OPPORTUNITIES – ALTERNATIVES FOR APPLICATION OF AGROECOLOGICAL MEASURES AND USING POST-HARVEST RESIDUES

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https://eastregion.mk/wp-content/uploads/2022/02/pdf

ANALYSIS OF THE CURRENT SITUATION ABOUT THE HARVEST RESIDUES IN THE BREGALNICA REGION

Schweizerische Eidgenossenschaft
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ФАРМАХЕМ
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ИСТОЧЕН РЕГИОН

ПРОГРАМА ЗА
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НА ПРИРОДАТА

GOOD AGRICULTURAL PRACTICE - RICH BIODIVERSITY (PHASE II)

Swiss Agency for Development and Cooperation (SDC)

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Nature Conservation Program in Macedonia (PZP)

NATURE CONSERVATION PROGRAM IN MACEDONIA

- Aims to help the Republic of Macedonia in **preserving the great biological diversity and natural ecosystems** through the promotion of their **sustainable use and management**
- The program will help the Republic of Macedonia in **realizing the requirements of NATURA 2000**, one of the **conditions for accessing** the EU

MATERIALS AND METHODS

- recognition and **collection of data**, their preparation, grouping, validation, tabular and textual presentation and analysis
- **average annual hectares** of cultivated cereals in the Bregalnica region by municipalities and **obtained yields**
- the **weight of the post-harvest biomass** was theoretically calculated and analyzed
- methods and analyses (SWOT), oriented to **the possibilities of the resources**
- description and **analysis of the current situation** about the management of harvest residues
- the **farmers experiences**
- **alternative approaches** for the use of harvest residues

MATERIALS AND METHODS

- data sources used:
- officially published data from the SSO (**State Statistical Office**)
- data from **original scientific researches** published in the domestic and foreign scientific journals covering this field
- data from **publications, project reports and monographs**
- data from the regional units of the **Ministry of Agriculture, Forestry and Water Management**
- **field surveys made with the producers**

MATERIALS AND METHODS

Prediction and calculation of the theoretical, technical and economic potential of biomass

- **The theoretical potential** is the **maximum amount** of harvestable biomass, which is available according to the potential of its source
- **Technical potential** is a **part of the theoretical potential**, which can be **used for energy** needs or for its **use as a raw material for other purposes**, taking into account the **limitations** related to the **current technological possibilities**, the possible **use of human labor**, as well as **environmental limitations**
- **Economic potential** is the potential that can be used under current economic conditions, i.e., it satisfies the **criterion of being profitable**

Bregalnica region-municipalities	Wheat				Corn			
	Area (ha)		Production		Area (ha)		Production	
	Sown area	harvested area	Total t (tons)	Yield kg/ha	Sown area	harvested area	Total t (tons)	Yield kg/ha
Berovo	366	366	1 024	2 798	135	135	225	1 667
Vinica	287	287	575	2002	263	263	2 362	8 981
Delčevo	829	829	1 480	1 786	709	707	1 439	2 035
Zrnovci	229	224	572	2 555	294	258	1 878	7 278
Karbinci	1 081	1 041	1 068	1 026	382	318	1 265	3 978
Kočani	626	626	1 513	2 417	393	383	2 901	7 573
Lozovo	668	668	1 136	1 700	22	22	25	1 136
Makedonska kamenica	71	71	126	1770	87	87	146	1672
Pehčevo	422	422	1 271	3 011	84	84	198	2 362
Probištip	1 507	1 507	3 261	2 164	248	248	330	1332
Sveti Nikole	3 160	3 160	4 988	1 579	477	477	388	814
Češinovo - Obleševo	831	831	2 282	2 746	860	860	7230	8407
Štip	1 015	1015	826	814	157	157	576	3668
Total ha/t (tons)/avg. kg/ha:	11 092	11 047	17 918	1 622	4 111	3 999	18 963	4 742

Source: Statistical Review: Agriculture 2018,[3]*

Production of **wheat** and **corn**, by municipalities in the Bregalnica region in 2017

Bregalnica region-municipalities	Barley				Rice			
	Area (ha)		Production		Area (ha)		Production	
	Sown area	harvested area	Total t (tons)	Yield kg/ha	Sown area	harvested area	Total t (tons)	Yield kg/ha
Berovo	130	130	215	1650	-	-	-	-
Vinica	266	266	532	2000	95	95	475	5000
Delčevo	1 008	1 008	1 823	1809	-	-	-	-
Zrnovci	343	336	841	2502	158	158	736	4657
Karbinci	1 077	1 017	989	972	318	150	941	6270
Kočani	812	812	1 459	1796	1124	1124	5563	4949
Lozovo	668	668	1 136	1700	-	-	-	-
Makedonska kamenica	226	226	361	1599	-	-	-	-
Pehčevo	121	121	281	2323	-	-	-	-
Probištip	521	521	1 167	2241	39	34	204	6000
Sveti Nikole	3 049	3 049	3 211	1053	-	-	-	-
Češinovo - Obleševo	834	834	1 495	1793	1 713	1 713	9 162	5 349
Štip	1 182	1 182	853	722	6	-	-	-
Total ha/t (tons)/avg. kg/ha:	10 237	10 170	14 363	1 412	3 453	3 274	17 081	5 217

Source: Statistical Review: Agriculture 2018,[3]*

Barley and **rice** production by municipalities in the Bregalnica region in 2017

Bregalnica region-municipalities	Rye				Oats			
	Area (ha)		Production		Area (ha)		Production	
	Sown area	harvested area	Total t (tons)	Yield kg/ha	Sown area	harvested area	Total t (tons)	Yield kg/ha
Berovo	870	870	2 443	2 808	120	120	138	1 146
Vinica	87	87	131	1 500	47	47	71	1 506
Delčevo	269	269	466	1 733	259	259	400	1 546
Zrnovci	10	10	19	1 850	3	3	5	1 667
Karbinci	-	-	-	-	15	14	9	671
Kočani	93	93	97	1 046	89	89	94	1 056
Lozovo	-	-	-	-	-	-	-	-
Makedonska kamenica	79	73	129	1 773	23	23	26	1 113
Pehčevo	350	350	976	2 789	100	100	115	1 145
Probištip	62	62	95	1 529	58	40	48	1 206
Sveti Nikole	61	61	85	1 401	-	-	-	-
Češinovo - Obleševo	10	10	17	1 740	3	3	5	1 500
Štip	11	11	7	609	15	15	8	511
Total ha/t (tons)/avg. kg/ha:	1 902	**1 896**	**4 465**	2 355	732	**713**	**919**	1 289

Source: Statistical Review: Agriculture 2018,[3]*

Rye and **oats** production by municipalities in the Bregalnica region in 2017

MATERIALS AND METHODS

- **Harvest index (harvest residue index / grain yield) for some crops**

plant species	Harvest index (harvest residue index / grain yield)	Range – Grain Yield Rank* (кg/ha)
corn	1.0	3 100 – 9 400
soybeans	1.5	1 000 – 3 000
millet	1.0	2 500 – 5 600
winter wheat	1.7	1 700 – 4 000
spring wheat	1.3	1 700 – 4 000
spring oats	2.0	1 100 – 2 900

*If the grain yield is lower than the minimum value in the range, the index (harvest residue / grain yield) will need to be increased. If the yield is greater than the maximum value in the range, the index will need to be reduced.

Source: R.C. McClellan et al., (2012). [4]

RESULTS AND DISCUSSION

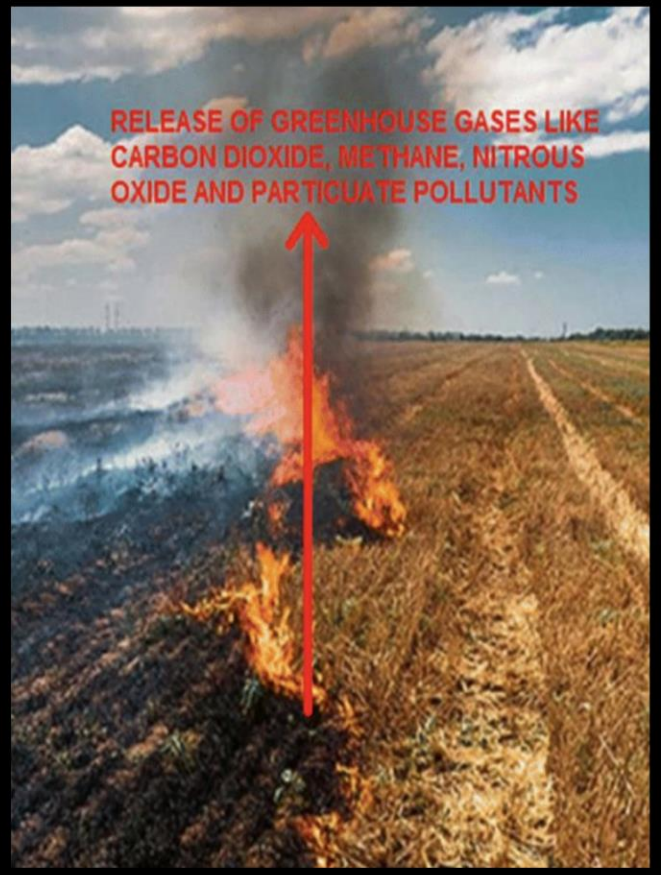
plant species	average yield – grain kg/ha	average yield - plant biomass after harvest (kg/ha)
wheat	1 622	2 760
corn	4 740	4 740
barley	1 412	2 400
rice	5 217	3 900
rye	2 355	4 000
oats	1 289	2 580

- Bregalnica region - of about **31 100 hectares** of arable land where the most common cereal crops **(wheat, corn, barley, rice, rye and oats)** are grown
- the **actual yields** from harvested plant biomass, which can be used as raw material for further use, are generally **lower**
- About **100 000 tons of "harvest residues"** are remaining on the productive agricultural arable land on an annual basis

EXPERIENCES AND PRACTICES WITH THE TREATMENT OF HARVESTED BIOMASS IN THE BREGALNICA REGION

- certain unscrupulous growers mostly of rice are knowingly breaking the law and deciding to use the unpopular agrotechnical measure of **burning the after harvest residues**
- **PURPOSE:**
  - enabling the **monocultural cultivation** which is avoiding the **implementation of the crop rotation**
- **REASON:**
  - farmers are deciding to do the burning because they **are not having their own machinery** - eg. baling machines,
  - the **lack of manual labor or tractor loaders** for loading and unloading the bales
- **JUSTIFICATIONS**
  - **destruction of :**
    - **weed** residues;
    - **plant residues** from the previous crop, in order **not to hinder the further cultivation** of the soil;
    - harvested crop residues and weeds infected with **present residues of plant disease agents**;
    - destruction of eggs, larvae and eggs of **insects – pests** of cultivated crops;

SOME HARMFUL CONSEQUENCES OF THE BURNING OF HARVEST RESIDUES



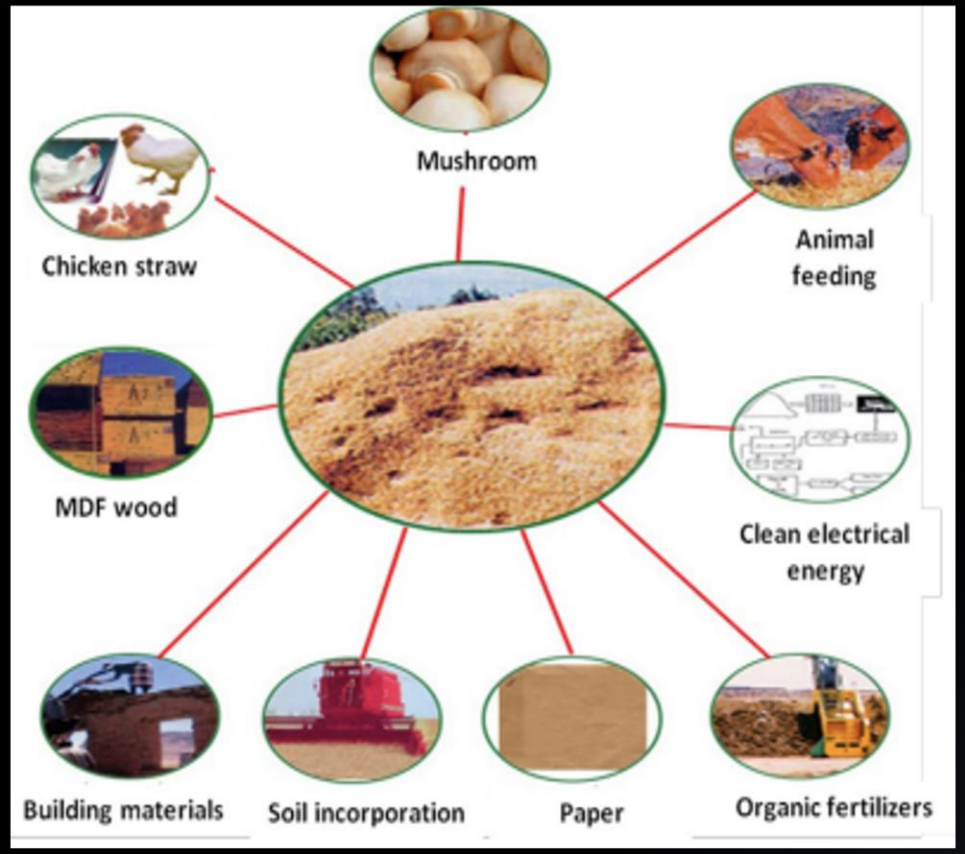
Source: GHG emissions from the burning straw (https://www.downtoearth.org.in/blog/agriculture/-thinking-glocal-to-solve-india-s-paddy-straw-burning-crisis%2D%2D62637)

- significant net source of CH_4 , CO, NOx and N_2O, which are contributing to the global warming, where **CO and O_3 are indirect greenhouse gases**
- it has been scientifically proven that **dioxin emissions** are increasing about 150 times when the biomass treated with 2.4-D is burned
- **dioxin emission** is approximately between 35 and 270 times **greater in the case of burning pesticide-treated corn crop residues**, compared to the amount of dioxin released when such crop residues are not treated
- the **increased pollution** with **suspended PM particles** and **sulfur dioxide** (which are released into the atmosphere during the burning of the **rice straw**)
- **the destruction** of the aboveground and underground **beneficial flora and fauna** - developing up to 200 to 400 °C above and critical 35 - 50 °C under the ground, which is very harmful or lethal to the flora and fauna in the soil

ALTERNATIVES FOR THE APPLICATION OF AGRO-ECOLOGICAL ACTIVITIES FOR THE USAGE OF THE HARVEST RESIDUES

- Integrating - **Best Management Practices - BMPs** - procedures that are increasing the **sustainability of crop residues in the long term** and including them in the **replacing of the soil nutrients that are extracted with crop yield and residues** - a **cheap and ecological resource for improving soil properties:**
  - reduced or minimal **tillage** of the soil
  - application of an **appropriate crop rotation** with the inclusion of **cover crops**, as well as the usage of **organic fertilizers** and **siderates**

ALTERNATIVES FOR THE APPLICATION OF AGRO-ECOLOGICAL ACTIVITIES FOR THE USAGE OF THE HARVEST RESIDUES



Source: Int. J. of Environmental Pollution & Environmental Modelling, Vol. 1(4): 91-102 (2018)

- The usage of crop residues for **energy purposes**:
  - obtaining **liquid** and gaseous fuel (biogas and gas generating plants, pyrolysis technology and **"fast" pyrolysis = bio-oil** from rice straw through the fast pyrolysis process that are taking place in the special reactors in which the **"flour"** of finely ground **rice straw** is treated) and production of **bioethanol** and **biodiesel**
  - processing into **pellets** or **briquettes**

CONCLUSIONS – RECOMMENDATIONS FOR GOOD AGRICULTURAL PRACTICES FOR THE MANAGEMENT OF HARVEST RESIDUES IN THE BREGALNICA REGION

- **Prediction, organizing, directing and implementing activities in the direction of:**
  - designing and building **processing capacity** for the production of some of the products that can be obtained by processing harvested residues (**compost, bio-oil, pellets, briquettes, biogas, etc**.)
  - **organizing logistics** (baling, loading, transport, unloading), i.e., **through agricultural cooperatives**
  - application of **appropriate technologies** for preparation and usage of **rice straw** and other types of plant residues **for animal feed**, by enriching them with nitrogen, in order to improve the protein content and meet the requirements for proper animal nutrition
  - **education of farmers** with **positive examples** for the usage of the harvest residues (i.e., the usage of microbiological compounds that can accelerate the residues decomposition)
  - modification and **increasing of the subsidy values** for the producers of **compost, lumbrihumus, mushrooms and agropellets**

Self-propelled baler: operating

- **maximum subsidy** for the purchase of **appropriate specialized agricultural machinery** for mulching, baling, transporting (loaders, special trailers for transport), **compost preparation machines, biodigesters, balers, etc.**

Зелена Берза

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Во пожар од запалени стрништа изгоре земјоделска механизација кај кочанското село Мојанци

Хроника | 17/01/2023 | 20:10

Во пожар предизвикан од палење на стрништата во оризовите полиња, доцна попладнево изгоре помошен објект и земјоделска механизација кај кочанското село Мојанци.

НАЈЧИТАНИ ВЕСТИ

СВР ДО 8 ГОДИНИ ЗАТВОР ЗА ПАЛЕЊЕ СТРНИШТА 27 02 2023 - YouTube

Нова Македонија

Изречени 34 казни за палење стрништа

THANK YOU FOR YOUR ATTENTION!