NAUČNO VIJEĆE
JU POLJOPRIVREDNI INSTITUT REPUBLIKE SRPSKE, BANJA LUKA
Banja Luka, decembar 2022.

Predmet: Izbor u naučno zvanje kandidata dr Tihomira Predića

Odlukom Naučnog vijeća JU Poljoprivrednoi Institut Republike Srpske, Banja Luka, broj: 1141-1/2022 donijetoj na sjednici Naučnog vijeće, održanoj 29. 09. 2022. Godine, imenovana je Komisija za pripremu izvještaja za izbor dr Tihomira Predića u zvanje VIŠEG NAUČNOG SARADNIKA za naučnu oblast - poljoprivredne nauke, uža naučna oblast - nauka o zemljištu, u sledećem sastavu:

1. Prof. dr Dragoja Radanović, redovni profesor Poljoprivrednog fakulteta, Univerziteta u Banjaluci, naučna oblast: biotehničke nauke – agrohemija, predsjednik;
2. Prof. dr Svetlana Antić Mladenović, varedni profesor Poljoprivrednog fakulteta Zemun, Univerziteta u Beogradu, naučna oblast: biotehničke nauke – agrohemija, član
3. Dr Željko Lakić, viši naučni saradnik, naučna oblast: poljoprivredne nauke - ratarstvo, JU Poljoprivredni institut Republike Srpske, Banja Luka, član.

Na osnovu uvida u podnijetu dokumentaciju kandidata, a u skladu sa članovima 81. i 82. Zakona o naučnoistraživačkoj djelatnosti i tehnološkom razvoju (Službeni glasnik Republike Srpske broj: 6/12, 33/14, 66/18), člana 7. Pravilnika o postupku za sticanje naučnih zvanja (Službeni glasnik Republike Srpske, broj: 25/15) i člana 48. Statuta JU Poljoprivredni institut Republike Srpske, Banja Luka, Komisija podnosi sledeći:

I Z V J E Š T A J
o prijavljenom kandidatu za izbor u naučno zvanje

1) BIOGRAFSKI PODACI

a) Osnovni biografski podaci:

Ime (ime oca) i prezime:	Tihomir (Milan) Predić
Datum i mjesto rođenja:	21.03.1964. god., Banja Luka
Zaposlenje:	JU Poljoprivredni institut Republike Srpske, Banja Luka
Radno mjesto:	Rukovodilac Zavoda za agroekologiju
Sadašnje naučno zvanje	Naučni saradnik
Datum izbora u sadašnje zvanje	01.03.2012. god.
Članstvo u naučnim i stručnim organizacijama ili udruženjima:	Član Srpskog društva za proučavae zemljišta, Republike Srbije

b) diplome i zvanja:

Osnovne studije	
Naziv institucije:	Univerzitet u Beogradu, Poljoprivredni fakultet, Zemun
Zvanje:	Diplomirani inženjer poljoprivrede
Mjesto i godina završetka	Beograd – Zemun, 1988
Prosječna ocjena:	8,41
Postdiplomske studije	
Naziv institucije:	Univerzitet u Beogradu, Poljoprivredni fakultet, Zemun
Zvanje:	Magistar agrohemije
Mjesto i godina završetka	Beograd – Zemun, 1995
Prosječna ocjena:	9,30
Doktorske studije	
Naziv institucije:	Univerzitet u Beogradu, Poljoprivredni fakultet, Zemun
Zvanje:	Doktor biotehničkih nauka – oblast melioracije zemljišta
Mjesto i godina završetka	Beograd – Zemun, 2011

2. NAUČNI I STRUČNI RAD KANDIDATA

RADOVI SAOPŠTENI POSLIJE IZBORA U ZVANJE NAUČNI SARADNIK

Naučne knjige (monografije, naučne knjige u užem smislu), monorafske studije međunarodnog značaja (R10)

Monografska studija/poglavlje u knjizi koeficijenta kompetentnosti R_{11} (R_{13} - bodova 1,80)

1. **Predić, T.**, Nikić, Nauth, P., Tanasić, B., Docić, Kojadinović, T., Cvijanović, T., Bjelobrk, D. (2021): Impact of Flood Disaster on Agricultural Land and Crop Contamination at the Confluence of the Bosna River; The book series "Innovations in Landscape Research", E. Saljnikov et al. (eds.), Advances in Understanding Soil Degradation, ISBN 978-3-030-85682-3 (eBook), https://link.springer.com/book/10.1007/978-3-030-85682-3; pg. 507-528.
   R_{13} = 1,80 bodova *(6,0 x 30% = 1,80)*

Monografska studija/poglavlje u knjizi koeficijenta kompetentnosti R_{12} (R_{14}= bodova 6,40)

1. Zingstra, H. L., Kiš, A., Ribaric, A. Ilijas, I., Jeremić, J., **Predic T.** (2010): Protection of Biodiversity of the Sava River Basin Floodplains; The relevance of farming and farmland for maintaining the landscape and biodiversity of the Sava floodplains; Final Report of Task C of the EU LIFE TCY 06/INT/246 Project, https://www.researchgate.net/publication/239850075 pg. 1 - 80.
   R_{14}=1,20 boda *(4,0 x 30% = 1,20)*

2. Bukalo, E., Voljevica, N., Behlulovic, N., Vasko, Z., **Predic, T.**, Markovic , B., Bajramovic, S. (2019): Status of Soil, Climate and Digital Mapping Information in Bosnia and Herzegovina; Book - Areas with Natural Constraints in South-East Europe; Assessment and Policy Recommendations; Zdruli, P., et al., Published by: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, ISBN 978-608-4536-06-2; pg. 82 - 117.
   R_{14}=1,20 boda *(4,0 x 30% = 1,20)*

3. **Predic, T.**, Markovic, M., Rogic, B. (2019): Agri-Environmental Policy in Bosnia and Herzegovina; Book - Agri-Environmental Policy in South-East Europe; Cukaliev O. et al., Published by: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, ISBN 978-608-4760-26-9; pg. 103 - 125.
   R_{14}=4,0 boda *(4,0 x 100% = 4,00)*

Naučni časopis međunarodnog značaja (ISI publikacije) (R_{20})

Rad u istaknutom međunardnm časopisu (R_{22} - bodova 1,50)

1. Sunulahpašić, A., Mitrić, S., Šunjka, D., Žabić, M., **Predić, T.**, Šipka, M., Rodić, L. (2020): Adsorption of nicosulfuron herbicide in the agricultural soils of Bosnia and Herzegovina; Plant, Soil and Environment, 66, 2020 (4): 162–166, doi: 10.17221/80/2020-PSE.
   R_{22}=1,50 bod *(5,0 x 30% = 1,50)*

Rad u časopisu međunardnog značaja (R_{23} - bodova 3,90)

1. Tošić, I., Bošković, Rakočević, I., **Predić T.,** Pržulj, N., Savić, B., Trkulja, V. (2018): Assessment of Dutch Tomato Hybrids Grown in Conditions of Western Bosnia and Herzegovina; Genetika 50 (3): 933-942, License CC BY-NC-ND, doi: 10.2298/GENSR1803933T.
   R_{23}=0,90 bodova *(3,0 x 30% = 0,90)*

2. Jovanović, S., **Predić, T.,** Bratć, G. (2022): Analysis of Free and Open Land Cover Maps for Agricultural Land Use Planning at Local Level; Free and Open Source Software for Geopsatial (FOSS4G) 2022 - Academic Track, The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Volume XLVIII-4/W1-2022, pg. 237-243 https://doi.org/10.5194/isprs-archives-XLVIII-4-W1-2022-237-2022 License CC BY 4.0,
   R_{23}=3,0 boda *(3,0 x 100% = 3,00)*

Rad u časopisu međunardnog značaja verifikovan posebnom odlukom (R_{24} - bodova 6,75)

1. Lakić, Ž., **Predić T.**, Đurđić, I., Popović, V. (2020): Recultivation of degraded soil due to mining activity without adding organic layers of soil using Alfalfa and mixtures of grass legumes; Agriculture and Forestry, 66 (4): 223-237, doi: 10.17707/AgricultForest.66.4.18
   R_{24}=2,25 bodova *(3,0 x 75 = 2,25)*

2. Vidojević, D., Manojlović, M., Đorđević, A., Nešić, Lj., **Predić, T.** (2020): Correlations between Soil Organic Carbon, Land Use and Soil Type in Serbia; Matica Srpska Journal for Natural Sciences, Novi Sad, 138, 9-18, https://doi.org/10.2298/ZMSPN2038009V
   R_{24}=1,50 bod *(3,0 x 50% = 1,50)*

3. **Predić,** T., Pešević, D., Popović, V. (2022): Causes of Acer platanoides "Globosun" tree rows damages in urban environment; Agriculture and Forestry, 69 (4): 7-20. doi:10.17707/AgricultForest.69.4.01
   R_{24}=3,00 boda *(3,0 x 100 = 3,00)*

Zbornik međunardnih naučnih skupova (R30)

Predavanje po pozivu sa istaknutog međunardnog naučnog skupa štampano u cjelini (R_{31}- bodova 0,90)

1. **Predić, T.**, Lukić, R., Nikić, Nauth, P., Cvijanović, T., Docić, Kojadinović, T., Malčić, T., Jokić, D., Radanović, B. (2013): Introduction of Continuous Monitoring of Agricultural Land of Republic of Srpska; Plenary Lectures, 1st International Congress on Soil Science Society of Serbia: SOIL-WATER-PLANT, UDC:502.55:631.142, Proceedings, pp 1–16.
   R_{31}=3,00 boda *(3,0 x 30% = 0,90)*

Saopštenje sa istaknutog međunardnog naučnog skupa štampano u cjelini (R_{33} - bodova 3,55)

1. **Предић, Т.,** Никић, Наутх, П., Лукић, Р., Цвијановић, Т. (2011): Начин кориштења пољопривредног земљишта Републике Српске. Међународни научни симпозијум – Agrosym 2011, UDK:332.3:63 (497.6 RS), Зборник радова, стр. 147-156.
   R_{33}=0,75 bodova *(1,0 x 75% = 0,75)*

2. **Predić, T.,** Pećanac, D., Radanović, B., Docić-Kojadinović, T., Radanović, D. (2012): Root and leaf mineral content of wild growing yellow Gentian (gentiana lutea l) from natural habitats in western part of Bosnia and Herzegovina; 7th Conference on Medicinal and Aromatic Plants of Southeast European Countries, Proceedings, ISBN: 978-86-83-141-16-6, pg. 68 –73.
   R_{33}=0,50 bodova *(1,0 x 50% = 0,50)*

3. **Predic, T.**, Lukic, R., Cvijanovic, T., Docic–Kojadinovic, T., Malcic, T., Pesevic, D. (2012): Research on the Content of Plant Nutrients and Pesticide Residues in Drainage Water; The Fifth International Scientific Conference on Water, Climate and Environment, Ohrid, Proceedings, pg. 86-90. **R_{33}=0,30 boda** *(1,0 x 30% = 0,30)*

4. **Predic, T.**, Radanovic D. (2015): Phytotoxic effect of aluminium and manganese in barley. 9th International Simposium on Plant-Soil Interactions at Low pH, Proceedings, pg. 139-140.
   R_{33}=1,00 bod *(1,0 x 100% = 1,00)*

5. **Predić, T.,** Nikić-Nauth, P., Jovanović S., (2021): Land Cover/Land Use in service of agricultural land protection, use and restructuring; 3rd International and 15th National Congress, Serbian Society of Soil Science, Booko of proceedings, pg 350-365, ISBN-978-86-912877-5-7. https://congress.sdpz.rs/
   R_{33}=1,00 bod *(1,0 x 100% = 1,00)*

Saopštenje sa međunardnog naučnog skupa štampano u izvodu (R_{34} – bodova 1,80)

1. **Predić, T.**, Nikić, Nauth, P., Cvijanović, T., Docić, Kojadinović, T., Radanović, B, Jokić, D. (2014): State of pollution of flooded agricultural land in the north part of Bosnia and Herzegovina; 12th Congress of the Croatian Society of Soil Science: Sustainable soil management for food and environment safety, Book of Abstracts, pg. 93.
   R_{34}=0,15 bodova *(0,5 x 30% = 0,15)*

2. **Predić, T.**, Lakić, Ž., Pešević, D., Lukić, R. (2014): Rekultivacija jalovišta laporca termoelektrane Gacko"; Integrated Meeting - Planning and Land Use and Landfills in Terms of Sustainable Development and New Remedation Technologies – SOIL 2014, Book of Abstracts, pp 148-149.
   R_{34}=0,375 bodova *(0,5 x 75% = 0,375)*

3. **Predić, T.**, Nikić, Nauth, P., Cvijanović, T., Docić, Kojadinović, T., Radanović, B., Jokić, D. (2014): State of pollution flooded agricultural land in the Republic of Srpska; 5th International Scientific Agicultural Symposium - Agrosym, Book of Abstracts, pp 111.
   R_{34}=0,15 bodova *(0,5 x 30% = 0,15)*

4. Tanasić, B., **Predić, T.**, Bogdanović, D. (2017): "Distribution of phosphorus by pseudogley profile based on the using of phosphoric fertilizers in Pear plantations"; 2nd International and 14th National Congress of Soil Science Society of Serbia "Solutions and Projections for Sustainable Soil Managment", Book of abstracts, pg. 27.
   R_{34}=0,375 bodova *(0,5 x 75% = 0,375)*

5. **Predić, T.** (2018): Phytotoxic Effects of Aluminum on Distryc Cambisol and Pseudogley; 7th International Simposium on Agricultural Sciences, AgroRes, Book of Abstracts, pg. 69.
   R_{64}=0,20 boda *(0,5 x 100% = 0,50)*

6. Lakić, Ž., **Predić, T.**, Žabić, M., Zoran Maličević, Z. (2020): Quality of Silage from Whole Maize Plant Prepared on Dairy Cattle Farms; 9th International Symposium on Agricultural Sciences – AgroRes 2020, Book of Apstracts, pg. 45.
   R_{64}=0,10 bod *(0,5 x 50% = 0,25)*

Nacionalne naučne knjige (monografije) (R_{40})

Poglavlje u knjizi koeficijenta kompetentnosti R_{41} (R_{44} – bodova 2,00)

1. Стричевић, R., Предић, Т., Марковић, М. (2022): Климатске промјене и управљање земљиштем, Монографија - Управљање природним ресурсима у ери климатских промјена. Трбић, Г. и сар., Академија наука и умјетности Републике Српске, Едиција Одрживи развој и управљање природним ресурсима Републике Српске, стр. 273 – 332.
   R_{44}=2,00 *(2,0 x 100% = 2,00)*

<u>Časopisi nacionalnog značaja (R_{50})</u>

Rad u vodećem časopisu (časopis prve kategorije) nacionalnog značaja (R_{51}–bodova 4,10)

1. Novković, D., Antić-Mladenović, S., Radanović, D., **<u>Predić, T.</u>,** Babić M., Marković, S., Maličević, Z. (2012): Contents of nickel, zinc, copper and lead in agricultural soils of the plains in the northwestern part of the Republic of Srpska; Agro-knowledge Journal, vol 13, no. 1, 2012, pg. 123-134 DOI: 10.7251/AGREN1201123M
   R_{52}=0,45 bodova *(2,0 x 30% = 0,60)*

2. **<u>Predić, T.,</u>** Nikić, Nauth, P., Radanović, B., Predić, A. (2016): State of Heavy Metals Pollution of Flooded Agricultural Land in the North Part of Republic of Srpska; Agro-knowledge Journal, vol 17, no. 1, 2016, pp. 19-27.
   R_{52}=1,125 bodova *(2,0 x 75% = 1,50)*

3. Lakić, Ž., **<u>Predić, T.</u>**, Pavlović, S., (2016): Biološke rekultivacije rudarskom aktivnošću degradiranih zemljišta na lokalitetu Srđevići–Gacko; UDK 631.438:539.163, Svarog, 13, str. 285-298.
   R_{51}=2,00 boda *(2,0 x 100% = 2,00)*

Rad u časopisu nacionalnog značaja (časopis druge kategorije) (R_{52} – bodova 2,25)

1. Lakić, Ž., Žabić, M., **<u>Predić, T.</u>** (2021): Determining the content of nitrogen and some macroelements in the dry mass of perennial leguminous plants; Agro-knowledge Journal, vol 22, no. 1, 2021, pg. 13-22 DOI: 10.7251/AGREN2201013Z
   R_{52}=1,50 bodova *(1,5 x 100% = 1,50)*

2. Tokhetova, L., Baizhanova, B., Baykenzhieva, A., Kultasov, B., **<u>Predić, T.</u>** (2021): Perspectives for cultivation of diversified crops in a rice (Oryza sativa L.)-based crop rotation in the Kyzylorda region, Kazakhstan; Zemljiste i biljka 70(1):68-85, 2021, DOI: 10.5937/ZemBilj2101068T, http://www.sdpz.rs/index.php/sr-yu/casopis-zemljiste-i-biljka
   R_{52}=0,50 bodova *(1,5 x 50% = 0,75)*

Rad u naučnom časopisu (prve, druge i treće kategorije) (R_{53} – bodova 0,75)

1. **<u>Predić, T.</u>**, Nikić, Nauth, P., Tanasić, B., Vidojević, D. (2019): Organic Carbon Stocks in Arable Land of Republic of Srpska – Bosnia and Herzegovina; AGROFOR International Journal, Vol. 4(2), 2019, doi.10.7251/AGRENG1902069P; UDC 631.41:681.518.3(497.6), pg. 70–77.

R_{52}=0,75 bodova *(1,0 x 75% = 0,75)*

<u>Zbornici skupova nacionalnog značaja (R_{60})</u>

Predavanja po pozivu sa skupa nacionalnog značaja štampano u cjelini (uz dokaz) (R_{61} – bodova 1,875)

1. **<u>Predić, T.</u>**, Nikić, Nauth, P., Rapić, K., Jovanović, S. (2022): Korišćenje uređenje i zaštita poljoprivrednog zemljišta. 56. Savetovanje agronoma i poljoprivrednika Srbije (SAPS) i 2. Savetovanje agronoma Republike Srbije i Republike Srpske, Zbornik referata, ISBN 978-86-80417-86-8, str. 149-162.
   R_{52}=1,125 bodova *(1,5 x 75% = 1,125)*

2. Lakić, Ž., **<u>Predić T.</u>**, Savić, B., Jovićević, R., Mihajlović D. (2022): Vrste i kavlitet stočne hrane spremljene na porodičnim farmama u Republici Srpskoj. 56. Savetovanje agronoma i poljoprivrednika Srbije (SAPS) i 2. Savetovanje agronoma Republike Srbije i Republike Srpske, Zbornik referata, ISBN 978-86-80417-86-8, str. 163-173.
   R_{52}=0,75 bodova *(1,5 x 50% = 0,75)*

Predavanja po pozivu sa skupa nacionalnog značaja štampano u izvodu (uz dokaz) – (R_{62} – bodova 1,00)

1. **<u>Предић, Т.</u>** (2019): Поремећаји у развоју коријеновог система јечма у зависности од концентрације алуминијума у земљишту. Симпозијум Српског друштва за проучавање земљишта - Земљиште основно природно добро – угроженост и опасности, Књига апстракта, стр. 7.
   R_{62}=1,00 bod *(1,0 x 100% = 1,00)*

Saopštenje na skupu nacionalnog značaja štampano u izvodu (R_{64} – bodova 0,94)

1. **<u>Predić, T.</u>**, Marković, M., Lukić, R., Nikić, Nauth, P. (2012): Potential fertility of soil types of agricultural land of Republic Srpska; 1st International Symposium and 17th Scientific Conference Of Agronomists of Republic Of Srpska, Book of abstracts, pg. 87.
   R_{64}=0,15 bodova *(0,2 x 75% = 0,15)*

2. **<u>Predić, T.</u>**, Lukić, R., Nikić, Nauth, P., Cvijanović, T., Docić, Kojadinović, T., Lejić, T., Jokić, D. (2012): Introduction of continuous monitoring of agricultural land of Republic of Srpska; **1st** International Symposium and 17th Scientific Conference Of Agronomists of Republic Of Srpska, Trebinje, Book of abstracts, pg. 88.
   R_{64}=0,06 bodova *(0,2 x 30% = 0,06)*

3. Đurić, G., Mićić, N., **<u>Predić, T.</u>**, Karapetrović, B. (2012): Morpho – physiological characteristics of leaf as basis for genotype specific mineral, nutrition of apple; 1st International Symposium and 17th Scientific Conference Of Agronomists of Republic Of Srpska, Trebinje, Book of abstracts, pg. 151.
   R_{64}=0,15 bodova *(0,2 x 75% = 0,15)*

4. **Predić, T.,** Cvijanović, T., Docić Kojadinović, T., Radanović, B., Jokić, D., Malčić, T. (2013): Kontrola sadržaja nitrata i ostataka pesticida u zelenoj salati (Lactuca sativa). II međunarodni simpozijum i XVIII naučno stručno savjetovanje agronoma Republike Srpske, Trebinje, Zbornik sažetaka, str. 64.
   R_{64}=0,06 bodova *(0,2 x 30% = 0,06)*

5. **Predić, T.,** Nikić, Nauth, P., Cvijanović, T., Docić, Kojadinović, T., Radanović, B., Jokić, D. (2015): Uticaj plavljenja Drine i Save na zagađenje poljoprivrednog zemljišta teškim metalima i organskim zagađivačima. IV međunardni sipozijum i XX naučno stručno savjetovanje agronoma Republike Srpske, Trebinje, Zbornik sažetaka, str. 152-153.
   R_{64}=0,06 bodova *(0,2 x 30% = 0,06)*

6. **Predić, T.,** Radanović, B., Nikić Nauth P., Cvijanović, T., Docić Kojadinović, T., Jokić, D. (2015): Plodnost zemljišta porodičnih komercijalnih gazdinstava u Republici Srpskoj. IV međunardni sipozijum i XX naučno stručno savjetovanje agronoma Republike Srpske, Trebinje, Zbornik sažetaka, str. 285-286.
   R_{64}=0,06 bodova *(0,2 x 30% = 0,06)*

7. Nikić, Nauth, P., **Predić, T.,** Predić, A. (2016): LUCAS topsoil survey in Bosnia and Herzegovina; 5th International Simposium and 21st Scientific –Professional Conference of Agronomist of Republic of Srpska, Book of Abstracts, pg. 106.
   R_{64}=0,20 boda *(0,2 x 100% = 0,20)*

8. Đalović, I., Rengel, Z., **Predić, T.** (2016): Crop–Yield Improvement – Strategies for Alleviation to Combined Aluminium Toxicity and Drought Stress; 5th International Simposium and 21st Scientific – Professional Conference of Agronomist of Republic of Srpska, Book of Abstracts, pg. 214.
   R_{64}=0,20 boda *(0,2 x 100% = 0,20)*

Rukuovođenje projektima (R_{90})

Rukovođenje projektima međunardnog značaja (R_{95}- bodova 4,0)

1. **Predić, T.,** (2014-2015):): " Collection of soil samples and data on land use and land cover at the sampling locations for LUCAS Project"; IES.B391031 European Commission, Joint Research Centre, Institute for Environment and Sustainable (IES) Land Resources Management Unit, Ispra, Italy. Rukovodilac projekta.
   R_{95} = 4,0 bodova *(4,0 x 100% = 4,00)*

Rukovođenje projektima nacionalnog značaja (R_{97} – bodova 27,0)

1. **Predić, T.,** (2011-2013): "Utvrđivanje početnog stanja zagađenja zemljišta kao preduslov za uvđenje trajnog monitoringa zagađenja zemljišta – druga faza. JP 03-348/11, sufinansiran od strane Fonda za zaštitu životne sredine i energetsku efikasnost RS. Rukovodilac projekta.
   R_{97} = 3,0 boda *(3,0 x 100% = 3,00)*

2. **Predić, T.,** (2011-2012): "Uspostavljanje stanica trajnog monitoringa poljoprivrednog zemljišta na području Grada Banjaluka u okviru uspostavljanja trajnog monitoringa poljoprivrednog zemljišta Republike Srpske“, ugovor br. 798-11 od 26.06.2011. god. Rukovodilac projekta.
   R_{97} = 3,0 boda *(3,0 x 100% = 3,00)*

3. **Predić, T.,** (2014): "Utvrđivanje stanja zagađenja poljoprivrednog zemljišta poplavljenih površina“ rešenje br.12.03.5-330-3647/14 od 27.08.2014. god. odobreno od strane Ministarstva poljoprivrede šumarstva i vodoprivrede RS. Rukovodilac projekta.
   R_{97} = 3,0 boda *(3,0 x 100% = 3,00)*

4. **Predić, T.,** (2014-2018): „Pedološke analize poljoprivrednog zemljišta za potrebe porodičnih komercijalnih gazdinstava u Republici Srpskoj“, finansiran od strane Ministarstva poljoprivrede šumarstva i vodoprivrede RS. Rukovodilac projekta.
   R_{97} = 3,0 boda *(3,0 x 100% = 3,00)*

5. **Predić, T.,** (2016): „Monitoring plodnosti i zagađenosti zemljišta i podzemnih voda u uslovima navodnjavanja važnijih biljnih vrsta u Lijevče polju“, sufinansiran od strane Fonda za zaštitu životne sredine i energetsku efikasnost RS. Rukovodilac projekta.
   R_{97} = 3,0 boda *(3,0 x 100% = 3,00)*

6. **Predić, T.,** (2017-2019): „Utvrđivanje stanja i uspostavljanja trajnog monitoringa poljoprivrednog zemljišta u zonama uticaja termoelektrana i rafinerije nafte“, sufinansiran od strane Fonda za zaštitu životne sredine i energetsku efikasnost RS, ugovor br. 04-149-01-17 od 13.06.2017. god. i aneksa ugovora 02.01.1-149-3/17 од 04.04.2019. god. Rukovodilac projekta.
   R_{97} = 3,0 boda *(3,0 x 100% = 3,00)*

7. **Predić, T.,** (2018-2022): „Pedološke analize poljoprivrednog zemljišta za potrebe porodičnih komercijalnih gazdinstava u Republici Srpskoj“, finansiran od strane Ministarstva poljoprivrede šumarstva i vodoprivrede RS. Rukovodilac projekta.
   R_{97} = 3,0 boda *(3,0 x 100% = 3,00)*

8. **Predić, T.,** (2018-2019): Predić, T., (2018-2019): Osnova zaštite uređenja i korišćenja poljoprivrednog zemljišta opštine Laktaši. Projekat finansiran od strane Opštine Laktaši, ugovor br. 08-404-114/18. Rukovodilac projekta.
   R_{97} = 3,0 boda *(3,0 x 100% = 3,00)*

9. **Predić, T.,** (2019-2021): Osnova zaštite uređenja i korišćenja poljoprivrednog zemljišta opštine Šamac. Projekat finansiran od strane Opštine Šamac, ugovor br. 01-122-427/18. Rukovodilac projekta.
   R_{97} = 3,0 boda *(3,0 x 100% = 3,00)*

10. **Predić, T.,** (2022): "Utvrđivanje početnog stanja zagađenja poljoprivrednog zemljišta u procesu uspostavljanja trajnog monitoringa poljoprivrednog zemljišta Republike Srpske – zapadni dio RS. Projekat sufinansiran od strane Fonda za zaštitu životne sredine i energetsku efikasnost RS; broj ugovora: 2.01.1-1996-01/21. Rukovodilac projekta.
    R_{97} = 3,0 boda *(3,0 x 100% = 3,00)*

Tabela 1. Pregled rezultata naučno-istraživačkog rada i ukupna vrijednost koeficijenata kompetentnosti prema Pravilniku o postupku sticanja naučnih zvanja, prilog 1. *(Sl. Glasnik RS br. 25/2015)*

Grupa koeficijenata kompetentnosti	Oznaka koeficijenta kompetentnosti	Vrijednosti koeficijenta kompetentnosti (bodovi)	Broj publikacija	Ukupno broj bodova u skladu sa Članom 21. Pravinika
R_{10}	R_{13}	6	1	1,80
	R_{14}	4	3	6,40
R_{20}	R_{22}	5	1	1,50
	R_{23}	3	2	3,90
	R_{24}	3	3	6,75
R_{30}	R_{31}	3	1	0,90
	R_{33}	1	5	3,55
	R_{34}	0,5	6	1,80
R_{40}	R_{44}	2	1	2,00
R_{50}	R_{51}	2	3	4,10
	R_{52}	1,5	2	2,25
	R_{53}	1	1	0,75
R_{60}	R_{61}	1,5	2	1,88
	R_{62}	1	1	1,00
	R_{64}	0,2	8	0,94
R_{90}	R_{95}	4	1	4,00
	R_{97}	3	10	27,00
		UKUPNO:	**51**	**73,52**
			Minimani broj prema Pravilniku:	**38,00**

Tabela 2. Pregled ostvarenih kvantitativnih uslova za izbor u zvanje viši naučni saradnik prema Pravilniku o postupku sticanja naučnih zvanja, prilog 3 *(Sl. Glasnik RS br. 25/2015)*

Naučno zvanje	Koeficijenti kompetentnosti propisani Pravilnikom	Zbir bodova koeficijenata	
		Potrebno	Ostvareno
Viši naučni sardnik	1. Ukupan zbir koeficijenata	≥38	73,52
	2. $R_{10}+R_{20}+R_{31}+R_{32}+R_{33}+R_{41}+R_{42}+R_{51}+R_{80}+R_{90}$	≥30	59,90
	3. $R_{21}+R_{22}+R_{23}+R_{24}+R_{31}+R_{32}$	≥12	13,05

KRATKA ANALIZA RADOVA
KOJI KANDIDATA KVALIFIKUJU U PREDLOŽENO ZVANJE

Naučne knjige (monografije, naučne knjige u užem smislu), monorafske studije međunarodnog značaja (R10)

Monografska studija/poglavlje u knjizi koeficijenta kompetentnosti R_{11} (R_{13})

1. **Predić T.**, Nikić Nauth P., Tanasić B., Docić Kojadinović T., Cvijanović T., Bjelobrk D. (2021): Impact of Flood Disaster on Agricultural Land and Crop Contamination at the Confluence of the Bosna River; The book series "Innovations in Landscape Research", E. Saljnikov et al. (eds.), Advances in Understanding Soil Degradation, ISBN 978-3-030-85682-3 (eBook), https://link.springer.com/book/10.1007/978-3-030-85682-3; pg. 507-528.

The Western Balkans Region (Croatia, Bosnia and Herzegovina and Serbia) was affected by disastrous floods of a large scale in May 2014. The flooded area occupied an approximately total area of 10.000 km2 - 13.000 km2Research results of soil and crop contamination in flooded area of 2845 ha of agricultural land located at the confluence of Bosna and Sava Rivers are presented in this paper. The duration of the flood wave was up to 22 days. The maximum height of water in flooded areas was three meters. Total of 62 samples were collected: 31 soil samples from arable land, 13 samples of flood sediment and 18 samples of plant material. The soil and plant samples were analyzed for the concentrations of Pb, Cd, Cr, Ni, Zn and Cu, by atomic absorption spectrophotometer. The pH of flood sediment was alkaline. The soil pH was in the range of slight acid (pH H2O>6.03) to alkaline (pH H2O-8.25). In the flood sediment and soil samples the elevated Zn concentration (flood sediment: 102-171 mg kg-1, soil: 59.7-276 mg kg-1) and Cu (flood sediment: 41.5–58.2 mg kg-1, soil: 25.7–85.3 mg kg-1) were determined. The Ni concentration in the flood sediment was 240-295 mg kg-1, and in the soil 129 to 452 mg kg-1, which classified these soils as Ni contaminated. Content of Cu in plant material (green fruits of pepper and tomato, onion, potato) was below the MAC (<5 mg kg-1freshweight) at all sites. In all analyzed vegetables and corn grown in the alkaline soil (pH in H2O 8.88–8.13) the Ni content was <5 mg kg-1 of dry matter. At all sites with slightly acidic soil (pH in H2O 6.03-6.72) in the corn, soybean and alfalfa the Ni content was >5 mg kg-1 of dry matter. Analyses of soybean, alfalfa and corn showed that in slightly acidic soils with a high concentration of Ni, and due to the changes in the redox potential of the soil, some heavy metals can dissolve and become available for absorption by plant. Obtained results showed that the floods occurred in May 2014 have not polluted the agricultural land by the tested heavy metals. However they slightly increased concentrations of Ni, Zn and Cu in the places where the flood sediment depth was more than 5 cm. The Ni content in the arable layer of agricultural land depended to a large extent on long-term previous floods, since it accumulated along with flood deposits and mixed with soil during agricultural work

Monografska studija/poglavlje u knjizi koeficijenta kompetentnosti R_{12} (R_{14})

1. Zingstra, H. L., Kiš, A., Ribaric, A. Ilijas, I., Jeremić, J., **Predic T.** (2010): Protection of Biodiversity of the Sava River Basin Floodplains; The relevance of farming and farmland for maintaining the landscape and biodiversity of the Sava floodplains; Final Report of Task C of the EU LIFE TCY 06/INT/246 Project, https://www.researchgate.net/publication/239850075 pg. 1 - 80.

This report presents the results of the activities the land use working group performed in the frame of the Life 3rd countries project: "Protection of Biodiversity of the Sava River Basin Floodplains" (LIFETCY 06/INT/246). The following deliverables are included in this report: Assessment of traditional and ongoing land use activities and their relevance for maintaining the landscape and biodiversity; Analysis of market conditions and product chains; Action plan for restoring, maintenance and management of floodplain areas including; guidelines for land use practices; Concepts for innovative land-use practices; Recommendations for setting up a support/incentives scheme for continuing traditional land uses. The analyses of the land uses is relevant because in combination with the information about the distribution of habitats ands species it provides an essential bases for the identification of threats and the design of the required restoration and management measures to secure favourable conservation status of the habitats and species. Given the time needed to make a full inventory of the land uses of all 49 project sites along the Sava River it was decided to focus on those sites that were indicated as most valuable for biodiversity. The sites were selected in close communication with the biodiversity working group because of the need to improve the protection status and to design management and restoration plans for these sites. An analyses of land uses and their relevance for the landscape and biodiversity was carried out in the following focal areas: Odransko Polje (Croatia), Žutica (Croatia), Gajna (Croatia), Bardača (Bosnia and Herzegovina), Rača (Bijeljina) (Bosnia and Herzegovina) (bordering with Ušće Drine, Serbia), Velika i Mala Tišina (Bosnia and Herzegovina), Zasavica (Serbia), Ušće Drine (Serbia) (bordering with Rača, Bosnia and Herzegovina), Morovičko-bosutske šume (Serbia) (bordering with Spačva, Croatia), Obedska bara (Serbia). The first part of chapter 5 presents the results of the detailed land use inventory of the focal sites carried out in the frame of this project plus the main conclusions of the analyses while the second part of chapter 5 presents basic information about land use issues based on existing data. The land use data were gathered through field work. All data gathered have been processed into SDI (Spatial Data Information) base which is available at the project's web site www.savariver.com.

2. Bukalo, E., Voljevica, N., Behlulovic, N., Vasko, Z., **Predic, T.**, Markovic , B., Bajramovic, S. (2019): Status of Soil, Climate and Digital Mapping Information in Bosnia and Herzegovina; Book - Areas with Natural Constraints in South-East Europe; Assessment and Policy Recommendations; Zdruli, P., et al., Published by: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, ISBN 978-608-4536-06-2; pg. 82 - 117.

The region of Southeast Europe is characterised by a great diversity of climatic, soil and eomorphological features, creating conditions for various forms of farming, from the most advanced and intensive ones implemented in the lower fertile valleys, to more traditional forms in the uplands. Pastoralism and small ruminants play a fundamental role in the livelihoods of mountainous communities. Nature has blessed the region with some of the most fertile soils

found in Europe, like those in the Pannonia plain, as well as gorgeous mountains covered with forests and pastures and fascinating beaches. Nevertheless, the region also possesses soils with natural constraints ranging from salinity, sodicity, poor drainage and texture conditions, shallowness and stoniness. When such conditions are combined with lower temperatures, especially at higher elevations and dry/arid conditions in lower locations, conditions for farming become cumbersome. The first consequence of these harsh biophysical conditions is land abandonment and increased costs for the farmers of these areas. The purpose of ANC payments is to provide total or partial compensation to farmers for the natural or specific disadvantages of farming in areas with natural or specific handicaps to ensure that this land remains in agricultural production and to prevent land abandonment. The European Union has paid particular attention to Areas with Natural Constraints (ANC) and its experiences show that the ANC policies have different results in different EU member states, but the general conclusion is that the ANC approach is an instrument for improved targeting of the national agricultural funds and preserving of the population and the agricultural production in the handicapped areas. Furthermore, the ANC policies remain an integral part of the EU's Common Agricultural Policy (CAP) as they tackle important aspects of the integrated rural development strategies in support of the farmers facing these natural hardships. Institutions in the Republic of Srpska that are in charge of data management regarding ANC are mostly under the jurisdiction or funded by the Ministry of Agriculture, Forestry and Water management (including the Institute of Hydrometeorology, Institute of Agriculture, the public enterprise for water management, the public forest enterprise, etc.). The Ministry is also the UNCCD focal point for B&H. Other important institutions are the Faculty of Agriculture and the Faculty of Forestry that could assist with data collection relevant to ANC project. The institutional setup in regard to the ANC project is closely connected with general spatial (land) data management that is underdeveloped in RS although it is legally defined. Unfortunately, spatial data management based on GIS relevant and reliable facts is still not relevant in the decision making context.

3. **Predic, T.**, Markovic, M., Rogic, B. (2019): Agri-Environmental Policy in Bosnia and Herzegovina; Book - Agri-Environmental Policy in South-East Europe; Cukaliev O. et al., Published by: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, ISBN 978-608-4760-26-9; pg. 103 - 125.

As a transitionl country in the post-war period, BIH has faced a large number of social, economic and other problems. Therefore, environmental protection has not been a development priority, but the EU approximation process has improved the environmental protection policies. According to the Constitution, environmental policy and the use of natural resources are part of the responsibilities of the Entity Governments and the BD Government, which regulate environmental issues within the respective entitiy's laws, regulations and standards. In line with the country's political organisation, there are a number of fragmented jurisdictions on the environment, which are located at four administrative levels: state, entity, cantonal (FBIH) and municipal (RS). In such a complex administrative structure, a major problem is the lack of vertical (entity/cantonal/municipal) and horizontal (inter-entity/inter-ministerial/ intermunicipal) co-operation. There is a visible shift in the implementation of environmental sector reforms. The BIH approximation process to the European Union is one of the main drivers of reform, largely related to the harmonization of the domestic legislation with the EU. In that sense, a set of environmental laws was adopted in FBIH, RS and BD during the period from 2002

to 2004, which is the basis for adopting environmental regulations at all levels. In addition to the government institutions, state and entity agencies and institutes, scientific and research institutions, professional and/or business associations, associations of citizens or nongovernmental organisations play an important role in the protection of the environment. Over the last decade, there has been a growing trend in the number of institutions and organisations, both governmental and non-governmental, which is the result of the increase in the public awareness about the need to preserve the environment. According to the fact that BIH has the status of a potential candidate, environmental protection was not one of the development priorities. Since BIH is a potential candidate for EU membership, it has no obligation to report, but the process of EU approximation has improved the environment protection policies. There is no institutional agro-environmental monitoring scheme within the defined National Reference Centre (NRC) for certain agroenvironmental segments in BIH. The data on individual indicators are collected from different institutions at the Entity level and in BD and then reported to Entity governments and the BD government. Since BIH is a potential candidate for EU membership, it has no obligation to report. However, reports for certain sectors such as air quality and climate change have been prepared. Most environmental monitoring has not been established. However, a certain level of data is collected, and reporting to the EU is mainly based on the reports to adopted conventions and for other accepted obligations (UNCBD, UNFCCC, UNCCD, SOER, EPR).

Naučni časopis međunarodnog značaja (ISI publikacije) (R_{20})

Rad u istaknutom međunardnom časopisu (R_{22})

1. Sunulahpašić, A., Mitrić, S., Šunjka, D., Žabić, M., **Predić, T.**, Šipka, M., Rodić, L. (2020): Adsorption of nicosulfuron herbicide in the agricultural soils of Bosnia and Herzegovina; Plant, Soil and Environment, 66, 2020 (4): 162–166, doi: 10.17221/80/2020-PSE.

In this study, the sorption characteristics of nicosulfuron herbicide in soils from different agricultural regions of Bosnia and Herzegovina, as well as factors influencing the sorption process, were evaluated. The analysis was perfor-med using a batch equilibrium method. The obtained results showed that soils in Bosnia and Herzegovina are very versa¬tile in terms of their characteristics. The Freundlich adsorption coefficient (Kf) coefficient ranged from 0.027 to 7.388, while the slope of the Freundlich isotherm (1/n) varied from 0.291 to 1.927. In soils with pH 4.31–7.60, 1/n was found to be less than 1 (0.337–0.547), and for the extremely alkaline soil with pH 8.2, 1/n was 1.927. Adsorption of nicosulfuron in the tested soils of Bosnia and Herzegovina was significantly correlated with the sand and silt content in the soil. Multiple linear regression correlating log Kf with the sand and silt content in the studied soils was also statistically significant (R2 = 0.951; P = 0.0108). The results of this study indicate that in sandy soils, which are slightly or moderately alkaline, the adsorption of nicosulfuron is very low and only a small amount of nicosulfuron will be adsorbed.

Rad u časopisu međunardnog značaja (R_{23})

1. Tošić, I., Bošković, Rakočević, I., **Predić T.,** Pržulj, N., Savić, B., Trkulja, V. (2018): Assessment of Dutch Tomato Hybrids Grown in Conditions of Western Bosnia and Herzegovina; Genetika 50 (3): 933-942, License CC BY-NC-ND, doi: 10.2298/GENSR1803933T.

The comparative estimation was carried out with seven tomato hybrids (*Lycopersicon esculentum* Mill.) during the period 2011 to 2013 in greenhouse at Agricultural Institute of Republic of Srpska, Banja Luka, Bosnia and Herzegovina. The aim of this study is to examine the dry matter content, lycopene in fruits and total yield of Dutch tomato hybrids in the conditions of western Bosnia and Herzegovina. The experiment was set up by a randomized block design in three repetitions. The dry matter content ranged from 5.60% to 8.14%. Hybrid and hybrid x year interaction had significant ($p<0.05$) influence on lycopene content and tomato yield. The factors that had a decisive influence on the content of dry matter, lycopene content in fruit and tomato yield were year, hybrid and cultivation technology.

2. Jovanović, S., **Predić, T.,** Bratć, G. (2022): Analysis of Free and Open Land Cover Maps for Agricultural Land Use Planning at Local Level; Free and Open Source Software for Geopsatial (FOSS4G) 2022 - Academic Track, The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Volume XLVIII-4/W1-2022, pg. 237-243 https://doi.org/10.5194/isprs-archives-XLVIII-4-W1-2022-237-2022 License CC BY 4.0,

According to the Law on Agricultural Land of the Republic of Srpska, municipalities and cities are obliged to prepare a planning document "Groundwork for Agricultural Land Protection, Use and Restructuring (The groundwork)". Information related to the current state of land cover and land cover use are essential for the groundwork. Such layer was created for the municipality Laktaši in Bosnia and Herzegovina by digitization of land cover features from orthophoto imagery. Even if digitization provides highly reliable data, it is also time-consuming activity, and therefore the evaluation of Corine Land Cover (CLC) for the municipality Laktaši was performed to determine if it is accurate enough to sustain the groundwork for other municipalities. In this paper, using free open source programs, a comparison of two sets of data representing land cover was performed: manually vectorized data with orthophoto images of LC/LU and CLC. Using QGIS, the two datasets were harmonized, and then the error matrix and accuracy indexes were computed by using Python. The obtained results show that the overall accuracy of CLC with respect to LC/LU reference is 70%, but the class related to agricultural areas are overestimated in some locations and underestimated in other locations. After analyzing the results, it was concluded that the CLC in the studied area is not a sufficiently precise GIS basis for agricultural land use planning at the local level. However, it can be a good starting point for making of LC/LU, which would significantly shorten the time of its creating.

Rad u časopisu međunarodnog značaja verifikovanog posebnom odlukom (R_{24})

1. Lakić, Ž., **Predić T.**, Đurđić, I., Popović, V. (2020): Recultivation of degraded soil due to mining activity without adding organic layers of soil using Alfalfa and mixtures of grass legumes; Agriculture and Forestry, 66 (4): 223-237, doi: 10.17707/AgricultForest.66.4.18.

The aim of this research was to examine the possibility of reparing the chemical properties of substrate and regenerating the vegetation of degraded soil due to mining activity without adding

the fertile soil layer. The research was carried out in the period 2011-2013 on degraded soil of mine and thermal power plant Gacko. The experiment was placed on a landfill located in Srđevići. For these tests, grass-leguminous mixtures were used: I/G (alfalfa 70%, orchard grass 30%); II/G (alfalfa 70%, orchard grass 15%, tall oat-grass 15%); III/G (red clover 50%, italian rye-grass 50%); IV/G (alfalfa 30%, tall fescue 40%, smooth brome15%; orchard grass 15%) and alfalfa 100%. The following parameters were monitored and analyzed during the tests: mechanical soil composition, soil chemical properties, microelement content in the soil: Zn, Mn, Fe, Cu; the content of heavy metals in the soil: Pb, Ni, Cr, Cd, Hg, As, plant species presence in the mixture, soil cover with grass, yield of green mass by cuts and years, content of microelements and heavy metals in dry vegetable mass by cuts and influence of nitrate content of individual microelements and heavy metals in soil and dry mass of plants. Studies of the content of microelements and heavy metals in degraded soil showed that it contained Cd in significantly higher value than the permitted limit value. Other elements were within the limit values permitted for agricultural land. The content of Cd in 2011 was 5.1 mg kg-1 of soil, and in 2013 it was 4.5 mg kg-1 of soil. By analyzing the composition of the green matter in mixtures I/G, II/G and IV/G, it was found that orchard grass was predominantly present in relation to other constituents of the mixture. The III/G mixture was dominated by Italian rye-grass. The participation of other plant species in the mixture was extremely low. In the green mass of all mixtures, leguminous was represented in a small percentage. The largest soil cover with plants was achieved with the mixture IV/G (88.4%), which at the same time achieved the highest average yield of green mass. The determined values of the content of microelements and heavy metals in the dry mass were within the allowed limits. Nitrates influenced the reduction of Cu and Cr content in soil and Cd content in dry plant mass.

2. Vidojević, D., Manojlović, M., Đorđević, A., Nešić, Lj., **Predić, T.** (2020): Correlations between Soil Organic Carbon, Land Use and Soil Type in Serbia; Matica Srpska Journal for Natural Sciences, Novi Sad, 138, 9-18, https://doi.org/10.2298/ZMSPN2038009V

Correlation between soil organic carbon (SOC) and land use and soil type were investigated in the soils of the Republic of Serbia. The database included a total of 1,140 soil profiles. To establish the correlation between organic carbon content and soil type, a soil map of Serbia was adapted to the WRB classification and divided into 15,437 polygons (map units). The SOC stock values were calculated for each reference soil group based on mean values of SOC at 0-30 and 0-100 cm and their areas. The largest SOC stocks for the soil layers 0-30 cm were found in Cambisol 194.76 x 1012 g and Leptosol 186.43 x 1012 g and for the soil layers 0-100 cm in Cambisol 274.87 x 1012 g and Chernozem 230.43 x 1012 g. Using the Corine Land Cover (CLC) database, the major categories of land use were defined. Based on the obtained mean values of organic carbon content for the soil layers 0-30 and 0-100 cm and the areas indicated by Corine Land Cover categories of land use, the organic carbon stocks in agricultural soil, forest soil, semi-natural areas, and artificial areas were calculated. The correlation of organic carbon stocks and the different land use categories, soil reference group, and soil depth was studied for reference groups that occupy the major part of central Serbia, such as Cambisol (taking up 37.76% of the territory) and Leptosol (22.22% of the territory), and have a sufficient number of sites that were required for this type of analysis.

3. **Predić,** T., Pešević, D., Popović, V. (2022): Causes of Acer platanoides “Globosun” tree rows damages in urban environment; Agriculture and Forestry, 69 (4): 7-20. doi:10.17707/AgricultForest.69.4.01.

Three years after the reconstruction of the promenade (paving) and the formation of a row of Acer platanoides "Globosum" trees in the main street of Banjaluka, a large number of trees showed symptoms of intense leaf necrosis and inhibited growth. A few trees have completely dried out. Preliminary research has shown that the mentioned symptoms are not caused by the outbreak of diseases and pests. In order to determine the real causes, soil and plant material analyses were carried out in five groups of trees that differ in the development of the crown and the intensity of the symptoms on the leaves. The soil was taken from the planting sites from two layers: 0-20 cm and a layer from 20 cm to the depth where the crushed limestone substrate was found. Leaves were taken from the lower part of the crown where symptoms first appeared (oldest leaves). The following analyzes of the soil were caried out: pH (H2O and 1M KCl), total carbonates, humus, easily soluble P2O5 and K2O. The content of N, P, K, Ca, Mg and Fe was analyzed in the leaves. Although the visual symptoms on the leaf were characteristic of K deficiency, the content of all tested elements decreased as the symptoms of necrosis became more intense. An alkaline reaction (8.8 – 9.1 pH H2O) was found in all soil samples, which led to disorder in the Acer nutrition. At a depth of 30 cm, where the trees were drying out, a layer of crushed limestone of different thickness was found which led to the interruption of the capillary movement of water. The roots of Acer trees which did not grow through the layer of crushed limestone depended exclusively on atmospheric precipitations. In these locations, in conditions of drought and high temperatures, the Acer trees were in the phase of complete drying out.

Zbornik međunardnih naučnih skupova R30;

Predavanje po pozivu sa istaknutog međunardnog naučnog skupa štampano u cjelini (R_{31})

1. **Predić, T.**, Lukić, R., Nikić, Nauth, P., Cvijanović, T., Docić, Kojadinović, T., Malčić, T., Jokić, D., Radanović, B. (2013): Introduction of Continuous Monitoring of Agricultural Land of Republic of Srpska; Plenary Lectures, International Congress on Soil Science Society of Serbia: SOIL-WATER-PLANT, UDC:502.55:631.142, Proceedings, pp 1–16.

Strategy of sustainable agricultural development is impossible without monitoring the changes in the soil as an integral part of environmental monitoring. From 1992 to 1997, the monitoring of land is introduced respectively: Bulgaria, England, Finland, Czech Republic, Norway, Slovakia, France, Holland, Hungary, Austria, Spain and Germany. Slovenia introduced it in 2007 and Croatia in 2010. Because of specificity of lands in relation to water and air, this job is very complex and expensive. The importance of land protection was not well recognized by decision makers in the RS and FBiH. However, the importance of land monitoring is stressed by the EU. This paper presents the results of previous research and implemented projects that were aimed to finding the most appropriate model for establishing a permanent monitoring of agricultural land in the RS. Also, it presented a model for establishing a permanent monitoring of

pollution of agricultural land of the RS, which will meet all EU requirements and is acceptable for the economic situation of the Republic of Srpska.

Saopštenje sa istaknutog međunardnog naučnog skupa štampano u cjelini (R_{33})

1. **Предић, Т.,** Никић, Наутх, П., Лукић, Р., Цвијановић, Т. (2011): Начин кориштења пољопривредног земљишта Републике Српске. Међународни научни симпозијум – Agrosym 2011, UDK:332.3:63 (497.6 RS), Зборник радова, стр. 147-156.

Основа заштите уређења и кориштења пољопривредног земљишта Републике Српске као основа процеса планирања кориштења пољопривредног земљишта (у даљем тексту, Основа РС), је стратешки докумнт Владе РС који је израђен 2009. године од стране пољопривредног института РС. Један од резултата овог пројекта је и дигитална ГИС карта земљишног покривача и начина кориштења земљишта РС (у даљем тексту, ЗПНК-РС) у размјери 1:100 000. Основа за израду ЗПНК-РС су сателитски снимци (удаљем тексту, САТ снимци) LANDSAT7 из 2007 године (RGB , и панхроматски, резолуција 15 m) и IRS SAT снимци (Indian Remote Sensing, 5 m резолуција) такође из 2007године. Поред САТ снимака кориштене су топографске карте 1:100000, као и провјера сатања на терену. За интерпретацију САТ снимака и одређивање ЗПНК-РС класа кориштена је FAO номенклатура LCCS (FAO Land Cover Classification System) која је модификована за услове РС и БиХ (FAO пројекат 2000 – 2002) и која има 36 ЗПНК класа. Приликом интерпретације САТ снимака и провјере стања на терену у табелу атрибута сваке ЗПНК класе унешено је неколико врло битних података од којих се издвајају: примарни начин кориштења земљишта; % заступљеност примарног начина кориштења; секундарни начин кориштења, % заступљености секундарног начина кориштења; просјечна величина парцела.коначни резултати су представљени дигиталном ГИС картом ЗПНК-РС која се састоји од 5270 полигона. Обрадом података су добијени следећи резултати. Од укупно 2505300 ha површине RS, 16,3% површинеје обрађено; 4,2% површине је запуштено (105391 ha); 8,4% површина се користе као ливаде; 11,9% као пашњаци; 0,1% површине су рибњаци, а 56% површине је непољопривредно земљиште. Добијени резултати су поређени са катастарским подацима из 2007. године. Дигитална карта ЗПНК је израђена у геоинформационом систему (ГИС) кориштењем ArcGIS software, у Gauss Krueger пројекцији и у размјери 1:100000.

2. **Predić, T.,** Pećanac, D., Radanović, B., Docić-Kojadinović, T., Radanović, D. (2012): Root and leaf mineral content of wild growing yellow Gentian (gentiana lutea l) from natural habitats in western part of Bosnia and Herzegovina; 7th Conference on Medicinal and Aromatic Plants of Southeast European Countries, Proceedings, ISBN: 978-86-83-141-16-6, pg. 68 –73.

The content of macroelements (N, P, K, Ca, and Mg) and microelements (Fe, Mn, Zn, Cu) was examined in root and aboveground part of yellow gentian (Gentiana lutea L.) from the natural habitats of the mountains Klekovača, Osječenica and Vranica, Bosnia and Herzegovina. Plant samples were taken in the mid-August 2009 at three replications from each location were surveyed. Nitrogen was determined using Kjeldahl method, phosphorus by spectrophotometry and Ca, K, Mg, Fe, Mn, Zn, Cu AAS in the solution, after the destruction of samples in acid mixture Yellow Gentian's leaves contained in first the Ca (1,3 - 1,9 %) and N (1,1 - 1,9 %) , followed by K (0,7 - 1,3 %) and Mg (0,2 - 0,8 %), whereas the lowest content expressed the phosphorus (0,03 -

0,11 % P). Among microelements, the leaves contained mostly the Fe (46 - 213 mg kg-1) followed by Mn (23 - 82 mg kg-1) and Zn (32 - 55 mg kg-1), and finally the Cu (13 - 21 mg kg-1). The content of mineral elements in the root varied in significantly narrow range than in the leaves. Among the macroelements in the yellow gentian root, the most present were Ca (0,9 - 1,1 %) and N (0,8 - 1,2 %), while the lowest content had the phosphorus (0,01 - 0,02). Root bark had a similar content of macroelements as the inner part of the root, except for calcium which was for 45% higher in the cortex. Root bark contained 5 times higher content of Fe then inner root parts, while the content of Mn in the bark was 2 times higher than in the inner part of the root. The content of Zn and Cu was similar in both parts, the inner part of the root and root bark. Different soil and climate characteristics at the study sites affected the most of identified differences in the content of Fe, Mg and Mn in gentian leaves, and in less extent had the impact on its content in the roots. The content of Zn and Cu in gentian parts was the least dependent on the site features.

3. **Predic, T.**, Lukic, R., Cvijanovic, T., Docic–Kojadinovic, T., Malcic, T., Pesevic, D. (2012): Research on the Content of Plant Nutrients and Pesticide Residues in Drainage Water; The Fifth International Scientific Conference on Water, Climate and Environment, Ohrid, Proceedings, pg. 86-90.

Savremena biljna proizvodnja podrazumjeva upotrebu mineralnih đubriva i sredstava za zaštitu bilja (pesticida), čiji ostaci, u zavisnosti od doze, načina poljoprivredne proizvodnje i vremenskih uslova mogu dospjeti u površinske i podzemne vode. U radu su predstavljeni rezultati istraživanja zagađenja drenažnih voda sa parcela pod intenzivnom poljoprivrednom proizvodnjom, na tipu zemljišta pseudoglej u Lijevče polju, Republika Srpska, Bosna i Hercegovina. Parcela površine 25 hektara, dužina drenova 270 m, rastojanje drenova 30 m, promjer cijevi 80 mm . Drenovi su postavljeni na 1 m dubine i šljunak. Filter materijal u sloju od 60 cm. Uzorci vode su uzimani u jesen 2009., nakon dugog sušnog perioda, na tri lokacije: na izlazu iz odvodnih cijevi u kanale (7), u sabirnim kanalima i na ušću u rijeku Savu. Uzorci su uzimani 4 puta poslije početka isticanja vode iz cijevi. Na terenu je mjeren protok vode iz cijevi. Analiza uzoraka vode je urađena u laboratoriji Zavoda za agrohemiju i agroekologiju, Poljoprivrednog instituta Republike Srpske. Analiza je obuhvatila ispitivanje sadržaja nitratnog azota, P2O5 i 22 jedinjenja pesticida. Rezultati su varirali u zavisnosti od padavina i datuma uzorkovanja vode . Prosječne koncentracije NO3-N bile su u rasponu od 2,31 do 21,81 mg/l, koncentracije NH_4-N od 0,30 do 1,36 mg/l i koncentracija P_2O_5 od 0,08 do 1,20 mg/l. Od ispitanih pesticida u uzorcima drenažne vode, detektovano je prisustvo atrazina (u koncentraciji 0,10 do 0,20 mg/l), metolahlor (0,10 do 0,50 mg/l), permetrin (0,11 do 1,60 mg/l), beta -HCH (0,10 do 0,52 mg/l) i gama - HCH (od 0,06 do 0,16 mg/l). Najniže koncentracije ispitivanih parametara pronađene su u prvom i poslednjem merenju, a najveće koncentracije u drugom i trećem uzorkovanju, kada je protok vode iz drenažnih cijevi bio stabilan

4. **Predic, T.**, Radanovic D. (2015): Phytotoxic effect of aluminium and manganese in barley; 9th International Simposium on Plant-Soil Interactions at Low pH, Proceedings, pg. 139-140.

In order to determine the cause of the characteristic symptoms of the toxicity of manganese in barley that is grown on acid soils, pot experiment in the open field is set. The experiment with winter barley (*Hordeum vulgare sp.*) is set on a plot with three levels of pH (1M KCl): I), 3.68-

3.52; II) 3.87-3.77; III) 4.32-4.13. The concentration of available Mn=93.9-174.7 mg/kg, mobile Al=2.2-34.5 mg/100g. The first symptoms of the toxicity of Mn (dark spots) occur in the phase of the first fully developed leaves, when the ratio of Fe/Mn in the leaf is <0.5. The most intense symptoms at low and medium Al damage of the root system occur, when the ratio of Fe/Mn <0.2.

5. **Predić, T.,** Nikić-Nauth, P., Jovanović S., (2021): Land Cover/Land Use in service of agricultural land protection, use and restructuring; 3rd International and 15th National Congress, Serbian Society of Soil Science, Booko of proceedings, pg 350-365, ISBN-978-86-912877-5-7. https://congress.sdpz.rs/

Prevention of degradation should be the most important part of the land protection policy of every country and local community. In order for this policy to be implemented properly, relevant indicators of the state of land resources are necessary. According to the Law on Agricultural Land of the Republic of Srpska, municipalities and cities are obliged to prepare a planning document "Groundwork for Agricultural Land Protection, Use and Restructuring (The groundwork)". The Groundwork of municipalities is made by GIS reading and processing of existing relevant data on land resources and climate (digital terrain model, pedology, land cover and method of use, climate data…). With GIS modeling of existing data, new relevant data were created (bonity, agro-ecological zoning, suitability of cultivation…) which are used in the decision-making process. All GIS bases are made in ArcGIS software, *Gauss Krueger* projection in the scale of 1: 100000, 50000 and 25000. The only GIS base that is made in the scale of 1: 5000 is the land cover and land use (LC/LU). The paper presents a semi-automatic and manual method of digitization (vectorization) of the LC/LU classes on the example of making the Basis of Laktaši municipalities. Orthophoto images from 2012 were used to delineate the LC/LU areas, and satellite images from Google Earth for 2017 and 2018 were used to determine the changes in the LC/LU from 2012 compared to 2018. The obtained LC/LU result is presented in the form of a polygon (shape file). For the delimitation of the polygon, 8 main classes were used, which contain 22 out of a total of 36 classes of LC/LU that are represented on the territory of the entire Republic of Srpska. The obtained data are compared with cadastral data that have not been updated for many years, and are used as official data. According to LC/LU data, agricultural areas occupy 49.5% of the municipality, which is a decrease of 15.8% or 6137 ha compared to the data from the cadaster. Of this area, 418.4 ha was converted into unproductive land (built up areas), and most of the changes were identified with the increase of areas under woody vegetation, i.e. in overgrowing of uncultivated areas (17.7% or 5719 ha). From the degraded areas, exploitation fields of gravel (217 ha or 0.6% of the total area of the Municipality) have been identified, which are also open on agricultural areas. The expansion of exploitation came due to the construction of a network of highways. By overlapping the bonity map with the built-up areas, it can be concluded that 264 ha of land of the first bonity class, 61 ha of the second and 397 ha of agricultural land of the third bonity class were permanently lost, which totals in 722 ha of the best land. A comprehensive analysis found that there was a significant increase of non-agricultural land area, and significant reduction of cultivated land in relation to arable land.

Saopštenje sa međunardnog naučnog skupa štampano u izvodu (R_{34})

1. **Predić, T.**, Nikić, Nauth, P., Cvijanović, T., Docić, Kojadinović, T., Radanović, B, Jokić, D. (2014): State of pollution of flooded agricultural land in the north part of Bosnia and Herzegovina; 7th Congress of the Croatian Society of Soil Science: Sustainable soil management for food and environment safety, Book of Abstracts, pg. 93.

This paper will present the results of the research of soil contamination in flooded area of Samac municipality located at the confluence of Bosna and Sava rivers. The duration of the flood wave was up to 23 days. The maximum height of water in flooded areas was 3 m. The flooded area covers 2845 ha. Sampling was performed according to a network of points Etrs89 references EuropeanNetwork 500 m x 500 m. The average samples were taken from the surface of the circle 30m in diameter. The total number of soil samples was 23 (arable land) and 13 samples of sediment-mud. The samples were analyzed for the total content of heavy metals (aqua regia): Pb, Cd, Cr, Ni, Zn, Cu and organic pollutants PCBs and TPH. Analysis of pH (H_2O and M KCl), humus, readily available P_2O_5 and K_2O were also carried out. Elevated concentrations of Ni, Cu and Zn were identified in the analyzed samples. Except in one sample, the content of Ni in mud samples was higher than in soil samples. Ni content in mud was from 240.5 mg/kg to 294.5 mg/kg. The Ni content was from 128.9 mg/kg to 452.1 mg/kg, which classifies this flooded soil as contaminated soil with Ni, according to *The European Soil Database, version V2.0, EUR 19945.* All mud samples were alkaline, and 79% of soil samples were alkaline and neutral reaction. The analysis indicated that the flood in May 2014 was not the cause of soil contamination with Ni, Cu and Zn, but it contributed to the overall content increases of these elements in the soil.

2. **Predić, T.**, Lakić, Ž., Pešević, D., Lukić, R. (2014): Rekultivacija jalovišta laporca termoelektrane Gacko"; Integrated Meeting - Planning and Land Use and Landfills in Terms of Sustainable Development and New Remedation Technologies – SOIL 2014, Book of Abstracts, pg. 148-149.

Agricultural Institute of the RS, in the period 2011-2013, conducted research on degraded surface of thermal power-plant of Gacko for the purpose of selection of the most adoptable plant species to establish economically viable reclamation. In the selected site location of tailing, whose surface area of 1 ha is marl, there has beeen an experiment with four combinations of substrates: I) soil 30 cm; II) soil 60 cm; III) ash 40 cm + marl 35 cm + soil 40 cm; IV) ashes 40 cm + marl 35 cm + soil 40 cm and 0) control of the marl. Chemical characteristics of marl: 8.40 pH in H2O, 98.3 % CaCO3, 1.1 mg P2O5/100 g and 1.3 mg K2O/100 g. Chemical characteristics of soils used for the reclamation: 8.1 pH in H2O, 7.4 pH in 1 M KCl, 16.3 % CaCO3, 2.1 mg P2O5/100 g and 7.5 mg K2O/100 g. On the combination of substrates, there are fodder crops of small grains, grass-legume mixtures and planted different kinds wooden varieties. In this paper, a two-year results were researched, which were obtained by a combination of five seeding legumes and grass-legume mixtures: 1) 100 % alfalfa *(Medicago sativa L.)*; 2) alfalfa 70 % + 30% cocksfoot *(Dactylis glomerata L.);* 3) alfalfa 70 % + cocksfoot 15 % + 15 % tall oatgrass *(Arrhenatherum elatius L)*; 4) 50 % red clover *(Trifolium pratense L.)* + 50 % italyan ryegrass *(Lolium multiflorum Lam. - syn. L. Italicum A. Br.)*; 5) 30 % alfalfa + 40 % tall fescue *(Festuca arundinacea L.)* + 15 % awunless brome *(Bromus inermis Leyss.)* + 15 % cocksfoot. In the first year there were two, and in the second year there were three harvests. The values are measured for the following

parameters: ground cover, green mass yield, botanical composition and yield of hay. There were chemical analysis of hay on the content of macro-and microelements and heavy metals. On the basis of two-year testings, the following was concluded: The amount and distribution of rainfall had a significant impact on ground cover, yield of green and dry mass and botanical composition of the mixture on all combinations of substrates; Best ground cover of substrate was achieved with alfalfa in pure sowing (combination 1) and mixtures alfalfa 70 % + 30 % cocksfoot (combination 2); the worst average coverage on all surfaces, had a combination 4 - mixture of 50 % red clover and italian ryegrass 50 %. This mixture has suffered the greatest damage from prolonged drought in 2012. The highest twoyear average hay yield of 7.4 t/ha gave a combination 2 - mixture of alfalfa 70 % + 149 cocksfoot 30 % and a combination 3 - alfalfa 70 % + cocksfoot 15 % + 15 % tall oatgrass on a combination of substrate IV ash 40 cm + marl 35 cm + soil 40 cm. Three mixtures have yielded significant average yields of hay on the control i.e. the on the pure marl: 4.2 t/ha of hay combination 2 - mixture of alfalfa 70 % + 30 % cocksfoot; the two mixtures gave 4.0 t/ha, a combination 4 - red clover 50 % + italian ryegrass 50 % and a combination 5 - 30 % alfalfa + 40 % tall fescue + 15 % awunless brome + 15 % cocksfoot. The results obtained on pure marl suggest that further research should be directed towards testing perennial legumes, grass and grassclover mixtures in direct and indirect reclamation of marl but with less powerful layer of soil and substrates, up to 20 cm, in order to find the most suitable, economically viable solutions transfer of mining degraded land to a condition suitable for use for agricultural purposes.

3. **Predić, T.**, Nikić, Nauth, P., Cvijanović, T., Docić, Kojadinović, T., Radanović, B., Jokić, D. (2014): State of pollution flooded agricultural land in the Republic of Srpska; 5th International Scientific Agicultural Symposium - Agrosym, Book of Abstracts, pg. 111.

Ministry of Agriculture, Forestry and Water Management of the RS prescribed a set of short- and long-term measures for rehabilitation of the consequences of the floods that hit the Republic of Srpska in mid-May of 2014, and in order to rehabilitate the damages in the current production, launching new production cycle and restore production capacities damaged by floods. The set of urgent short-term measures includes testing of agricultural land in the flooded area to determine the presence of contaminants on the basis of which a set of measures/recommendations for the remediation of contaminated land will be determined. The selection of surfaces for examination was made by GIS technology. The following data were used: borders of flooded areas (SHP) , high resolution satellite images, land cover and land use (SHP) and the EU reference network 500x500 m. For the preliminary state of pollution, the point from the 2 km x 2 km net were taken. Totally, there were 148 points taken. With GPS, all points were located in the field. Average samples were taken from the surface by a circle of 30 m radius, which is homogeneous by relief, soil type and usage. An average sample consisted of the 20 individual samples taken from a 25 cm depth. The samples of sediment - mud were taken from fifty locations. In all the samples, the basic parameters of fertility were determined by (pH, N, P_2O_5, K_2O), the total content of heavy metals Cu, Zn, Pb, Cd, Ni, Cr, Hg, content of PCB and total petroleum hydrocarbons. The analyses were performed by Agricultural Institute of the RS according to standard methods. Based on the results, directions of further actions will be determined and measures that need to be taken to remediate land in areas where needed. All data will be stored in the GIS database: basics, protection, development and land use of the RS and will be displayed in the overview maps.

4. Tanasić, B., **Predić, T.**, Bogdanović, D. (2017): "Distribution of phosphorus by pseudogley profile based on the using of phosphoric fertilizers in Pear plantations"; 2nd International and 14th National Congress of Soil Science Society of Serbia "Solutions and Projections for Sustainable Soil Managment", Book of abstracts, pg. 27.

A significant part of the fruit production in the northern part of the Republic of Srpska takes place on pseudogley soil that have adverse physical and chemical properties as well as low nutrition content, above all phosphorus. Phosphorus is a weakly mobile element in the soil, and in pseudogleys, due to its poor physical properties and its acid reaction it comes to its immobilization with Al, Fe and Mn ions. In the orchards, regular winter fertilization is carried out by applying PK fertilizers to herbicide strips with or without inserting the soil. The aim of the research is to determine the distribution of phosphorus by the soil profile depending on the method of introducing phosphorous fertilizers and to reconsider the most efficient way of applying fertilizers in regular winter fertilization of pears on the pseudogley. Sampling of the soil was carried out in pear orchards in which P fertilizer was introduced in three ways: Variant A) without meliorative fertilization during the phase of setting up the plantation with regular surface application of the fertilizer without tilling; Variant B) without meliorative fertilization in the phase of setting up the plantation with regular surface application of the fertilizer with tilling; Variant C) melirative fertilizing in the phase of setting up the plantation with regular surface application of the fertilizer with tilling. The soil was sampled at the depth of the profile, every 5 cm, to the depth of 40 cm (8 samples) and every 10 cm for the layer 40-60 cm (2 samples, i.e. a total of 10 samples). The profiles were opened in herbicide strips with a tractor drill of 60 cm in diameter. Because of the small work space from the 40-60 cm layer it was impossible to take samples in layers of 5 cm. In variants, soil was sampled in five repetitions. Each repetition (block) is open by 5 semi profiles by random selection. Individual samples for each layer of soil from the five profiles were mixed and represent an average sample for the respective layer. In this way, 10 average samples per layer were taken from each repetition (0-5 cm, 5-10 cm, 10-15 cm, 15-20 cm, 20-25 cm, 25-30 cm, 30-35 cm, 35-40 cm, 40-50 cm and 50-60 cm). The basic parameters of the fertilizer were analysed in these samples: pH H2O, 1M KCl, humus (method by Kotzman), easily available forms of P_2O_5 and K_2O (AL-method Egner-Rihem)

5. **Predić, T.** (2018): Phytotoxic Effects of Aluminum on Distryc Cambisol and Pseudogley; 7th International Simposium on Agricultural Sciences, AgroRes, Book of Abstracts, pg. 69.

Among the researchers prevails general agreement that Al-toxicity is a major factor of the limited production of crops on the highly acidic soils. Top of the root is a critical point of the Al-toxicity. Vegetation trial with the two soil types: distryc cambisol and pseudogley, with three levels of acid and highly acid reactions *(pH M KCl: 4,32 – 4,13; 3,87 – 3,77; 3,68 – 3,52)*, was set up in pots in the open field, where disorders in development of barley (*Hordeum vulgare sp.*) in the first phases of development, caused by different concentrations of mobile Al *(2,2 – 6,4; 14,2 – 19,3; 29,1 – 34,5 mg Al/100g:)* and available Mn *(93,9 – 174,7 mg/kg),* were monitored during the three-year period *(until second leaf phase).* The experiment was stopped when the symptoms of chlorosis and necrosis affected about 50% of the leaf surface of barley on some of the tested combinations of soil acidity. Methods for chemical analysis of soil: Mobile Al - method by *Sokolov*, available Mn, extraction with 1M CH_3COONH_4 (*pH 7.0*), reading on the AAS,; Analyses of plant material of root and leaf in wet burned sample (*conc* H_2SO_4+ H_2O_2+450 ° *C*): Nitrogen *(% N*):

Kjeldahl method, Phosphorus *(% P_2O_5)*, *vanadt - molybdate method*; *Mn, Zn, Fe,* reading on the AAS. Based on the results, it can be established that the disorders in development of the aboveground parts of barley plant on acid and highly acid soils were caused by the disorders in development and performance of the root system affected by different concentrations of mobile Al. Growing, developing and performing disorders of root system are displayed immediately after the emerging, and their intensity depends on the concentrations of mobile Al in the soil. Even small amounts of mobile Al, from 3 – 6 mg Al/100g soil can cause disorders in root system development in barley plants, while the concentrations from 29 – 34 mg Al/100g can lead to a complete stunting of primary root development immediately after emerging. Thus, the ˝root system˝ consists of 4 - 5 thickened small roots up to 1 cm long. Disorder symptoms and intensity of the aboveground barley plant parts depend on the extent of root system damage, therefore they can be manifested differently from the appearance on the soil surface *(emerging)*, until the second leaf phase. The symptoms can occur in different forms, but only the dark brown leaf spotting symptom can be attributed to the toxic concentrations of Mn *(308 mg Mn/kg)*. Depending on the extent of root system damage, the other *(non-specific)* symptoms can be caused by individual, and most probably common effects of all the elements which are in critical *(deficiency or excess)* concentrations *(N, Ca, Mg, Mn, Fe...)*. In addition to the above mentioned chemical traits of soil, the climate conditions are significant factors which effect the mode and intensity of symptom appearance on the aboveground plant parts of barely significantly.

6. Lakić, Ž., **Predić, T.**, Žabić, M., Zoran Maličević, Z. (2020): Quality of Silage from Whole Maize Plant Prepared on Dairy Cattle Farms; 9th International Symposium on Agricultural Sciences – AgroRes 2020, Book of Apstracts, pg. 45.

The goal of this research was to determine the quality of silage from the whole maize plant prepared on dairy cattle farms in lowland and mountain areas of Republic of Srpska. Examination of the quality of maize fodder was conducted for three years, from 2011 to 2013. The samples of silage were taken from the locations Prijedor, Derventa and Mrkonjic Grad. This research included nine farms. Farm silage samples were taken from horizontal silos and silo stacks during the winter period. Organoleptic properties, odor, color and presence of mold on samples were determined directly on the farm. One kilogram samples were taken for chemical analysis and packed in nylon bags. The following parameters were determined: moisture content, pH value, crude proteins, crude cellulose, crude fat and ash. The following parameters were obtained by calculation: BEM, metabolic energy and NEL. A significant variation in pH value and dry matter content was observed in the tested maize silage samples. The pH values varied from 3.3 (Mrkonjic Grad) to 4.3 (Derventa) and dry matter content ranged from 249.1 g kg-1 DM (Mrkonjic Grad) to 452.0 g kg-1 DM (Derventa). A significant variation in the content of crude cellulose was also observed, ranging from 195.7 to 304.6 g kg-1 DM. The silage from farm 2 (Prijedor, 2012) had the best quality, with 100.2 g kg-1 DM of crude proteins and 6.24 MJ kg-1 DM of energy value NEL.

<u>Nacionalne naučne knjige (monografije) (R_{40})</u>

Poglavlje u knjizi koeficijenta kompetentnosti R_{41} (R_{44})

1. Стричевић, R., Предић, Т., Марковић, М. (2022): Климатске промјене и управљање земљиштем, Монографија - Управљање природним ресурсима у ери климатских промјена. Трбић, Г. и сар., Академија наука и умјетности Републике Српске, Едиција Одрживи развој и управљање природним ресурсима Републике Српске, стр. 273 – 332.

Есенцијални ресурси за опстанак живог света су ваздух, вода и земљиште. Земљиште је у суштини једини необновљиви природни ресурс, са потецијално брзом стопом деградације и са веома спорим процесом формирања и регенерације. Вода и земљиште су ресурси карактеристични за свако климатско поднебље, самим тим свака климатска промена неминовно утиче на процесе у земљишту и његово коришћење, чија сведочења данас можемо пратити проучавањем фосилних земљишта. Процеси у и на земљишту који су интензивирани последњих пар деценија широм света, попут ерозије, превлаживања, суше, пожара, губитка органске материје и слично, повезују се са климатским променама и видљиви су и на поростору Републике Српске. Основни задатак данашњег човека је да рационално користи земљиште и да га сачува за нова покољења. На осову расположивих података и климатских модела у будућности, дошло се до следећих закључка: коришћење земљишта се неће битније нарушити, нити ће бити угрожена ратарска производња; и даље ће владати повољни климатски услови за производњу кукуруза, пшенице, кромпира, с повећаним међугодишњим варијацијама до краја века; због раније сетве биће изражени проблеми превлаживања; редовно одржавање постојећих дренажних система треба да обезбеди пуну функционалност, а на угроженим местима треба градити нове; за развој воћарства и повртарства неопходна је изградња система за наводњавање; системско решавање постојећих еризионих процеса и спречавање појаве нових је такође неопходно, јер у будућим климатским условима могу се очекивати сушни периоди већег интензитета праћени јаким кишним олујама, који услед сасушеног биљног покривача могу изазавати трајни губитак земљишта; с обзиром да су земљишта Републике Српске јако сиромашна хумусом, тј. органским угљеником, неопхпдно је примењивати агротехничке мере које ће повећати унос органске материје. Намерно паљење жетвених остатака мора бити најстроже кажњавано. Такођеје неопходно континуирано праћење плодности земљишта на георефeренцираним локацијама (pH, макроелемената (NPK), садржаја органске материје, воднофизичких особина земљишта)ради што бољег упоређивања података и одређивање правца утицаја било у позитивног или негативног, како би се планирале и предузеле благовремене мере заштите због обезбеђења правилног и одрживог коришћења земљишта и ублажавања климатских промена.

Časopisi nacionalnog značaja (R_{50})

Rad u vodećem časopisu (časopis prve kategorije) nacionalnog značaja (R_{51})

1. Novković, D., Antić-Mladenović, S., Radanović, D., **Predić, T.,** Babić M., Marković, S., Maličević, Z. (2012): Contents of nickel, zinc, copper and lead in agricultural soils of the plains in the northwestern part of the Republic of Srpska; Agro-knowledge Journal, vol 13, no. 1, 2012, pg. 123-134, DOI: 10.7251/AGREN1201123M

This paper presents the results and methodology of investigation conducted on agricultural soils of the plains in the northwest Republic of Srpska, aiming to determine the extent of heavy metals contamination: nickel (Ni), zinc (Zn), copper (Cu) and lead (Pb). The investigation included 140 soil samples from 14 sites, where the soil samples were taken on 5 locations, from two layers (depths): arable (0-25 cm) and sub-arable (25-50 cm). The total contents of metals were determined by a method of atomic spectrophotometry after acid digestion (HNO_3+H_2O_2). Organic matter content, CEC and pH were determined by standard agrochemical methods. The total contents of nickel in 78.5% of investigated soil samples were higher than the maximum allowed in the unpolluted soils (50 mg/kg). In 22.86% of the analysed samples, the content of zinc was higher than the maximum allowed in the unpolluted soils (100 mg/kg), while the content of copper and lead in the small number of samples was higher than the allowed maximum. Acidic soil reaction (pH<5.5) that increased bioavailability of metals was found in 38.6% of the samples investigated. A high degree of correlation was determined between the total content of certain metals (Cu and Ni, Cu and Zn). This suggests their common origin in the investigated area. The average contents of investigated metals in different layers (depths) were slightly different, having determined higher concentrations of Ni and Cu in the sub-arable layer that indicated the dominance of natural, geochemical sources of these metals in the soils. Territorial distribution of samples with high content of Ni and Zn corresponds to geological substrates which include minerals- natural carriers of Ni and Zn. This also indicates probable geochemical origin of these elements in the investigated soils. High contents of metals and acid soil reaction indicate that it is necessary to continue research in order to determine the risk of increased transfer of heavy metals from soil to the crops grown.

2. **Predić, T.,** Nikić, Nauth, P., Radanović, B., Predić, A. (2016): State of Heavy Metals Pollution of Flooded Agricultural Land in the North Part of Republic of Srpska; Agro-knowledge Journal, vol 17, no. 1, 2016, pg. 19-27.

This paper will present the results of the research of soil contamination in flooded area located at the confluence of Bosna and Sava rivers. Sampling was performed according to a network of points Etrs89 references European Network 500 m x 500 m. The total number of soil samples was 31 and 13 samples of sediment-mud. The samples were analyzed for the total content of heavy metals: Pb, Cd, Cr, Ni, Zn, Cu. Elevated concentrations of Ni was identified in the analyzed samples. Ni content in mud was from 240.5 mg/kg to 294.5 mg/kg, in soil was from 128.9 mg/kg to 452.1 mg/kg. All mud samples were alkaline, and 79% of soil samples were alkaline and neutral reaction. The analysis indicated that the flood in May 2014 was not the cause of soil contamination with heavy metals, but it contributed to the overall content increases of these elements in the soil.

3. Lakić, Ž., **Predić, T.**, Pavlović, S., (2016): Biološke rekultivacije rudarskom aktivnošću degradiranih zemljišta na lokalitetu Srđevići–Gacko. UDK 631.438:539.163, Svarog, 13, str. 285-298.

Istraţivanja su obavljena na rudarski degradiranom zemljištu na lokalitetu SrŤeviši koje se nalazi u vlasništvu rudnika i termoelektrane Gacko, a trajala su od 2011-2013. godine. Ogled je postavljen na tri podloge: ţisti laporac – kontrola; zemljište 40 cm - laporac 35 cm - šljunak 30 cm; zemljište 40 cm - laporac 35 cm - pepeo 40 cm. Za sjetvu su korišćene tri travno-leguminozne smješe i lucerka u ţistoj kulturi. Tokom dvogodišnjih ispitivanja prešeni su sledeši parametri: hemijske osobine laporca prije i nakon završetka dvogodišnjih ispitvanja, hemijske osobine zemljišta i ostalih slojeva podloga, ukupan sadrţaj mikroelemenata, trških metala i koncentracija polihloriranih bifenila (PCB) u laporcu i podlogama, pokrovnost zemljišta usjevom na kraju druge godine ispitivanja, botaniţka analiza zelene mase smješa na poţetku i kraju ispitivanja, prinos zelene mase po godinama i sadrţaj mikroelemenata i teških metala u suvoj biljnoj masi. Zemljište koje je korišćeno u rekultivaciji imalo je baznu reakaciju. Analizom uzoraka laporca, zemljišta i drugih slojeva podloga, utvrŤen je povešan sadrţaj teških metala kadmijuma (Cd) i nikla (Ni), a konstatovane vrijednosti bile su iznad dozvoljenih graniţnih vrijednosti za poljoprivredna zemljišta. Tokom dvogodišnjih ispitvanja najbolja prosjeţna pokrovnost zemljišta bila je na podlogama koje su zasijane sa smješom I/G (lucerka 70%+ jeţevica 30%). Na kontrolnoj podlozi (ţisti laprac) najveši prosjeţan prinos zelene mase ostvaren je sa smješom IV/G (15,1 t/ha). Povešan sadrţaj teških metala kadmijuma (Cd) i nikla (Ni), koji je utvrŤen u zemljištu i ostalim slojevima podloga, nije se doveo do povešanja sadrţaja ovih elemenata u biljnom materijalu ispitivanih biljnih vrsta.

Rad u časopisu nacionalnog značaja (časopis druge kategorije) (R_{52})

1. Lakić, Ž., Žabić, M., **Predić, T.** (2021): Determining the content of nitrogen and some macroelements in the dry mass of perennial leguminous plants; Agro-knowledge Journal, vol 22, no. 1, 2021, pg. 13-22 DOI: 10.7251/AGREN2201013Z

The aim of this study was to determine the content of elements N, P, K, Ca, and Mg in the dry mass of perennial fodder legumes, mowed in the optimal growth phase. The experiment with perennial legumes of alfalfa (Medicago sativa), red clover (Trifolium pretense) and bird's-foot trefoil (Lotus corniculatus L.) was set up as a random block system in four replicates on valley-brown soil and was conducted for two years. The green mass of perennial legumes in the first and second mowing was harvested at the end of budding/ beginning of flowering phase. In the third and fourth regrowth, mowing of the biomass was done after 5 weeks. Immediately after each mowing, representative sample of green biomass was taken from each replicate of each legume tested. The content of nitrogen, phosphorus, potassium, calcium, and magnesium in the dry plant material was determined. The content of nitrogen and potassium in the fodder of alfalfa and red clover was higher in the first year of the study, which was not the case for bird's-foot trefoil. The dry matter of alfalfa on average had the highest content of nitrogen (39.8 g kg-1 DM) and calcium (19.6 g kg-1 DM), bird's-foot trefoil of phosphorus (10.6 g kg-1 DM) and potassium (26.1 g kg-1 DM), and red clover of magnesium (3.7 g kg-1 DM). In the dry mass of bird's-foot trefoil the average content of nitrogen was 39.0 g kg-1 DM, phosphorus 10.6 g kg-1 DM, potassium 26.1 g kg-1 DM, calcium 15.7 g kg-1 DM, and magnesium 3.5 g kg-1 DM.

2. Tokhetova, L., Baizhanova, B., Baykenzhieva, A., Kultasov, B., **Predić, T.** (2021): Perspectives for cultivation of diversified crops in a rice (Oryza sativa L.)-based crop rotation in the Kyzylorda region, Kazakhstan; Zemljiste i biljka 70(1):68-85, 2021, DOI: 10.5937/ZemBilj2101068T, http://www.sdpz.rs/index.php/sr-yu/casopis-zemljiste-i-biljka

The specifics of the soil and climatic conditions of the Aral sea region, Kazakhstan, primarily associated with salinization, various types of droughts, uneven distribution of precipitation during the growing season, and late spring frosts, make it necessary to create crop varieties with resistance to biotic and abiotic environmental factors. In this regard, the expansion of the area under crops of non-traditional salt-tolerant grain crops in the Kyzylorda region is one of the main directions of increasing the sustainability of agriculture in the region. Studies have shown that among the grain crops cultivated in the region, spring barley (Hordeum vulgare L.) is a reliable crop that can make the most of the region's bioclimatic resources to form sustainable yields. The purpose of this study is to create a new promising source material of barley based on a comprehensive study of collection material of various ecological and geographical origin by applying various methods of classical breeding. Based on a comprehensive assessment of the collection material of barley, a working collection of 250 varieties with agronomic resistance to environmental stress factors of the Aral Sea region was created. The selected samples are recommended for use in practical breeding in order to increase the adaptive potential of modern barley varieties.

Rad u naučnom časopisu (prve, druge i treće kategorije) (R_{53})

1. **Predić, T.**, Nikić, Nauth, P., Tanasić, B., Vidojević, D. (2019): Organic Carbon Stocks in Arable Land of Republic of Srpska – Bosnia and Herzegovina; AGROFOR International Journal, Vol. 4(2), 2019, doi.10.7251/AGRENG1902069P; UDC 631.41:681.518.3(497.6), pg. 70–77.

On the territory of Republic of Srpska (RS – Entity of Bosnia and Herzegovina), in the period 2014 - 2017, the fertility control of arable land was performed in 4125 average samples *(taken from top soil, 0 - 30 cm)* representing the surface area of 5776 ha. All samples were geo-positioned and linked to the SOTER database *(soil and terrain databases)*. RS is divided into 262 SOTER units. In each soil sample humus was analysed (colorimetric method, wet burning with K2Cr2O7 and conc H_2SO_4). Soil organic carbon (SOC) was calculated from humus (% humus x factor 0.58). SOC stock *(t ha^{-1})* for each plot were calculated on the basis of the volume mass *(mg m^{-3})* of the soil type on which the plot was located, the soil weights up to 30 cm *(kg ha^{-1})* and the area of the plot *(ha)*. SOC stock on 5776 ha of agricultural land was 225168 t ha^{-1}. The analyzed area was represented by 24 types of soil *(FAO class)*. The highest average SOC stocks of 130 t ha^{-1} *(based on 31 samples)* was found in Calacaric Cambisol and the lowest in Stagnic Luvisol 38 t ha^{-1} *(based on 464 samples)*. In 84% of the tested samples, representing 89% of researched area, the SOC stocks were less than 57 t ha^{-1}. Estimation of the SOC stocks on the total arable land was prepared by GIS analysis interpolation of the SOC results for 4125 samples on the agricultural land area *(arable land, gardens, orchards, vineyards and meadows)*. Estimated SOC stocks on 578894 ha of arable land were 32833549 t. The result of this research is the first step towards the establishment of SOC monitoring system in RS.

<u>Zbornici skupova nacionalnog značaja (R_{60})</u>

Predavanja po pozivu sa skupa nacionalnog značaja štampano u cjelini (uz dokaz) (R_{61})

1. **<u>Predić, T.</u>**, Nikić, Nauth, P., Rapić, K., Jovanović, S. (2022): Korišćenje uređenje i zaštita poljoprivrednog zemljišta. 56. Savetovanje agronoma i poljoprivrednika Srbije (SAPS) i 2. Savetovanje agronoma Republike Srbije i Republike Srpske, Zbornik referata, ISBN 978-86-80417-86-8, str. 149-162.

Zemljište je, za razliku od vode i vazduha, u suštini neobnovljiv prirodni resurs, sa potecijalno brzom stopom degradacije i sa veoma sporim procesom formiranja i regeneracije. Privremeni i trajni gubitak zemljišta antropogenim djelovanjem proporcionalan je gustini populacije i predstavlja posljedicu ukupnog društvenog i ekonomskog razvoja nekog područje (regiona, države, kantona, opštine). Pošto svi korisnici zemljišta neprekidno i argumentovano pretenduju na korišćenje zemljišta, postavlja se osnovno pitanje kako zaštititi poljoprivredno zemljište od trajnog gubitka i njegovo očuvanja za proizvodnju dovoljnih količina hrane. Sprečavanje degradacije i održivo upravljanje zemljišta treba da budu najvažniji dijelovi politike svake države i lokalne zajednice. Da bi ta politika mogla da se kvalitetno sprovodi neophodni su, prije svega, relevantni pokazatelji stanja zemljišnih resursa. Prema Zakonu o poljoprivrednom zemljištu Republike Srpske, opštine i gradovi su obavezne izraditi planski dokument „Osnovu zaštite uređenja i korišćenja poljoprivrednog zemljišta“ (Osnova opština). Osnova opština, izrađuje se GIS obradom postojećih relevantnih podataka o zemljišnim resursima i klimi (model terena, pedlogija, zemšišni pokrivač i način korištenja, klimatsi podaci…). GIS modelovanjem postojećih podataka, dobijaju se nove relevantne GIS podloge (slojevi) (bonitet, agroekološko zonirenje, rejonizacija, pogodnost gajenja…). Ažuriranje tj. kontinuirano unošenje novih podataka omogućava dobijanje tačnijih rezultata i kreiranja relevantnijih GIS podloga i GIS modela koji su neophodni donosiocima odluka u procesu planiranja korišćenja poljoprivrednog zemljišta u cilju zaustavljanja trenda trajnog gubljenja poljoprivrednog zemljišta koje se prema UN strategiji do 2030. godine treba svesti na nulu (Land Degradation Neutrality – LDN). U ovom radu je prezentovana metodologija izrade nekoliko važnih GIS podloga neophodnih za izradu Osnove opštine koja je zasnovana na FAO konceptu i koji je adaptiran za specifične uslove Republike Srpske i Bosne i Hercegovine.

2. Lakić, Ž., **<u>Predić T.</u>**, Savić, B., Jovićević, R., Mihajlović D. (2022): Vrste i kavlitet stočne hrane spremljene na porodičnim farmama u Republici Srpskoj. 56. Savetovanje agronoma i poljoprivrednika Srbije (SAPS) i 2. Savetovanje agronoma Republike Srbije i Republike Srpske, Zbornik referata, ISBN 978-86-80417-86-8, str. 163-173.

Ispitivanja kvaliteta stočne hrane, proizvedene i spremljene na porodičnim farmama, provedena su na području 42 opštine u Republici Srpskoj tokom 2020. i 2021. godine. Analizirana su 803 uzorka različitih stočnih hraniva sa 277 porodičnih farmi. Cilj istraživanja bio je da se kroz anketu sagleda stvarno stanje na farmama koje su obuhvaćene ovim ispitivanjima, te da se pomoću organoleptičkih i hemijskih analiza kabastih stočnih hraniva proizvedenih i spremljenih na samoj farmi utvrde razlozi koji utiču na njihov kvalitet, a zatim da se kroz rad savjetodavne službi na ternu oni otklone. Analiza uzoraka stočne hrane obavljena je u laboratorijama JU Poljoprivredni institut Republike Srpske, Banja Luka. Tokom hemijskih analiza kabastih stočnih hraniva praćeni su sljedeć i parametri: pH vrijednost silaže/sjenaž e, suva

materija, sirovi proteini, sirova celuloza, sirovi pepeo, sirove masti i sadržaj skroba kod silaže od cijele biljke kukuruza. Na sistemu sita - Penn State Particle Separator utvrđeno je učešće pojedinih frakcija u silaž i i dužina odrezaka siliranih biljaka. Najčešće kabasto hranivo koje se sprema na farmama je sijeno, zatim slijedi silaža od cijele biljke kukuruza. Sjenaža se sprema na 95 farmi, a travna silaža samo na dvije. Od ukupnog broja farmi na kojima se sprema silaža od kukuruza, utvrđeno je da ona na 22,3% farmi ima nižu ili višu pH vrijednost od optimalne. Sadržaj suve materije u silaži je na 11,7% farmi bio niži od donje optimalne vrijednosti, dok je na 25,6% farmi silažni materijal koji je unijet u silose bio presuv. Na najvećem broju farmi, sadržaj sirovih proteina u ispitivanoj kukuruznoj silaži je bio u intervalu od 61-80 g kg^{-1} SM. Na više od 50% porodičnih farmi dužina odrezaka silažne mase nije bila u okviru graničnih vrijednosti za pojedine frakcije silaže. Kod ispitivanih sjenaža, pH vrijednost je bila u granicama od 4,0-5,5, izuzev na 3,2% farmi gde je ona bila viša. Na 25,3% farmi koje spremaju sjenažu sadržaj sirovih proteina bio je manji od 100,0 g kg^{-1} SM. Na porodičnim farmama najčešće se koristi sijeno spremljeno od zelene mase prirodnih travnjaka. Na 21 farmi (10,6%) sijeno ima sadržaj sirovih proteina manje od 50,0 g kg^{-1} SM, a na 122 farme (61,3%) sadržaj varira od 50,1-100,0 g kg^{-1} SM.

Predavanja po pozivu sa skupa nacionalnog značaja štampano u izvodu (uz dokaz) – (R_{62})

1. **<u>Предић, Т.</u>** (2019): Поремећаји у развоју коријеновог система јечма у зависности од концентрације алуминијума у земљишту. Симпозијум Српског друштва за проучавање земљишта - Земљиште основно природно добро – угроженост и опасности, Књига апстракта, стр. 7.

Значајан дио обрадивих површина у сјеверном дијелу Републике Српске се налази на земљиштима киселе и јако киселе реакције на којима долази до поремећаја у исхрани и развоју гајених биљака које нису адаптиране или које те услове теже подносе. Досадашња истраживања су показала да је један од главних фактора који доводи до поремећаја у развоју биљака, повећана концентрацијом лакорастворљивог Al^{3+} у земљишном раствору који се акумулира у коријеновим длачицама и блокра усвајање воде и појединих хранљивих елемената, а у првом реду фосфора. Познато је да је јечам једна од биљака која слабо подноси услове јако киселе реакције али се и поред тога и даље гаји на киселим земљиштима јер се видљиви симптоми поремећаја не испољавају сваке године. Поремећаји у развоју јечма се обично примјећују у прољеће након јаких зима и кишних и хладних прољећа, а манифестују се спорадично на појединим дијеливима парцле у неправилним површинама у којима је видљива хлороза, заостајање у порасту па и потпуно сушење и пропадање усјева. Циљ рада је да се утврди у којој фази развоја настају поремећаји у развоју јечма и да ли се након појаве могу ублажити или отклонити.

Saopštenje na skupu nacionalnog značaja štampano u izvodu (R_{64})

7. <u>Predić, T.</u>, Marković, M., Lukić, R., Nikić, Nauth, P. (2012): Potential fertility of soil types of agricultural land of Republic Srpska; 1st International Symposium and 17th Scientific Conference Of Agronomists of Republic Of Srpska, Book of abstracts, pg. 87.

The basis of planning and use of agricultural land of the Republic of Srpska as the basis of the planning process of using agricultural land is a strategic document of the Government of the

Republic of Srpska that was drafted in 2009 by the Agricultural Institute of RS, the Department of Agrochemistry and Agroecology. Data on land resources of the RS are systematically sorted into digital GIS database, which depending on the goal; provide opportunities for a wide variety of analysis and modeling. The basis of Srpska made in this methodology, presents a dynamic component of the planning process of land use RS. In this work, for the first time, the basic GIS analysis of Soil Map of BiH (1:50000) was made for the Republic of Srpska. Using digital maps of land cover and land use of RS (LC / LU) by GIS analysis the data from the soil map extracted soil types that are used for agricultural production and analysis of the potential fertility of the soil types. Of the total agricultural land of RS (1047724 ha) arable land (arable land, gardens, orchards, vineyards and meadows) cover 719 902 ha (68.7%). Out of these, acidic soils having limited physical and chemical characteristics for the cultivation of most crops, occupy 340 557 ha or 41.2%. Hydromorphic soils, on which the amelioration measures need to be carried out in order to have fertility potential, take 127 858 ha (17.8%). Out of these areas, now in the RS (4.25) a detailed drainage (drainage pipe) has been made on the 5340 ha in the eighties of the last century. This paper presents a detailed analysis of agricultural land by class (automorphic, hydromorphic soil) and soil types, especially for arable land, especially for grazing. All results are presented in digital form in a Geographic Information Systems (GIS). They are made in the ArcGIS software, the Gauss Krueger projection at a scale 1:50000.

8. **Predić, T.**, Lukić, R., Nikić, Nauth, P., Cvijanović, T., Docić, Kojadinović, T., Lejić, T., Jokić, D. (2012): Introduction of continuous monitoring of agricultural land of Republic of Srpska; 1st International Symposium and 17st Scientific Conference Of Agronomists of Republic Of Srpska, Trebinje, Book of abstracts, pg. 88.

Strategy of sustainable agricultural development is impossible without monitoring changes in the soil as an integral part of environmental monitoring. From 1992 to 1997, the monitoring of land is introduced respectively: Bulgaria, England, Finland, Czech Republic, Norwign, Slovakia, France, Holland, Hungary, Austria, Spain and Germany. Slovenia introduced it in 2007, and Croatia in 2010. Because of the many specifics of land in relation to water and air, this job is very complex and expensive, and the importance of protecting land was not sufficiently recognized by decision makers in the RS and FBiH. However, the importance of monitoring land is stressed by the EU, which is by the implementation of Section 6 Programme of Action for the Environment, raised the importance of land protection at the level of protection of water and air. *("Environment 2010: Our Future, Our Choice" - Decision of the European Parliament and Council of the European Union 2002*). European Commission in 2006 proposed to the European Parliament and the Council of the European Union Water Framework Directive for soil protection COM (2006) 232 aimed at ensuring the protection of land based on the principle of conservation of its function, prevention of soil degradation, mitigation of degradation and repair of degraded land. Agricultural Institute of RS, ie. Department of Agrochemistry and Agroecology from 2002 to 2011 completed several major projects aimed at the introduction of continuous monitoring of agricultural land, the only monitoring within environment monitoring that is not introduced in RS. This paper presents the results of previous research and implemented projects that were aimed at finding the most appropriate model for establishing a permanent monitoring of agricultural land in the RS. Also, it presented a model for establishing a permanent monitoring of pollution of agricultural land of the RS, which will meet all EU requirements and is acceptable for the economic situation of the Republic of Srpska.

9. Đurić, G., Mićić, N., **Predić, T.**, Karapetrović, B. (2012): Morpho – physiological characteristics of leaf as basis for genotype specific mineral, nutrition of apple; 1st International Symposium and 17th Scientific Conference Of Agronomists of Republic Of Srpska, Trebinje, Book of abstracts, pg. 151.

Genotype specific mineral nutrition through fertirrigation systems is technically available. It has become a standard in highly intensive orchard management systems. For consistent application of this concept, the key issue relates to the reliable definition of standards and monitoring the level of genotype specific mineral nutrition under the given agroecological conditions of orchard management. The aim of this research was to determine the average content of macroand microelements in leaf blades of 23 apple cultivars (*Malus x domestica* Borkh.) and two pollinators (*Malus sikkimensis* (Wenz.) Koehne ex C.K. Schneid. And Malus niedzwetzkyana Dieck) and their classification in relation to leaf morphophysiological characteristics (the surface and specific leaf weight). All cultivars and pollinators are on a board in the field collection and represented with 6 - 10 trees in the rootstock MM106. 100 leaves were taken for each apple genotype from the middle of the medium-length shoots at the end of July. Fresh leaves were scanned for software analysis of leaf blade surface. The petiole and central nerve were removed and 10 *mm* sections were taken from both leaf blades. By means of drying the sections until a constant weight, leaf blade specific weight was determined. A total leaf blade dry weight (including the sections) was used for determining the contents of these elements: N, P, K, Ca, Mg, Zn, Mn, Cu и Fe. Through cluster analysis, the cultivars were grouped according to the contents of the elements and leaf blade surface. On account of leaf specific weight, the average dry weight accumulation of leaf blade was also determined. The grouping of the cultivars using cluster analysis shows that: according to the surface, specific weight and dry weight accumulation in the leaf, the cultivers are grouped into four groups with two or three subgroups and Vista White cultivar as completely separate; according to the content of the observed macroelements, the cultivers are grouped into six groups with *Malus sickimensis* L. pollinator as completely separate; according to the content of the observed microelements, the cultivers are grouped into four groups. Generally, the examined genotypes are specific according to the dry weight accumulation of leaf blades and content of macroelements, although the variation in the content of microelements among the genotypes is much more expressed.

10. **Predić, T.,** Cvijanović, T., Docić Kojadinović, T., Radanović, B., Jokić, D., Malčić, T. (2013): Kontrola sadržaja nitrata i ostataka pesticida u zelenoj salati (Lactuca sativa). II međunarodni simpozijum i XVIII naučno stručno savjetovanje agronoma Republike Srpske, Trebinje, Zbornik sažetaka, str. 64.

Sadržaj ostataka štetnih materija za ljudsko zdravlje u plodovima i dijelovima biljaka koji se koriste za ishranu moguće je održati u dozvoljenim koncentracijama ako se poštuju principi dobre poljoprivredne prakse. Jedan od načina kontrole bezbjednosti poljoprivrednih prizvoda je i njihov redovan monitoring na tržištu. Poljoprivredni institut RS je u 2011/12 godini sproveo istraživanje o koncentraciji nitrata i ostataka pesticida u uzorcima zelene salate na tržištu Grada Banjaluka. Iz šest tržnih centara i gradske tržnice, uzorkovanje je vršeno jednom mjesečno (decembar – maj) metodom slučajnog odabira. Ukupno je uzeto 42 uzorka, od čega 26 uzoraka iz domaća proizvodnja (Hercegovina i Lijevče polje) i 16 uzoraka iz uvoza (Italija). U svježoj salati sadržaj nitrata je određen Xsilenol metodom, a ostaci pesticida multirezidualnom QuEChERS

metodom. Tehnikom gasno-masene hromatografije (GC/MS) analizirana je 41 aktivna materija pesticida različitih hemijskih grupa. Sadržaj nitrata iznad MRL (4500 mg/kg) utvrđen je kod dva uzorka (4,7%) – jedan uzorak iz domaće proizvodnje (4900 mg/kg - Hercegovina) i jedna uzorak iz uvoza (4700 mg/kg - Italija). Oba neispravna uzorka su uzorkovana u februaru kada je na svim ispitivanim lokacijama utvrđena najviša koncentracija nitrata u listu salate, u prosjeku 3340 mg/kg što je za 25% niţe od MRL. U svim ostalim mjesecima (decembar – maj) sadžaj nitrata je bio nizak, u prosjeku 263 mg/kg što je za 93% niže od MRL. Rezultati analiza ostataka pesticida pokazuju da je od 42 ispitana uzorka salate u tri (3) uzoraka ili 7,1% uzoraka utvrđen sadžaj pesticida iznad MRL. Sva tri uzoraka su iz domaće proizvodnje, tako da je procenat nespravnih uzoraka iz domaće proizvodnje 11,5% (3 od 26 uzorka) što predstavlja vrlo visok procenat neispravnosti uzoraka salate. Evropski prosjek je oko 4 % neispravnih uzoraka. U neispravnim uzorcima salate detektovani su uzorci sa jednom i dvije aktivne materije pesticida i to: u dva uzorka je detektovna jedna aktivna materija (Prosimidon 6,13 mg/kg i 7,20mg/kg) u jednom uzorku dvije aktivne materije (Iprodion 11,9 mg/kg i Fenarimol 0,04 mg/kg). Na osnovu dobijenih rezultata moţe se zaključiti da je koncentracija nitrata u salati koja se nalazila na tržištu Grada Banjaluke u periodu decembar - april, bila daleko ispod MRL, tj. da je rizik od povećanog sadržaja nitrata u salati na tržištu Banjaluke u tom periodu bio nizak. Nitrati u salati nisu predstavljali opasnost u ishrani ljudi. Međutim, sa aspekta ostataka pesticida, salata iz domaće proizvodnje nije bila bezbjedna za ishranu ljudi i to u visokom procentu 11,5%. Ovi podaci ukazuju da je potrebno intenzivirati edukaciju poljoprivrednih proizvođača za primjenu pesticida u proizvodnji salate tj. vršiti edukacije za primjenu dobre poljoprivredne prakse. Pored toga potrebno je na nivou države uspostaviti i sprovoditi monitoring ostataka pesticida u poljoprivrednim proizvodima u okviruččega će biti pojačan monitoring ostataka pesticida i nitrata u salati.

11. **Predić, T.,** Nikić, Nauth, P., Cvijanović, T., Docić, Kojadinović, T., Radanović, B., Jokić, D. (2015): Uticaj plavljenja Drine i Save na zagađenje poljoprivrednog zemljišta teškim metalima i organskim zagađivačima. IV međunardni sipozijum i XX naučno stručno savjetovanje agronoma Republike Srpske, Trebinje, Zbornik sažetaka, str. 152-153.

Rijeke Drina i Sava su na području opštine Bijeljina u majskim polavama 2014. god. plavile 17980 ha zemljišta (Drina 9709 ha; Sava 9235 ha). Trajanje plavnog vala Drine od 1 do 8 dana, a Save 7 do 27 dana. Maksimalna visina vode: Drina 1 m; Sava 4 m. Uzimanje uzoraka nanosa i zemljišta vršeno je po mreži tačaka ETRS89 reference European Network 500 m x 500 m. Prosječni uzorci su uzeti sa homogenih dijelova parcele, sa površine kruga prečnika 30 m. Uzeta su 53 uzorka - 15 uzoraka nanosa (samo ako je bio deblji od 1 cm) i 38 uzorka zemljišta (oranični sloj). Analiziran je ukupni sadražaj teških metala Pb, Cd, Cr, Ni, Zn, Cu (carska vodica, AAS) i organskih zagađivača: PCB i TPH (gasna hromatografija). Svi uzorci nanosa su alklane reakcije, a 89% uzoraka zemljišta je neutralne, slabo alkalne i alkalne reakcije. U analiziranim uzorcima su utvrđene povišene koncentracije Ni, Cu i Zn. Povišen sadržaj nikla utvrđen je u svim uzorcima nanosa (Drina: 87 do 136 mgNi/kg; Sava: 102 do 219 mgNi/kg) i veći je nego u oraničnom sloju zemljišta (Drina 81 do 100 mgNi/kg; Sava 58 do 149 mgNi/kg). U plavnom području Save, u uzorcima zemljišta koji se nalaze bliže koritu rijeke (do 2,5 km) utvrđene su koncentracije Ni od 110 do 149 mgNi/kg što ova zemljišta svrstava u zemljišta kontaminirana Ni prema klasifikaciji *Dutch Soil Remediation Circular 2009*. U plavnom području Drine nisu utvrđena zemljišta koja se po ovoj klasifikaciji svrstavaju u zemljišta kontaminirana Ni. U 43% uzoraka nanosa Drine

utvrđen je povećan sadržaj Zn (146 do 164 mgZn/kg) a u 57% povećan sadržaj Cu (38 do 48 mgCu/kg) dok je u nanosu Save utvrđen samo povećana sadržaj Cu (78% uzoraka). Međutim, sadržaj Zn i Cu u oraničnom sloju svih uzoraka zemljišta je bio u očekivanim koncentracijama. Rezultati analiza ukazuje da poplave u maju 2014. godine nisu uzrokovale kontaminaciju oraničnog sloja zemljišta ali su doprinijele da se ukupni sadržaj ispitivanih teških metala u oraničnom sloju zemljišta neznatno poveća. Zbog velike količine vode i trajanja njene stagnacije, opasnost postoji za kontaminaciju podzemnih voda.

12. **Predić, T.,** Radanović, B., Nikić Nauth P., Cvijanović, T., Docić Kojadinović, T., Jokić, D. (2015): Plodnost zemljišta porodičnih komercijalnih gazdinstava u Republici Srpskoj. IV međunardni sipozijum i XX naučno stručno savjetovanje agronoma Republike Srpske, Trebinje, Zbornik sažetaka, str. 285-286.

U cilju povećanja količine i kvaliteta prinosa gajenih biljaka po jedinici površine Ministarstvo poljoprivrede, šumarstva i vodoprivrede RS je u 2014. godini finansiralo program „Pedološke analize poljoprivrednog zemljišta za potrebe porodičnih komercijalnih gazdinstava u Republici Srpskoj". Odabir korisnika i parcela iz registra porodičnih komercijalnih gazdinstava izvršen je po osnovu kriterijuma objavljenih u Službenom glasniku RS broj 60/14, član 55. Planirani broj uzoraka za 2014. godinu iznosio je 3634. Uzorke su po propisanoj proceduri, uzimali predstavnici Resora za pružanje stručnih usluga u poljoprivredi MPŠVRS. U šest regija uzet je sledeći broj uzoraka: Prijedor 200, Gradiška 795, Banja Luka 139, Doboj 414, Bijeljina 134, Sokolac 87, Trebinje 107. Ukupno je uzeto 1876 ili 51,6% od planiranog broja. Svaka parcela je geopozicionirana i upisani su podaci o dosadašnjem načinu korištenja, načinu đubrenja i prinosima (15 stavki). U uzorcima su izvršene analize osnovnih parametara plodnosti zemljišta: reakcija (pH u H_2O, 1N KCl), humus (kolorimetrijska metoda –K_2Cr_2O7), fiziološki aktivni fosfor i kalijum (AL-metoda). Rezultati analiza sa svim terenskim podacima su unešeni u GIS bazu podataka iz koje se mogu vršiti obrade podataka po regijama ili po opštinama u zavisnosti od potreba i zahtjeva Ministarstva. Na osnovu rezultata kiselosti (pH u H_2O i 1N KCl) utvrđeno je da se ograničenja u biljnoj proizvodnji mogu javiti na 56% ispitanih parcela (ekstremno, jako kisela i kisela reakcija u 45,4% i bazna reakcija u 10,8% uzoraka). Nizak sadržaj humusa je utvrđen u 61,4% uzoraka, nizak sadržaj fosfora u 69,2%, a nizak sadržaj kalijuma u 16,3% uzoraka. Dobijeni rezultati potvrđuju opravdanost sprovedenog programa Ministarstva jer je utvrđeno da je plodnost zemljišta jedan od ograničavajućih faktora postizanja dobrih i kvalitetnih prinosa na parcelama porodičnih komercijalnih gazdinstava. Svaki korisnik analize je dobio pisani izvještaj sa preporukama za popravku plodnosti zemljišta (po potrebi) i startno đubrenje za dvije poljoprivredne kulture. U radu će biti prezentovani rezultati po regijama.

13. Nikić, Nauth, P., **Predić, T.,** Predić, A. (2016): LUCAS topsoil survey in Bosnia and Herzegovina; 5th International Simposium and 21st Scientific – Professional Conference of Agronomist of Republic of Srpska, Book of Abstracts, pg. 106.

PI Agricultural Institute of Republic of Srpska, Banja Luka, Department of Agroecology participated in the implementation of the part of the EU project Land Use/ Cover Area Frame Survey- LUCAS in 2015. The objective of LUCAS program is to set up area frame surveys for the provision of coherent and harmonized statistics on land use and land cover in the European Union. Since 2006, the statistical office of the European Union (Eurostat) implemented the LUCAS project for the EU member states every three years. Since last year Bosnia and

Herzegovina, Serbia, Montenegro, Macedonia and lbania have been included in the part referring to the locations where soil samples were taken. Soil samples were taken from 10% of the examined locations. The project is funded by the JRC (Joint Research Centre). Based on the coordinates of the regular grid in accordance with LUCAS Grid in the EU and on the basis of Corine LC for Bosnia and Herzegovina 250 sites were selected (includes all types of LC). Locations are selected according to the principle of "triplets", i.e. for each type of LC 3 possible points were determined. JRC has chosen 750 sites for Bosnia and Herzegovina. Thereof, the Department of Agroecology selected 250 sites. The choice of points is carried out using topographic maps, orthophoto and satellite images, Google Earth and data about areas where there is danger of mines. Locations on the ground were found on the basis of *Global Positioning System* devices. Soil composite samples were taken to an approximate depth from 0-20 cm. The composite soil sample consists of 5 individual sub-samples taken from the circle of 3m in diameter: one from the center and 4 of the circle intersects the direction of east, west, north, south. At each site 20 data on land, LC/LU were taken and photographed for a maximum of 8 parameters: location (point), land cover, landscape (cardinal directions), irrigation, and soil sample. The fieldwork took place from June, 2015 to November 15, 2015, and 246 locations were processed during that period. Four sites were unavailable (mountains, cliffs). The total mileage is 13567 km and the average distance between two points is 55,1 km. The soil samples were exported to the JRC. Soil samples from across the EU will be analyzed in one laboratory in Europe during 2016. This project created the basis for Bosnia and Herzegovina to be included in the complete LUCAS project 2018.

14. Đalović, I., Rengel, Z., **Predić, T.** (2016): Crop–Yield Improvement – Strategies for Alleviation to Combined Aluminium Toxicity and Drought Stress; 5th International Simposium and 21st Scientific –Professional Conference of Agronomist of Republic of Srpska, Book of Abstracts, pg. 214.

Aluminum (Al) toxicity and drought are two major factors limiting crop production in the world. Plant species have evolved to variable levels of tolerance to aluminum toxicity and drought stress enabling breeding of high tolerant genotypes. Present knowledge suggests that Al toxicity decreases drought resistance primarily by reducing the use of subsoil water and nutrients, and crops yield decreases under combined stresses. The common method of evaluating the interaction of Al toxicity and drought stresses is by measuring economic yield (grain or forage) under field conditions. Deleterious effects of subsoil soil-acidity on crop yield will thus be influenced by the extent to which plant depends on the subsoil for supply of water and nutrients, especially when the topsoil dries out. A possible breeding strategy for developing crops for superior adaptation to combined stress conditions of soil acidity and drought could involve screening germplasm under sufficient watered and drought stressed conditions on an acid soil and make selections based on superior performance (yield) under both conditions. Since field screening is highly inconsistent and complex secondary phenotypic traits for both Al toxicity and drought resistance can be performed using screening methods in laboratory, greenhouse and field level to link yield crops to the molecular genotypic traits. This review assesses the literature on aluminum toxicity, as well as crop-yield improvement–strategies for adaption to combined aluminum toxicity and drought stress.

RUKOVOĐENJE PROJEKTIMA R_{90}

Rukovođenje projektima međunardnog značaja (R_{95})

1. **Predić, T.,** (2014-2015):): " Collection of soil samples and data on land use and land cover at the sampling locations for LUCAS Project"; IES.B391031 European Commission, Joint Research Centre, Institute for Environment and Sustainable (IES) Land Resources Management Unit, Ispra, Italy.

Statističko istraživanje zemljišnog pokrivasča i načina korištenja zemljišta u okviru određenog područja, skraćeno LUCAS (Land Use / Cover Area Frame Survey), je evropski program istraživanja koji finansira i izvršava Eurostat (Agencija pri Evropskoj komisiji koja ima za cilja da EU obezbijedi visoki kvalitet statističkih podataka i usluga). Cilj LUCAS programa je da se uspostavi sistem istraživanja okvirnih područja za pružanje koherentnih i harmonizovanih statističkih podataka o zemljišnom pokrivaču i načinu korištenja zemljišta u EU. Pored toga, program obezbjeđuje informacije o poljoprivredi, životnoj sredini, pejzažu i održivom razvoju, dokaze sa terena za kalibraciju satelitskih snimaka i registar tačaka za specifična ispitivanja (kao što je zemljište, biodiverzitet i sl.) i za prikupljanja podataka na licu mjesta (in-situ) za glavnu evropsku mrežu. Jedan od glavnih ciljeva LUKAS projekta je uspostavljanje usklađene baze podataka o zemljišnom pokrivaču i načinu korištenja zemljišta na prostoru EU i dokumentovnje promjena tokom vremena. Od 2006 godine Eurostat svake treće godine (2006, 2009, 2012 i 2015) realizuje LUCAS projekat za zemlje članice EU. U 2014/15 godini LUCAS istraživanja su sprovedena u 28 evropskih zemalja i po prvi put u zemljama tzv. Zapadnog Balkana (BiH, Srbija, Crna Gora, Makedonija, Albanija i smoprogašena republika Kososovo) ali samo na 10% LUKAS lokacija koje se odnose na istraživanja površinskog sloja zemljišta. JU Poljoprivredni institut RS je bila partnerska institucija na nivou BiH za uzimanje uzoraka zemljišta i podatka o zemljišnom pokrivaču. Ukupno je posjećeno 250 lokacija na kojima su po posebnoj proceduri opisani i evidentirani podacia o zemljišnom pokrivaču i uzeti uzorci zemljišta, od toga je: 40% bilo u šumama, 29% na travnjcima (livade i pašnjaci), 22 % na obradivim površinama i 9% u makijama. Project", IES.B391031 European Commission; Rukovodilac projekta: dr Tihomir Predić.

Rukovođenje projektima nacionalnog značaja (R_{97})

1. **Predić, T.,** (2011-2013): "Utvrđivanje početnog stanja zagađenja zemljišta kao preduslov za uvđenje trajnog monitoringa zagađenja zemljišta – druga faza. JP 03-348/11, sufinansiran od strane Fonda za zaštitu životne sredine i energetsku efikasnost RS.

Cilj projekta je razrada modela za uvođenje trajnog monitoringa zagađenja poljoprivrednog zemljišta koji će biti primjenljiv za cijelo područje RS, a koji mora biti maksimalno usklađen sa odredbama međunarodnih sporazuma, direktiva i konvencija koje se odnose na ovu oblast. U prvoj fazi ovog kompleksnog zadatka je utvrđivanje početnog stanju sadržaja opasnih i štetnih materija u poljoprivrednom zemljištu koji se po prvi put radi za prostor Republike Srpske. Ova istraživanja su zajedno sufinasirali Fond za zaštitu životne sredine i energetsku efikasnost RS i JU Poljoprivredni institu RS. Početno stanje zagađenja poljoprivrednog zemljišta (u periodu 2011-2013), po usvojenoj metodologiji izvršeno je na području 13 opština zapadno od Distrikta Brčko: 4 opštine 2011 godine (Laktaši, Teslić, Prnjavor i Grada Banjaluka -151 uzorak); 9 opština

2012/2013 (Kupres, Jezero, Šipovo, Drinić, Ribnik, Mrkonjić Grad, Kneževo, Čelinac i Kotor Varoš – 138 uzoraka). Uzorci su u zavisnosti od načina korišćenja zemljišta uzimani sa evropske mreže tačaka: 2 x 2 km; 4 x 4 km i 8 x 8 km. Ukupno je analizirano 289 uzoraka zemljišta *(kiselosti (pH), humus, ukupan sadržaj teških metala: Cd, Cr, Cu, Hg, Ni, Pb, Zn)*. Rezultati su predstavljeni kao GIS podloge što je osnova za izradu GIS modela za utvrđivanje lokacija trajnih stanica monitoriga. Rukovodilac projekta: dr Tihomir Predić.

2. **Predić, T.,** (2011-2012): "Uspostavljanje stanica trajnog monitoringa poljoprivrednog zemljišta na području Grada Banjaluka u okviru uspostavljanja trajnog monitoringa poljoprivrednog zemljišta Republike Srpske“, ugovor br. 798-11 od 26.06.2011. god.

Cilj projekta je uspostavljanje stanice trajnog monitoringa poljoprivrednog zemljišta na nivou teritorije Grada Banjaluka u skopu razvoja nacionalnog sistema za monitoring životne sredine RS u skladu sa Evropskom mrežom za praćenje i informisanje o životnoj sredini (EIONET). Na osnovu postojećih podataka utvrđeni su kriterijumi za određivanje područja za postavljanje trajnih stanica monitoringa: reljef, dominantni tipovi zemljišta, način korištenja zemljišta, intenzitet poljoprivredne proizvodnje, mogući izvori zagađenja zemljišta, stanje zagđenja zemljišta, hidrografija, infrastruktura (putna mreža) i klima – ruža vjetrova. Na osnovu navedenih podataka i GIS modeliranjem su izdvojena četiri karakteristična područja (cjeline) na prostoru Grada Banjaluka na kojima je potrebno uspostaviti stanice trajnog monitoringa zemljišta. To su lokaliteti sa različitim stepenom uticaja mogućih zagađivača, sa različitim stepenom poljoprivredne proizvodnje, sa različitim tipovima zemljišta i sa različitim prirodnim stanjem sadržaja opasnih i štetnih materija. Uspostavljene su tri trajne stanice na kojima su po propisanoj proceduri izvršene analize fizičkih i hemijskih parametara, čije će se promjene pratiti u funkciji vremena. Na ovaj način je Grada Banjaluku prvo područje u BiH u kojem su po svim važećim standardima EU uspostavljene trajne stanice za praćenje promjena u poljoprivrednom zemljištu. Rukovodilac projekta: dr Tihomir Predić.

3. **Predić, T.,** (2014): "Utvrđivanje stanja zagađenja poljoprivrednog zemljišta poplavljenih površina“ rješenje br.12.03.5-330-3647/14 od 27.08.2014. god. odobreno od strane Ministarstva poljoprivrede šumarstva i vodoprivrede RS.

Ministarstvo poljoprivrede, šumarstva i vodoprivrede je tokom majskih poplava dopunilo Program rada za 2014. godinu sa setom kratkoročnih i dugoročnih mjera u cilju sanacije šteta u tekućoj proizvodnji, pokretanju novog proizvodnog ciklusa i obnovi proizvodnih kapaciteta oštećenih poplavama. U setu Urgentnih kratkoročnih mjera je i «Utvrđivanje stanja zagađenja poljoprivrednog zemljišta plavljenih površina” na osnovu čega će biti utvrđen potrebni set mjera/preporuka za remedijaciju eventualo utvrđenih zagađenih površina poljoprivrednog zemljišta. Istraživanja su vršena na plavljenim površinama u opštinama: Bijeljina, Doboj, Modriča, Šamac, Banjaluka, Laktaši, Srbac i Prijedor. Terenskim aktivnostima započeo 31. maja na području Bijeljine, a završio 24. juna na području Grada Banjaluka. U zavisnosti od površine plavljenja, načina i trajanja plavljenja uzorkvanje je vršeno sa mreže: 2 km x 2 km - na velikim površinama sa kraćim zadržavanjem vode (do 4 dana); 1 km x 1 km - na površinama sa dužim zadržavanjem vode (4 - 15 dana) i na površinama uz riječna korita; 500 m x 500 m – sa dugim zadržanjem vode > od 15 dana. Analizirani su uzorci mulja (nanosa) ako su moćnosti ≥ 0,5 cm i uzorci oraničnog sloja zemljišta (0 – 25 cm). U saradnji sa predstavnicima Poljoprivredne

svajetodavne službe Republike Srpske (PSSRS) sa poplavljenih područja je uzeto i analizirano 125 uzoraka zemljišta i 40 uzoraka mulja. U uzorcima je analizirano 13 parametara: osnovni parametri plodnosti zemljišta (4 parametra); ukupni sadržaj teški metali (7 elemenata) i rganski zagađivači, PCB i PTH. Rezultai su pokazali da majske polave nisu izazvale zagađenje poljoprivrednog zemljišta na ispitivane teške metale i organske zagađivače. Rezultati ovog projekta su publikovani u nekoliko radova. Rukovodilac projekta: dr Tihomir Predić.

4. **Predić, T.,** (2014-2018): „Pedološke analize poljoprivrednog zemljišta za potrebe porodičnih komercijalnih gazdinstava u Republici Srpskoj“, finansiran od strane Ministarstva poljoprivrede šumarstva i vodoprivrede RS.

Projektom su postavljeni sledeći ciljevi: Povećati kvalitet i kvantitet prinosa gajenih biljaka po jedinici površine pravilnom upotrebom poboljšivača zemljišta, organskih i mineralnih đubriva na osnovu rezultata kontrole plodnosti zemljišta; sačuvati i povećati plodnost poljoprivrednog zemljišta; zaštititi zemljište i podzemene vode od mogućih zagađenja prouzrokovanih nepravilnom upotrebom organskih i mineralnih đubriva; uspostaviti mrežu laboratorija za kontrolu plodnosti na prostoru cijele Republike Srpske i uspostaviti bazu podataka o plodnosti zemljišta registrovanih poljoprivrednih proizvođača Republike Srpske. Tvorac projekta je JU Poljoprivredni institut RS, Zavod za agroekologiju u sardnji sa Ministarstvom poljoprivrede, šumarstva i vodoprivrede RS. Resor za pružanje stručnih usluga u poljoprivredi je vršio koordinaciju rada sa poljoprivrednim proizvođačima, uzimao uzorke, pratio stanje na terenu tj. primjenu mjera i ostvarene prinose. JU Poljoprivredni institut RS, Zavod za agroekoogiju je koordinirao, vršio analize, davao preporuke i arhivirao podatke u bazu. U periodu 2014-2017 uspostavljena je baza podataka sa više od 4800 uzoraka sa područja cijele Republike Srpske. Svi podaci su georeferencirani i smješteni u GIS. Rukovodilac projekta: dr Tihomir Predić.

5. **Predić, T.,** (2016): „Monitoring plodnosti i zagađenosti zemljišta i podzemnih voda u uslovima navodnjavanja važnijih biljnih vrsta u Lijevče polju“, sufinansiran od strane Fonda za zaštitu životne sredine i energetsku efikasnost RS.

Cilj projekta je utvđivanje nivoa uticaja agro i hidrotehničkih mjera *(đubrenje, primjena pesticida i navodnjavanje)* u intenzivnoj ratarsko proizvodnji na stepen onečišćenja zemljišta i podzemnih vodao radi očuvanja vode i zemljišta, kao dva osnovna prirodna resursa. Ovim projektom se uspostavlja sistem za praćenje zagađenja poljoprivrednog zemljišta u uslovima intenzivne poljoprivredne proizvodnje, kao i sitem za ekonomsku opravdanosti iskorištavanja i očuvavanja agroekoloških resursa u intenzivnoj poljoprivredno proizvodnoj regiji Lijevča polja. Na oglednoj površini od 10 hektara u Maglajanima je uređen adekvatan vodozahvat i sistem za navodnjavanje kojim se koriste podzemne vode za navodnjavanje najvažnijih poljoprivrednih biljnih vrsta. Izvršeno je detaljno utvrđivanje postojećeg stanja fizičko-hemijskih osobina zemljišta i fizičko hemijskih osobina vode za navodnjavanje, zatim: stratigrafije lokaliteta *(moćnosti zemljišta do sloja šljunka)*, utvrđena je norma navodnjavanja, izvršena kontrola plodnosti i zagađenosti zemljišta. Uspostavljena je trajna stanica monitoringa zagađenja zemljišta u skladu sa usvojenom metodologijom. Uspostavljena stanica se nalazi na plitkom i srednje dubokom zemljištu u sistemu intenzivne poljoprivredne proizvodnje što je još jedan korak ka uspostavljanju sistema monitoringa poljprivrednog zemljišta na prostoru cijele Republike Srpske. Na uspostavljenoj stanici će se u propisanim vremenskim intervalima pratiti

promjene fizičko-hemijskih osobina zemljišta i podzemnih voda u funkciji vremena po usvojenoj metodologiji iz prethdna dva projekta koje su sufinasirali Fond za zaštitu životne sredine i energetsku efikasnost RS i JU Poljoprivredni institut RS. Rukovodilac projekta: dr Tihomir Predić.

6. **Predić, T.,** (2017-2019): „Utvrđivanje stanja i uspostavljanja trajnog monitoringa poljoprivrednog zemljišta u zonama uticaja termoelektrana i rafinerije nafte“, sufinansiran od strane Fonda za zaštitu životne sredine i energetsku efikasnost RS, ugovor br. 04-149-01-17 od 13.06.2017. god. i aneksa ugovora 02.01.1-149-3/17 од 04.04.2019. god.

Osnovni cilj projekta je doprinos razvoju zaštite životne sredine i proizvodnji bezbjedne hrane kroz upravljanja rizikom od zagađenja izazvanih globalnim procesima industrijalizacije i mogućih prirodnih katastrofa. Specifični ciljevi su: utvrđivanje koncentracije opasnih i štetnih materija u poljoprivrednom zemljištu u zonama uticaja termoelektrane i refinerije nafte, radi proizvodnje bezbjedne hrane, očuvanja zdravlja ljudi i zaštite životne sredine; doprinos uspostavljanju trajnog monitoringa zagađenja zemljišta; unapređenje kapaciteta referentne institucije za zemljište i usavršavanje kadrova na poslovima identifikacije zagađenja i osposbljenosti za analitiku opasnih i štetnih materija u uzorcima životne sredine i uzorcima hrane. U projektnom području su analizirani uzorci zemljišta na sadržaj opasnih i štetnih materija i smješteni u bazu podataka koja će omogućiti uspostavljanje trajnog monitoringa zagađenja poljoprivrednog zemljišta RS. Izvršena je obuka kadrova Zavodo za agroekologiju za odrđeivanje žive u uzorcim zemljišta i primarnim poljoprivrednim proizvodima – hrane biljnog porijekla. Obezbjeđeni su osnovni prostorni i tehnički uslovi za akreditaciju metode teških metala po osnovu ISO17025. Rukovodilac projekta: dr Tihomir Predić.

7. **Predić, T.,** (2018-2022): „Pedološke analize poljoprivrednog zemljišta za potrebe porodičnih komercijalnih gazdinstava u Republici Srpskoj“. Projekat finansiran od strane Ministarstva poljoprivrede šumarstva i vodoprivrede RS.

Nastavak projekta iz 2014-2017. Ciljevi projekta u ostali isti, a u realizaciju su uključeni i Poljoprivredni fakultet univerziteta u Banjaluci i Poljoprivredni fakultet Univerziteta u Istočnom Sarajevu čije laboratorije su vršile pripadajući broj uzoraka zemljišta. JU Poljoprivredni institut RS, Zavod za agroekoogiju je koordinirao, vršio analize, davao preporuke i arhivirao podatke u bazu, U periodu 2018-2021 dopunjena je postojeća baza podataka sa dodatnih više od 1200 uzoraka sa područja cijele Republike Srpske. Svi podaci su georeferencirani i smješteni u GIS. Rukovodilac projekta: dr Tihomir Predić.

8. **Predić, T.,** (2018-2019): Predić, T., (2018-2019): Osnova zaštite uređenja i korišćenja poljoprivrednog zemljišta opštine Laktaši. Projekat finansiran od strane Opštine Laktaši, ugovor br. 08-404-114/18.

Osnova Opštine Laktaši izrađena je obradom i procesuiranjem postojećih relevantnih podataka uz primjenu savremenih metodologija za procjenu i planiranje korišćenja zemljišta. Izrada Osnove Opštine ima za cilj da postojećim podacima o zemljišnim resursima i klimi da novi operativni kvalitet, tj. da ih na sistematski način sortira u GIS baze podataka. Ove GIS baze podataka treba da posluže donosiocima odluka u procesu racionalog planiranja korišćenja zemljišta, dajući im relevantne informacije, a u cilju sprečavanja kontinuiranog trajnog gubljenja najkvalitenijih i najproduktivnijih zemljišta i njihovog očuvanja za proizvodnju dovoljnih količina

hrane. Analizom dobijenih podataka o trenutnom stanju zemljišnog pokrivača i načinu korišćenja zemljišta i poređenja sa oficijalnim katasterskim podacima na području opštine Laktaši utvrđeno jeznačajno smanjenje poljoprivrednih površina (-6137 ha) i značajnije su povećane neobrađene površine. Najveća promjena je utvrđena u povećanju šumske vegetacije usljed nekorištenja poljoprivrednih površina. Ova promjena je dobra za biodiverzitet i očuvanje zemljišta. Najveća degradacija je utvrđena otvaranjem šljunkara na poljoprivrednim površinama i odnošenje poljoprivrednog zemljišta riječnom erozijom (poplave). Evidentirana je gradnja na najkvalitetnijim zemljištima. Tako da se 25,4% izgrađenih površina nalazi na zemljištima I, II i III bonitetn klase tj. trajno je izgubljeno 722 ha najkvalitetnijih zemljišta. Svi rezultati inventara stanja zemljišnih resursa opštine i rezultati dobijeni obradom tih podataka su predstavljeni u digitalnom obliku u geoinformacionom sistemu (GIS). Izrađeni su u ArcGIS softveru, Gauss Krueger projekciji u razmjerama od 1:5000 do 1:50000. Rukovodilac projekta: dr Tihomir Predić.

9. **Predić, T.,** (2019-2021): Osnova zaštite uređenja i korišćenja poljoprivrednog zemljišta opštine Šamac. Projekat finansiran od strane Opštine Šamac, ugovor br. 01-122-427/18.

Osnova Opštine Šamac je izrađena po istoj metodologiji kao i Osnova opštine Laktaši i u saglasnosti je sa Osnovom zaštite uređenja i korišćenja zemljišta Republike Srpske. U izradi Osnove opštine Šamac, su na najbolji način iskorištena sva dosadašnja pozitivna iskustva, i izrada ove Osnove treba da bude pokazatelj drugim lokalnim zajednicama kako treba započeti i nepovratno pokrenuti proces zaštite zemljišta od trajnog gubljenja. Analizom dobijenih podataka o trenutnom stanju zemljišnog pokrivača i načinu korišćenja zemljišta (ZP/NK iz 2020. god.) i poređenja sa oficijalnim katasterskim podacima utvrđeno je su poljoprivredne površine smanjene za 3147 ha (poljoprivredne površine prema katastru 85 % ili 14632 ha, prema ZP/NK 66,7% ili 11485 ha). Smanjenje poljoprivrednih površina je proizašlo zbog povećanja izgrađenih i površina pod drvenastim rastinjem. Evidentiran je i značajan dio zapuštenih površina (12,4% ili 1427 ha). Najveća degradacija je izazvana građenjem. Trajno je izgubljeno 216 ha najboljeg poljoprivrednog zemljišta na prostoru opštine. Svi rezultati inventara stanja zemljišnih resursa opštine i rezultati dobijeni obradom tih podataka su predstavljeni u digitalnom obliku u geoinformacionom sistemu (GIS). Izrađeni su u ArcGIS softveru, Gauss Krueger projekciji u razmjerama od 1:1000 do 1:50000. Ove GIS baze podataka treba da posluže donosiocima odluka u procesu racionalog planiranja korišćenja zemljišta, dajući im relevantne informacije, a u cilju sprečavanja kontinuiranog trajnog gubljenja najkvalitenijih i najproduktivnijih zemljišta i njihovog očuvanja za proizvodnju dovoljnih količina hrane. Rukovodilac projekta: dr Tihomir Predić.

10. **Predić, T.,** (2022): "Utvrđivanje početnog stanja zagađenja poljoprivrednog zemljišta u procesu uspostavljanja trajnog monitoringa poljoprivrednog zemljišta Republike Srpske – zapadni dio RS. Projekat sufinansiran od strane Fonda za zaštitu životne sredine i energetsku efikasnost RS; broj ugovora: 2.01.1-1996-01/21.

Projekat predstavlja završnu fazu aktivnosti Fonda za zaštitu životne sredine i energetsku efikasnost RS i JU Poljoprivredni institut RS na utvrđivanju početnog stanja zagađenja poljoprivrednog zemljišta u sjevernom dijelu Republike Srpske zapadno od Brčko distrikta. U prethodnim projektima je istraživanje urađeno na području 26 od ukupno 30 opština zapadnog

dijela: četiri opštine 2010/11 godine (Laktaši, Teslić, Prnjavor i Grada Banjaluka); 9 opština 2012/2013 (Kupres, Jezero, Šipovo, Drinić, Ribnik, Mrkonjić Grad, Kneževo, Čelinac i Kotor Varoš); 6 opština 2016/2017 (Doboj, Petrovo, Modriča, Vukosavlje, Šamac, Pelagićevo, Donji Žabar), 3 opštine 2017/2019 (Derventa, Brod i Vukosavlje) i 4 opštine 2020/21 (Srbac, Gradiška, Prijedor i Oštra Luka). Ovim projektom je završeno istraživanje na području preostale 4 opštine – Krupa na Uni, Novi Grad, Kostajnica i Kozarska Dubica, tako da su dobijeni svi potrebni podaci za uspostavljanje sistema trajnog monitoringa poljoprivrednog zemljišta u zapadnom dijelu RS. Opšti cilj prijekta: Doprinos razvoju zaštite životne sredine i proizvodnji bezbjedne hrane kroz upravljanje rizikom od zagađenja iz procesa poljoprivredne proizvodnje i mogućih prirodnih katastrofa. Specifični ciljevi: 1) Utvrđivanje početnog stanja zagađenja poljoprivrednog zemljišta na području opština Krupa na Uni, Novi Grad, Kostajnica i Kozarska Dubica. 2) Uspostavljanje sistema trajnog monitoringa zagađenja poljoprivrednog zemljišta u RS radi zaštite životne sredine i proizvodnje zdravstveno bezbjedne hrane.

Zaključno mišljenje

Komisija je ostvarila uvid i izvršila detaljan pregled i ocjenu referenci kandidata, koje su taksativno navedene i kratko opisane u prethodnom dijelu Izvještaja, a rezimirane u ovom zaključnom mišljenju. Kandidat dr Tihomir Predić je svoje stručno i naučno obrazovanje stekao na Univerzitetu u Beogradu, Poljoprivrednom fakultetu u Zemunu. Diplomirao je 1987. godine, magistrirao 1995. godine, a doktorirao 2011. godine. Prvi radni odnos zasnovao je 1988. godine u Poljoprivrednom institutu RS u Banjaluci i u toj ustanovi radi do danas na mjestu rukovodioca Zavoda za agroekologiju. Od prethodnog izbora u zvanje naučnog saradnika, kandidat je u naučnoistraživačkom radu publikovao i saopštio ukupno 37 naučnih i stručnih radova, od čega je 25 naučnih radova publikovano u cjelini, a 15 su saopštenja na naučnim skupovima publikovana u formi apstrakta. Od radova objavljenih u cjelini jedan naučni rad je publikovan u monografiji međunardnog značaja faktora kompententnosti R_{13}, a 6 radova je objavljeno u naučnim časopisima međunarodnog značaja (ISI publikacije) faktora kompententnosti R_{20}. Ostali radovi su objavljeni u monografiji nacionalnog značaja, u nacionalnim časopisima, kao i u zbornicima sa međunarodnih i nacionalnih naučnih i stručnih skupova.

U svojim radovima kandidat je naročito istraživao limitirajuće faktore proizvodnje bilja na jako kiselim zemljištima i mjere njihove popravke, u čemu je pokazao zavidno poznavanje problematike i veliku umješnost u naučnoj postavci i analizi tematike koju je proučavao. Najveći doprinos kandidata očituje se u njegovoj bogatoj naučnoj i stručnoj djelatnosti, kako u oblasti agrohemije tako i u oblasti korišćenja zemljišta koja se ogleda kroz uvođenje savremenih tehnologija (GIS) u zaštiti, uređenju i planiranju korišćenja poljoprivrednog zemljišta, kao i uspostavljanju trajnog monitoringa poljoprivrednog zemljišta u Republici Srpskoj.

Istraživački rad dr Tihomira Predića se odlikuje vrlo uspješnom saradnjom sa istraživačima iz ustanove u kojoj radi, ali i sa istraživačima iz drugih institucija u zemlji i inostranstvu. Uspješno je izradio i rukovodio deset projekata od nacionalnog značaja za Republiku Srpsku koji se odnose na očuvanje plodnosti i zaštite poljoprivrednog zemljišta od trajnog gubljenja za poljoprivrednu proizvodnju.

Prijedlog komisije

Imajući u vidu cjelokupnu aktivnost kandidata, a naročito obim i kvalitet objavljenih radova kao i sposobnost da samostalno organizuje i rukovodi naučnoistraživačkim radom u oblasti nauke o zemljištu, komisija je jedinstvena u ocjeni da kandidat **dr Tihomir Predić ispunjava sve uslove predviđene Zakonom o naučnoistraživačkoj djelatnosti i tehnološkom razvoju i Pravilnikom o postupku za sticanje naučnih zvanja, da bude izabran u zvanje višeg naučnog saradnika za naučnu oblast Poljoprivredne nauke, uža naučna oblast Nauka o zemljištu**. Uzimajući u obzir sve navedeno komisija sa zadovoljstvom predlaže Naučnom vijeću JU Poljoprivredni institut Republike Srpske, Banja Luka da Ministarstvu za naučnotehnološki razvoj, visoko obrazovanje i informaciono društvo, predloži dr Tihomira Predića za izbor u **zvanje višeg naučnog saradnika za naučnu oblast Poljoprivredne nauke, uža naučna oblast Nauka o zemljištu**.

Beograd - Banjaluka, 9. decembar 2022. god.

Članovi komisije:

Prof. dr Dragoja Radanović, redovni profesor Poljoprivrednog fakulteta, Univerziteta u Banjaluci, naučna oblast: biotehničke nauke – agrohemija, predsjednik

Prof. dr Svetlana Antić Mladenović, vanredni profesor Poljoprivrednog fakulteta Zemun, Univerziteta u Beogradu, naučna oblast: biotehničke nauke – agrohemija, član

Dr Željko Lakić, viši naučni saradnik, naučna oblast: poljoprivredne nauke - ratarstvo, JU Poljoprivredni institut Republike Srpske, Banja Luka, član