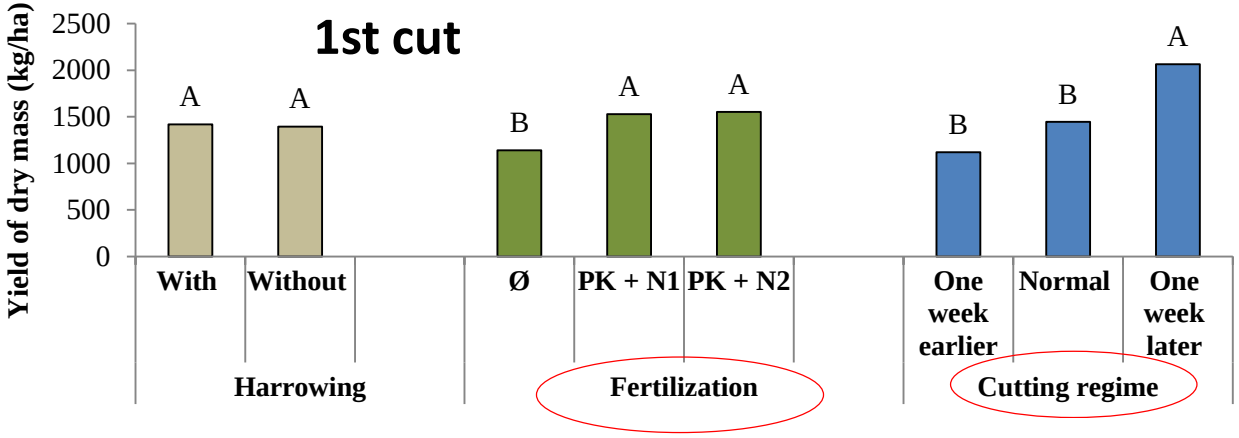
Treatment	CP (%) in I cut average for 2012-2014*
Without harrowing	12.67 A
With harowing	12.80 A
Ø	12.90 b
PK + N1	13.75 b
PK + N2	14.74 a
One week earlier	16.5 a
Regular	14.7 b
One week later	13.8 b

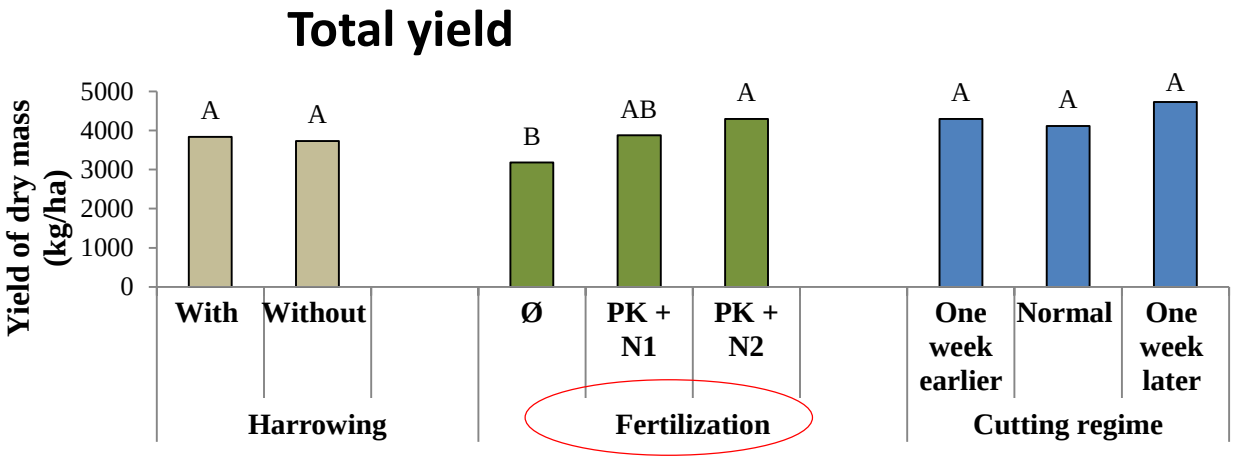
FERTILIZATION PRACTICE AND CUTTING REGIME ARE IMPORTANT FACTORS IN GRASS PRODUCTION IN TEMPERATE REGION

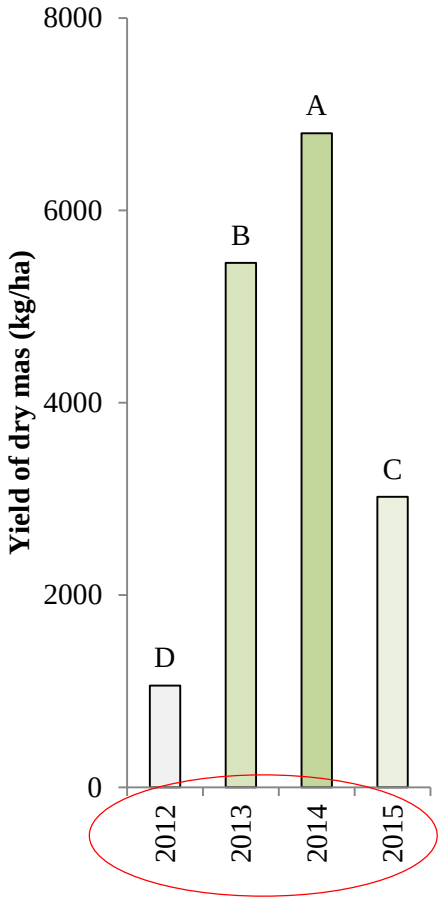
↓

N fertilization can improve quality and yield of natural grassland

IMPACT OF MANAGEMENT PRACTICE ON
YIELD OF DRY MASS OF NATURAL GRASSLAND (AVERAGE 2012-2015)







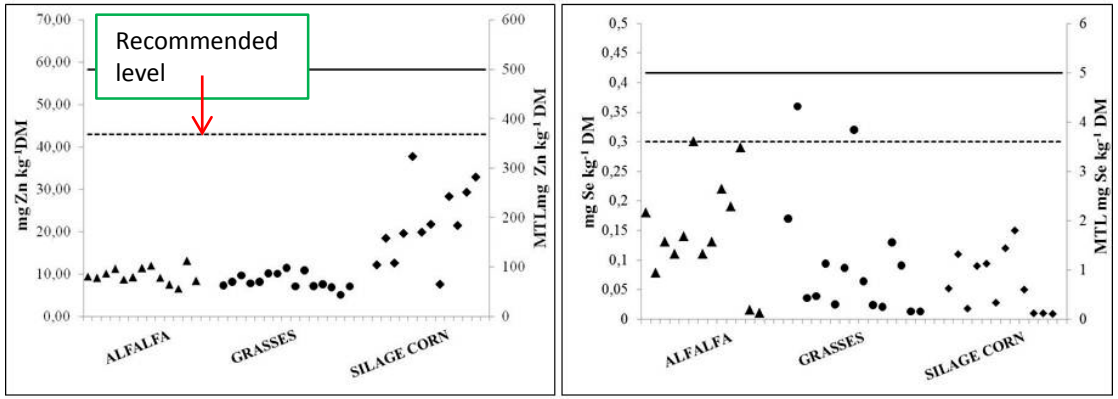
IMPACT OF MANAGEMENT PRACTICE ON
FLORISTIC COMPOSITION OF NATURAL GRASSLAND

Diverse vegetation of natural grassland

Moderate N fertilization can improve floristic composition and yield

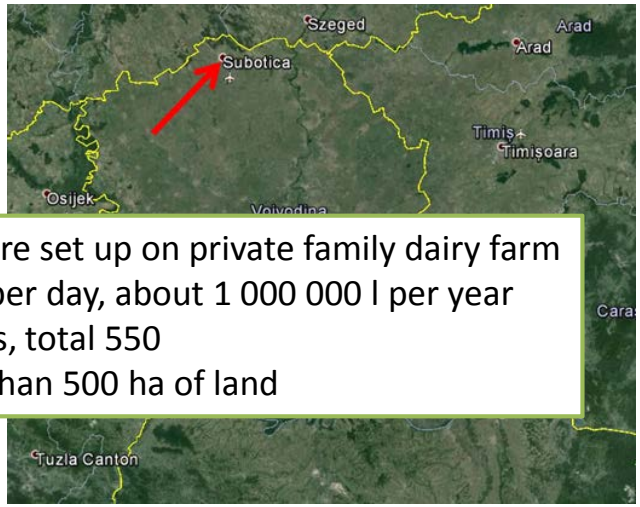
- More grasses, higher yield
- More legumes, better quality
- Less weeds (due to higher yield of grass)

PhD thesis - Mineral composition of forage crops – Klara Marijanušić

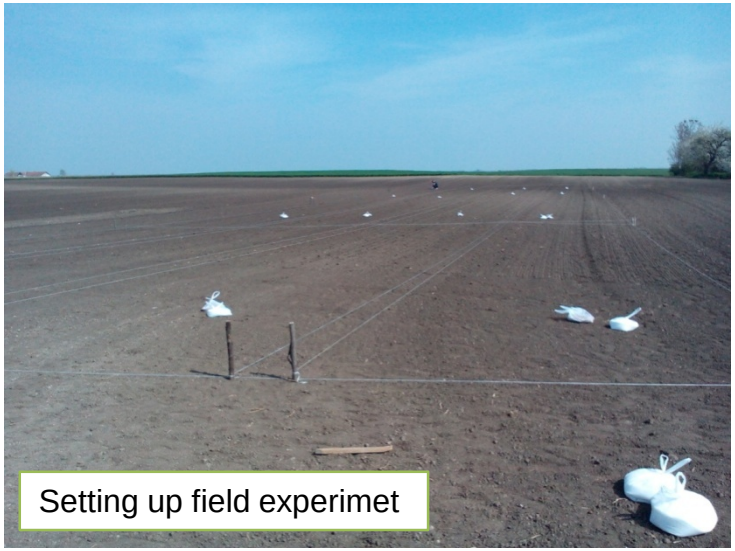


Contents of Zn and Se in plants

The soils were well provided with the studied elements, but the analyzed fodder crops could not secure sufficient amounts of Cu, Zn and Se.



- Two field experiment were set up on private family dairy farm
- Milk production 3.000 l per day, about 1 000 000 l per year
- About 140 lactating cows, total 550
- Farmer cultivates more than 500 ha of land



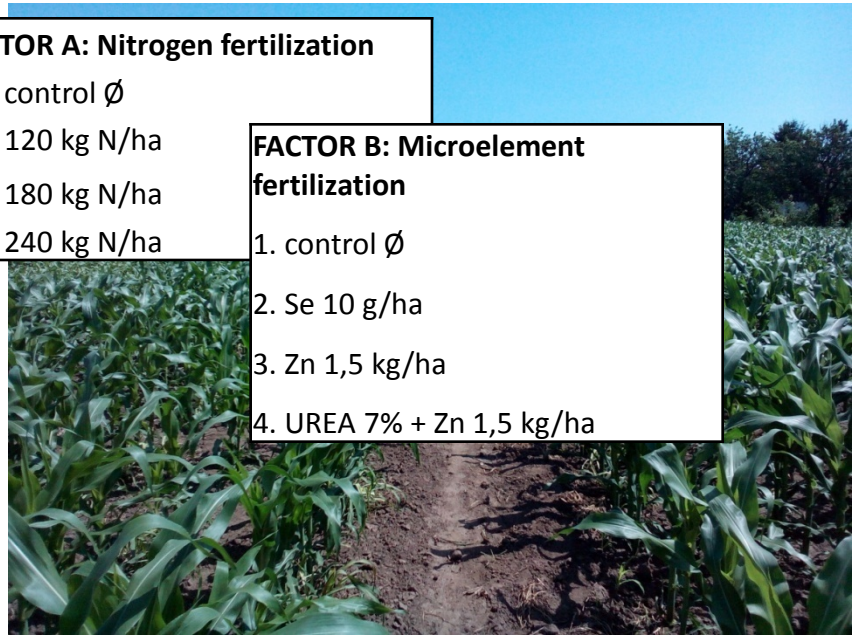
Setting up field experimet

ALFALFA

Treatments

1. **Control**
2. **Se 5 g ha^{-1} (Na_2SeO_4)**
3. **Se 10 g ha^{-1} (Na_2SeO_4)**
4. **Zn 0,5kg ha^{-1} ($ZnSO_4$)**
5. **Zn 1 kg ha^{-1}($ZnSO_4$)**
6. **2% Cu ($Cu SO_4$)**
7. **Zn 0,5 kg ha^{-1} + Se 10 g ha^{-1}**

SILAGE CORN

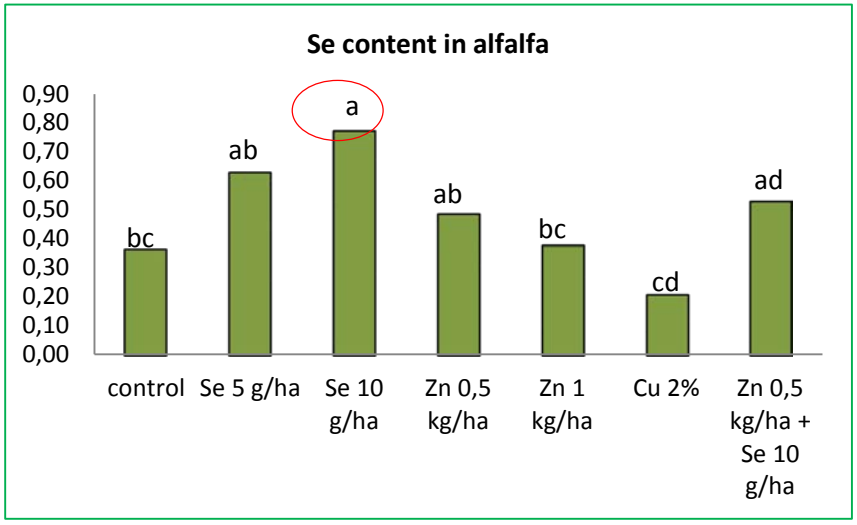


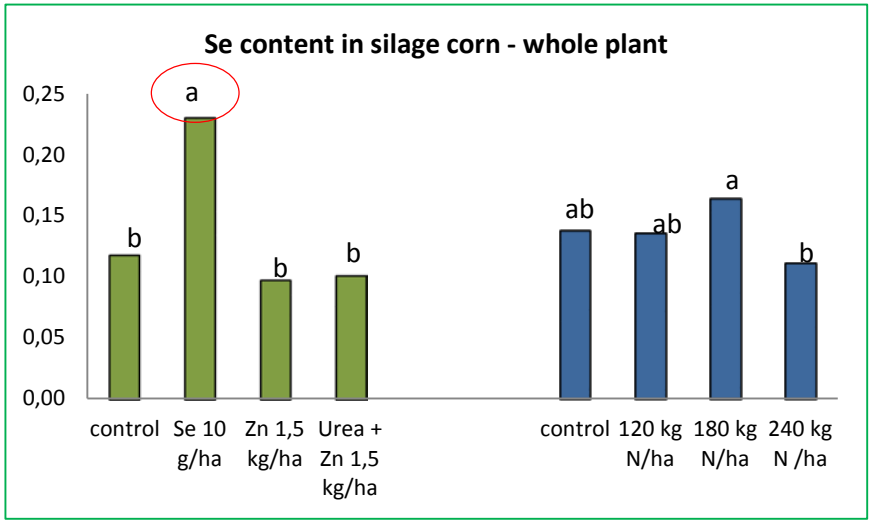
FACTOR A: Nitrogen fertilization

1. control Ø
2. 120 kg N/ha
3. 180 kg N/ha
4. 240 kg N/ha

FACTOR B: Microelement fertilization

1. control Ø
2. Se 10 g/ha
3. Zn 1,5 kg/ha
4. UREA 7% + Zn 1,5 kg/ha



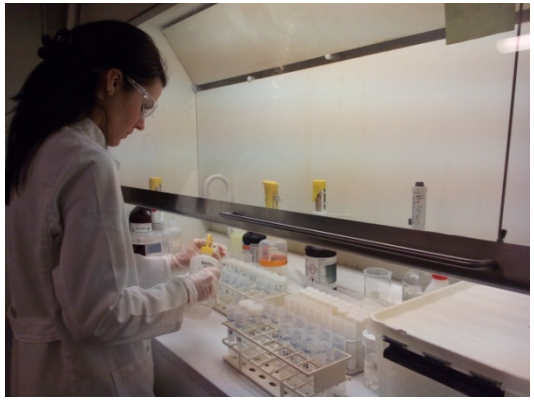


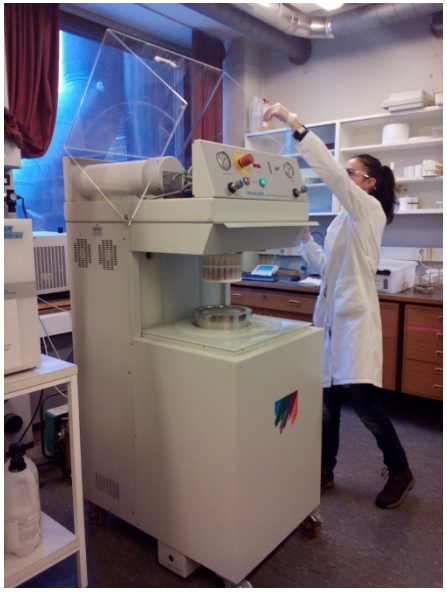
PROJECT OUTCOMES

Importance for the

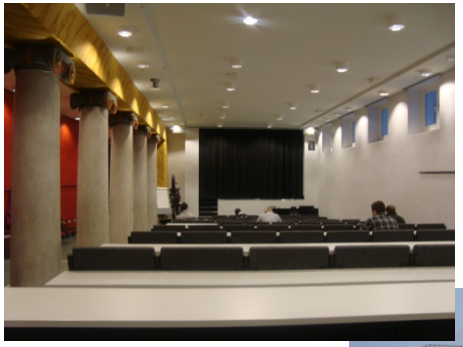
Universities

- Collaboration of different working groups at the UNS
- Knowledge transfer (PhD students from UNS attend statistical course at the NMBU and worked in NMBU laboratory)
- Improved teaching activities and quality
- Improved research approach





Preparation and analyses of soil and plant samples



PhD students from UNS attend the course STAT200 Regression Analysis

Ås, Norway, 2002

Odda, Norway, 2002

Taylor & Francis
Taylor & Francis Group

Long-term Effects of Crop Rotation and Different Fertilization Systems on Soil Fertility and Productivity

Cuvardic, M., Tveitnes, S., Krogstad, T. and Lombnæs, P. (Faculty of Agriculture, University of Novi Sad, Trg D. Obradovica 8, SCG-21000 Novi Sad, Serbia and Montenegro and Department of Plant and Environmental Sciences, Agricultural University of Norway, P.O. Box 5003, NO-1432 Ås, Norway). Long-term effects of crop rotation and different fertilization systems on soil fertility and productivity. Accepted March 10, 2004. Acta Agric. Scand., Sect. B, Soil and Plant Sci. 54: 193–201, 2004. © 2004 Taylor & Francis.

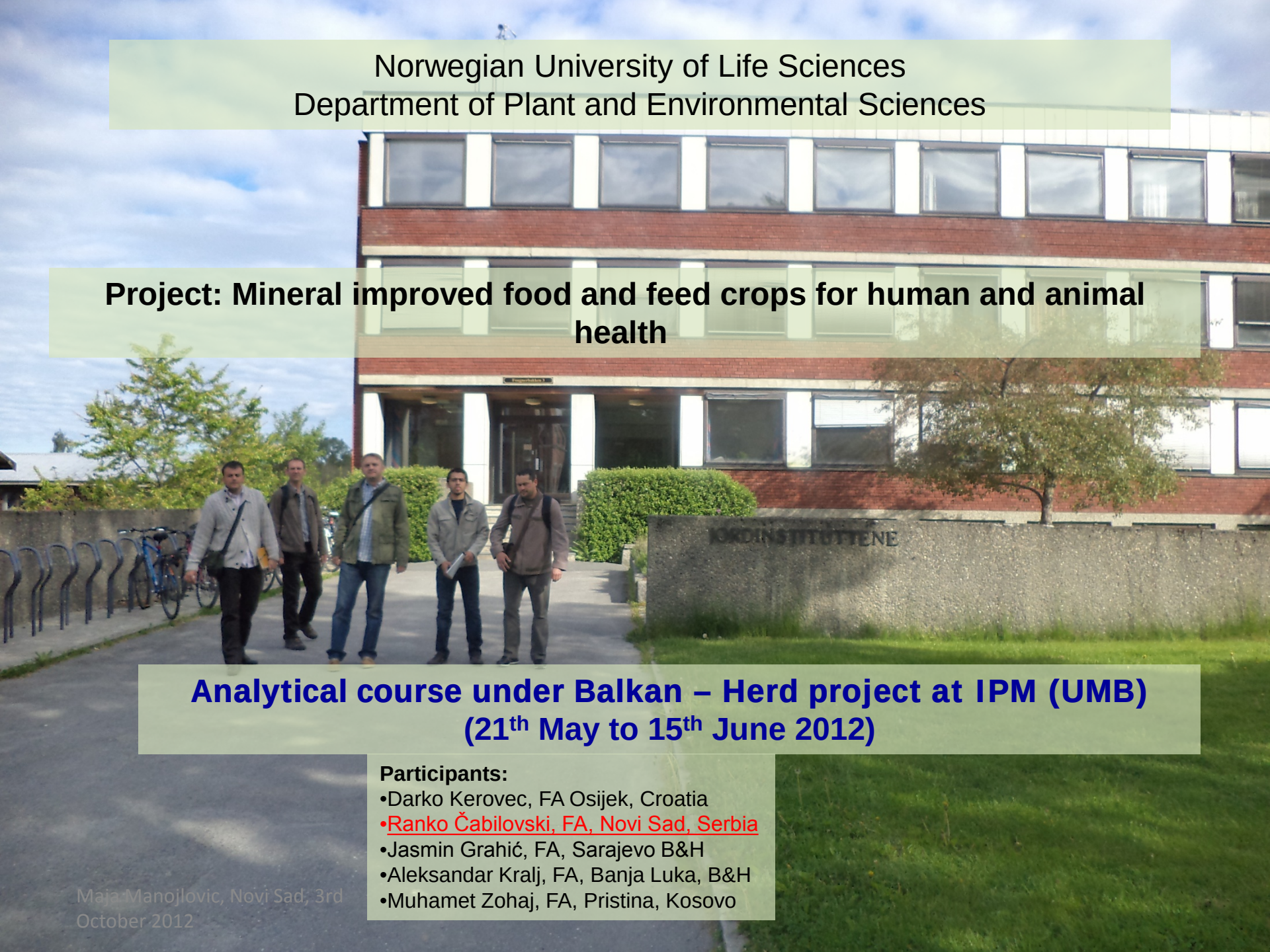
The effects of crop rotation and fertilization systems on yield and soil fertility parameters have been investigated in a long-term field trial established in southeast Norway in 1953. The results indicate the small

Maja Cuvardic[1,*], Steinar Tveitnes[2], Tore Krogstad[2] and Peder Lombnæs[2]

[1]Faculty of Agriculture, University of Novi Sad, Trg D. Obradovica 8, SCG-21000 Novi Sad, Serbia and Montenegro and [2]Department of Plant and Environmental Sciences, Agricultural University of Norway, P.O. Box 5003, NO-1432 Ås, Norway

Norwegian University of Life Sciences
Department of Plant and Environmental Sciences

Project: Mineral improved food and feed crops for human and animal health



Analytical course under Balkan – Herd project at IPM (UMB)
(21th May to 15th June 2012)

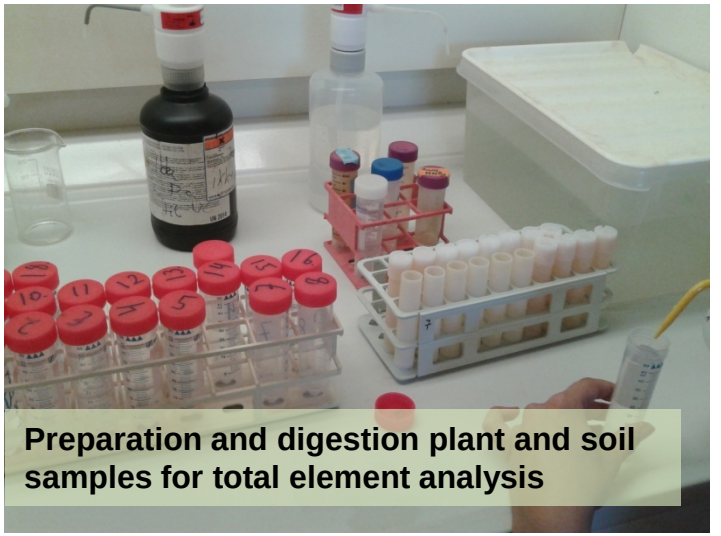
Participants:
- Darko Kerovec, FA Osijek, Croatia
- Ranko Čabilovski, FA, Novi Sad, Serbia
- Jasmin Grahić, FA, Sarajevo B&H
- Aleksandar Kralj, FA, Banja Luka, B&H
- Muhamet Zohaj, FA, Pristina, Kosovo

Procedures and analysis

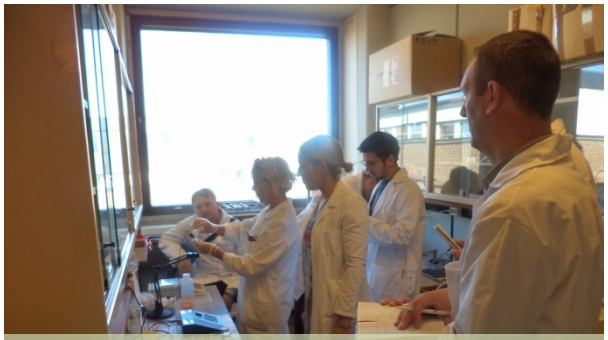
Norwegian University of Life Science
Laboratory of the Department of Plant and Environmental Sciences
May 21 – June 15, 2012
As, Norway

Soil sampling , preparation of soil and plant samples and soil dry matter determination

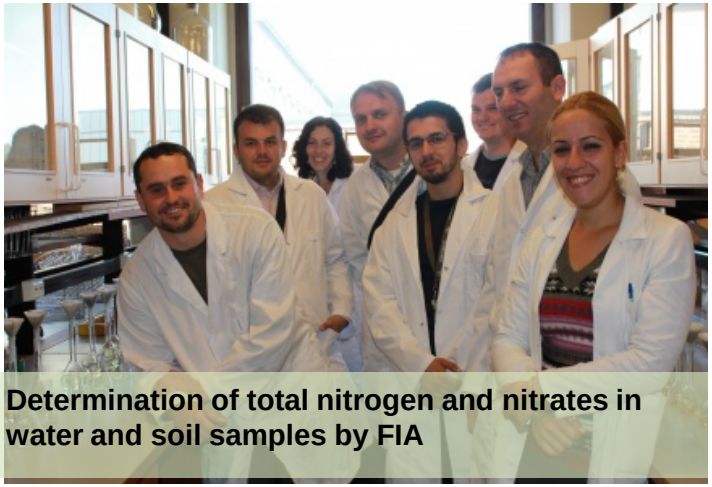
Basic laboratory procedures



Preparation and digestion plant and soil samples for total element analysis



Cation exchange capacity (CEC), total exchangeable basis and AL-P extraction



Determination of total nitrogen and nitrates in water and soil samples by FIA

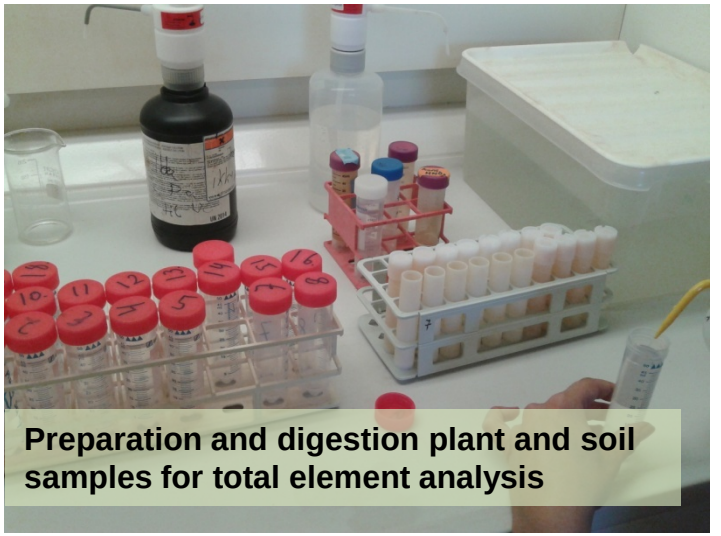
Total C and organic C content in soil

Procedures and analysis

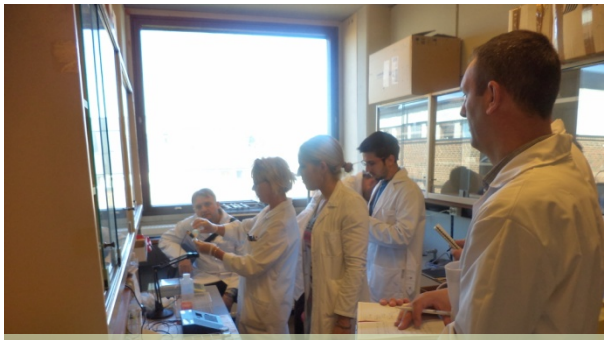
Norwegian University of Life Science
Laboratory of the Department of Plant and Environmental Sciences
May 21 – June 15, 2012
As, Norway

Soil sampling , preparation of soil and plant samples and soil dry matter determination

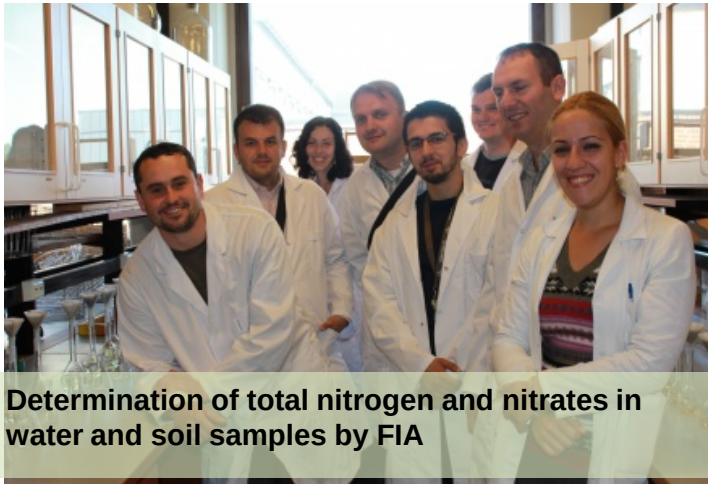
Basic laboratory procedures



Preparation and digestion plant and soil samples for total element analysis



Cation exchange capacity (CEC), total exchangeable basis and AL-P extraction



Determination of total nitrogen and nitrates in water and soil samples by FIA

Total C and organic C content in soil

Ås, Norway, 2002

Odda, Norway, 2002

Taylor & Francis
Taylor & Francis Group

Long-term Effects of Crop Rotation and Different Fertilization Systems on Soil Fertility and Productivity

Cuvardic, M., Tveitnes, S., Krogstad, T. and Lombnæs, P. (Faculty of Agriculture, University of Novi Sad, Trg D. Obradovica 8, SCG-21000 Novi Sad, Serbia and Montenegro and Department of Plant and Environmental Sciences, Agricultural University of Norway, P.O. Box 5003, NO-1432 Ås, Norway). Long-term effects of crop rotation and different fertilization systems on soil fertility and productivity. Accepted March 10, 2004. Acta Agric. Scand., Sect. B, Soil and Plant Sci. 54: 193–201, 2004. © 2004 Taylor & Francis.

The effects of crop rotation and fertilization systems on yield and soil fertility parameters have been investigated in a long-term field trial established in southeast Norway in 1953. The results indicate the small

Maja Cuvardic[1,*], Steinar Tveitnes[2], Tore Krogstad[2] and Peder Lombnæs[2]

[1]Faculty of Agriculture, University of Novi Sad, Trg D. Obradovica 8, SCG-21000 Novi Sad, Serbia and Montenegro and [2]Department of Plant and Environmental Sciences, Agricultural University of Norway, P.O. Box 5003, NO-1432 Ås, Norway

PROJECT OUTCOMES

Importance for the

Agriculture and business

- On-farm trials and results were available for farmers
  - higher yield and quality of forage crops and grasslands with applied treatments
  - improved soil properties
- Higher forage crops yield led to development of the livestock production
  - development of other agricultural sectors

Social sector

- Improved economic budget ensures better social status and number of rural population
  - one of the key problems in WBC
- Higher awareness of climate and climate changes importance

University of Novi Sad

Novi Sad, Serbia

Thank you!


Thank you!