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THE ROLE OF DPSIR DIAGRAM IN THE ANALYSIS OF ECOLOGICAL AND SOCIAL CONDITIONS OF THE ARAL SEA SHRINKING PROBLEM IN UZBEKISTAN

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The paper deals with application of the DPSIR diagram approach to the Aral Sea ecosystem problem. The DPSIR diagram, a causal framework for environment-society interaction, represents complex connections between the shrinking of the Aral Sea and various social and ecological problems in the region. Examining the components of this interdisciplinary approach – economic forces, pressures, states, impacts and responses could lead to a common response to the environmental, social and economic challenges in the Aral Sea region.

Keywords: Aral Sea, DPSIR diagram, driving force, pressure, state, impact, response, ecological, social conditions

"Today it is quite obvious that the complex of ecological, climatic, social and demographic problems came about in the Aral Sea adjacent area, which are of a global, I would say, planetary scale" stated the first President of Uzbekistan Islam Karimov at the Meeting of Heads of States-Founders of the IFSA on April 28, 2009.

The Aral Sea was an endorheic lake lying between Kazakhstan in the north and Uzbekistan (Karakalpakstan) in the south. Over the past four decades, it has dried, due to both natural and human forces. As a result of the shrinking, the diversity of social and environmental problems in Uzbekistan has increased. A large debate between international policies, focusing on different methods and ways of solving the problem, is still ongoing.

The Aral Sea which stands in the 4th place according to size is drying up before the eyes of one generation. The problem of the Aral Sea is not only a local but also a global catastrophic problem in the world over the last two decades due to the reduction of the Aral Sea. The variety of problems in the region is increasing in the socio-economic and natural environment. Normally developed conceptual frameworks, such as the DPSIR (Drivers, Pressures, State, Impact, Response Model Intervention), could adapt to this issue, so that they are familiar with and able to address a huge environmental catastrophic problem of the DPSIR diagram (Carr et al., 2007).

In order to give a structure of the complex problem and to present all indicators with their links, it is helpful to use the DPSIR framework. The DPSIR framework is a tool consisting of five main parts: Driving force, Pressure, State, Impact and Response (Kristensen, 2004). The driving forces are the socio-economic and socio-cultural forces of human activities. Pressure covers the tensions that human actions place on the environment and societal invention that leads to a change in the "State". State is the condition and quality of the Environment. Impact covers only negative consequences, whereas positive effects of environmental problems and societal impact of a change should be a part of the "State". Response denotes to the possible solution by society to the environmental situation and it is this societal response that feeds back on the Driving force, Pressure, State and Impact again. The DSPIR tool can give feedback on the complex problems to the policy makers and cannot hereby help in decision-making (Digout, 2005).

The proposition is that the interdisciplinary framework like the DPSIR tool can analyze the social and environmental problems of the Aral Sea region in order to give a clear overview of the problem for the decision-makers. It can be argued without the complex analysis that the DPSIR diagram can present, the links of the problem can be missed, what will further influence the wrong decision making.

The paper consists of the short overview of the Aral Sea disaster and its negative consequences to the region, further, the problem will be analyzed from the interdisciplinary approach using the DPSIR diagram of the case.

The Desiccation of the Aral Sea and its negative Consequences

The decline in groundwater levels in the Amudarya and Syrdarya areas has contributed to the accumulation of salt on the surface. This increase in salt content was later accompanied by a change in vegetation coverage, as the plants began to die due to the increased salinity of the sea. As a result, vegetation in the region has decreased by at least 40%. A side effect of the decrease in the protective vegetation cover was intensified winds, which led to more dust storms in the area. Six million hectares of agricultural land were destroyed as a result of salinization and desertification (Bosch, 2007).

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Table 1 Hydrological observation and morphologic change of water index of the Aral Sea

Years	Inflow into Aral Sea in km^3			Evaporation in km^3	Water volume in km^3			Precipitation in km^3	Salinity in g.L^{-1}
	Amudarya	Syrdarya	total		small sea	large sea	total		
1960	20.7	21.3	42.0	71.1	–	–	1093	8.5	10
1973	0.6	0.3	0.9	60.0	–	–	824.2	4.4	13.4
1982	0.0	1.3	1.3	38.5	–	–	579.8	8.5	18.8
1987	0.0	1.0	1.0	36.8	22.4	323.2	345.6	6.2	25.0
1992	7.4	3.2	10.6	31.9	20.3	240.2	260.5	5.4	35.0
1998	23.9	7.6	31.5	24.6	27.0	168.4	195.4	6.0	42.0
2001	0.4	2.7	3.1	23.1	17.9	131.2	149.1	2.5	58.6
2002	6.7	6.4	13.1	37.1	18.4	110.8	129.2	4.0	82.0
2003	11.4	9.2	20.6	36.7	19.8	97.2	117.0	5.4	86.0
2004	5.9	9.9	15.8	24.8	22.4	93.5	115.9	3.0	91.0
2005	3.0	4.4	7.4	14.0	22.5	89.8	112.3	3.5	98.0
2006	1.5	3.5	5.0	11.8	24.0	81.3	105.3	2.8	109.0
2007	2.5	4.5	7.0	11.9	23.2	81.1	104.3	3.0	112.0
2008	2.0	4.1	6.1	10.1	23.0	80.1	103.1	2.5	117.0
2009	2.1	3.1	5.2	8.3	22.8	79.2	102.0	3.2	120.0
2010	2.0	2.5	4.5	11.4	22.6	75.5	98.1	3.0	130.0

Source: Gaybullaev et al. (2012)

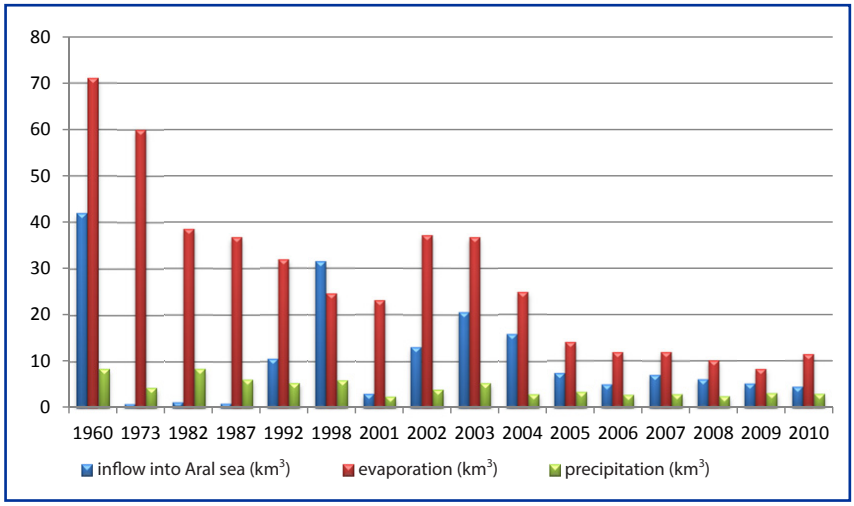

Figure 1 Water inflow, Evaporation and Precipitation indexes at the Aral Sea (Based on the tab.1)

A sharp increase in salinization of lands is one of the most negative consequences of the Aral Sea crisis. Groundwater level decline also caused salt accumulation in the subsoils. This led to the increase in salt deposition in the soil profiles and reeds were replaced by grass saltworts as a result, which prevented anything from growing there. Salinization of soils accelerated the desertification process as it accompanied the sharp decline in groundwater level and the drying of subsoils. This eventually led to soil erosion, one of the primary reasons for extensive fertilizer use. In turn, these abusive fertilizing practices further deteriorated soils and created pollution that went both into the Aral Sea through groundwater circulation and into the air through dust storms.

As a result of the shrinking Aral Sea, the death rate of children, bacteriological and infectious diseases like Tuberculosis, Anemia, Breathing and Nerves system diseases are often met among the people. During years of water shortage, the mineralization degree of ground water was increased from 10 g.L^{-1} to 40 g.L^{-1}. Due to this situation, 77% of the urban population of Karakalpakstan and villages are supplied with fresh water by water-pipe (Cawater-info portal data).

Shrinking of the Aral Sea is the main reason for the decreasing conditions of social life and causes the increasing of the desertification process. Moreover, there are changes in the ecosystems, a sharp decrease of the fertility of the soil harvest and an extinction of the animals and fish species in the region.

Since the case of the Aral Sea is related to all kind of problems, varying from social to ecological issues, it makes sense to discuss the case using an interdisciplinary approach, thereby covering all sorts of related problems.

Analyzing the Aral Sea problem using the DPSIR diagram

In the following figure 1, the DPSIR diagram is presented. If before it was considered that the shrinking of the Aral Sea is the main reason for all social and ecological problems in the region,

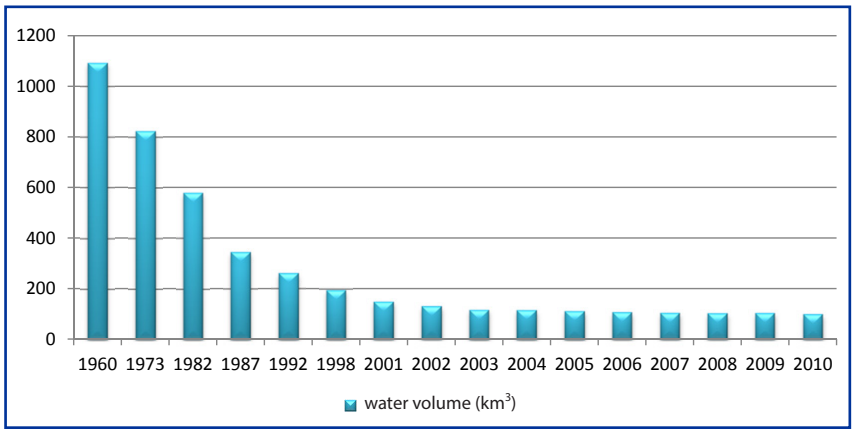

Figure 2 Water volume index at the Aral Sea (Based on the tab.1)

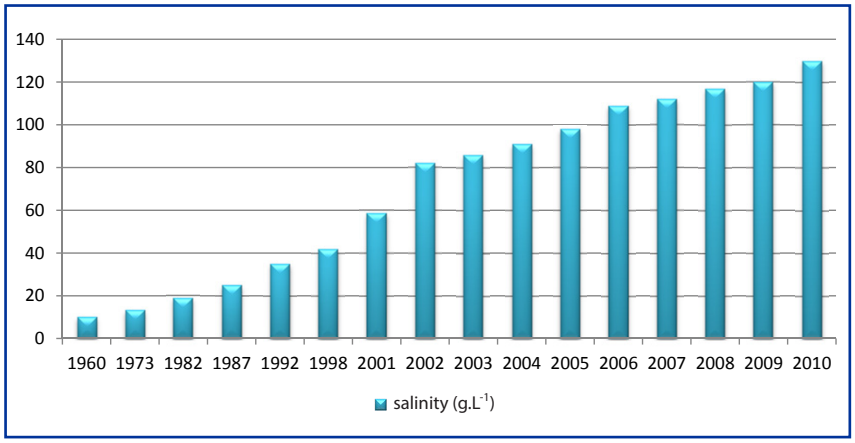

Figure 3 Salinity index at the Aral Sea (Based on the tab.1)

now the DPSIR diagram will show the real source of the problems. Increased irrigated area under the cotton growth because of the Soviet Union policy is presented as the driving force in this case and it has influence to water balance in rivers and in the lake, which has sharply decreased. According to these changes, the state of the area, presented in natural conditions as the quality of air, water and soil, loss of biodiversity and of course the regional climate has changed.

The social condition presented as the quality of life standard and health, economic activities and current condition of ecosystem services in the area also changed. The impact from the changed states of natural conditions are as follows: air pollution, lack of water resources and a simultaneously increasing concentration of salt in water, increasing salinity of the soil and a decreasing harvest year by year, disappearing fauna and flora and an increase of the regional temperature, while the social conditions impacts presented in economic activity decrease in the Aral Sea region, tuberculosis,

<table>
<tr><td colspan="2">DRIVING FORCE:
Increased irrigated area under the cotton growth because of the SU policy</td></tr>
<tr><td colspan="2">PRESSURE:
Extraction of water:
– lower water balance in the rivers
– lower water balance in the lake (shrinking)</td></tr>
<tr><td>State (Natural):
– Quality of air
– Quality of water
– Quality of soil
– Loss of biodiversity
– Regional climate change</td><td>State (Social):
– Quality of health
– Economic activities
– Condition of Ecosystem services (Cultural services)</td></tr>
<tr><td>Impact (Natural):
– Air pollution (Increasing of the dust in the air)
– Lack of water resources and simultaneously increasing the concentration of the salt in water
– Increasing salinity of the soil and decreasing harvest year by year
– Fauna and flora disappearance
– Regional temperature increase</td><td>Impact (Social):
– Economic activities decrease in the Aral Sea region
– Tuberculosis, Asthma and Anemia disease increase among the population
– Lack of clean drinking water
– Agricultural activities decrease year by year
– Cultural services, (tourism and recreation services almost dying)</td></tr>
<tr><td colspan="2">RESPONSE:
– Improving public awareness about the negative impacts of the shrinking the Sea
– Organizing and creation the complex (landscape) reserve and state Biosphere reserves, in order to be familiar and safe the current condition of the Aral Sea and biodiversity
– Launching pilot projects which will be based on new desert plants (in order to keep the dust) in the dried part of the Aral Sea
– Some legislation to protect the Aral Sea
– Education on effects of the Aral Sea shrinking problem</td></tr>
</table>

Figure 4 DPSIR diagram of the Aral Sea problem

asthma and anemia disease increase among the population, lack of clean drinking water, agricultural activities decrease year by year and cultural services.

Furthermore, both conditions refer to the ways of solutions for the Aral Sea problem as Improving public awareness about the negative impacts of the shrinking, organizing/creation of the complex (landscape) reserve and state Biosphere reserves, in order to be familiar and safe with the current condition of the Aral Sea and biodiversity, launching pilot projects which will be based on new desert plants (in order to keep the dust) in the dried parts of the Aral Sea, some legislation to protect the Aral Sea, and of course creating some education on effects of the Aral Sea shrinking problem in the region.

It is important to mention that interdisciplinary approach and the DPSIR tool play a big role in analyzing the problem. It can be seen from next example. Let's pretend that the decision maker is not going to use the DPSIR diagram structure that was shown above and he or she will be motivated only by one part of the problem, for instance, increasing of tuberculosis and asthma diseases in the region (only social aspects). His or her main focus will be directed to decrease the disease in the region, but not the cause of the disease. The problem of the region will still exist and people will continue to suffer from the other influences of the Aral Sea disaster, because the natural problems were not taken into account during the decision making.

This example shows how important it is to use interdisciplinary approach and to think wider while analyzing the problem and taking into account possible links from different perspectives.

Conclusion and Discussion

In conclusion it can be said that the interdisciplinary framework and the DPSIR tool is very helpful to make an overall overview of the problem without missing the links of causality of the problem. Based on the assessment of the Aral Sea's hydrological balance and other inputs on society and nature, DPSIR provides a methodical approach for comprehensive environmental assessment. The study also presents how the diagram can influence the decision making. Nevertheless, among all benefits of the DPSIR tool and interdisciplinary framework there could be some lacking points. As it was mentioned that the diagram represents fully all the problem, for decision makers it could be sometimes very difficult to cover all the aspects that the frame gives and the preference will be directed to one small part of the problem. It is usually done in a case of investment. However, it can be said that using interdisciplinary framework like the DPSIR diagram takes much more time compared to other disciplinary approaches in order to determine every detailed data about the specific area and in this case the efficiency and complexity of the problem has high results.

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TRENDS AND PERSPECTIVES OF FUELWOOD PRODUCTION IN EUROPE

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The paper focuses on the identification of trends and perspectives of fuelwood production in most countries of Europe. The shortages in forest territories per capita have been considered as forest poverty and the level of forest poverty has been measured. The indicator of fuelwood production intensity, which is defined as fuelwood production per hectare has been evaluated for every country under consideration. The EU countries have been classified by fuelwood production effectiveness and forest poverty. Trends of fuelwood production have been determined and the forecast of fuelwood production have been developed for selected countries.

Keywords: fuelwood production, EU, fuelwood production intensity, forest poverty

Wood fuel (or fuelwood) is a biofuel, such as firewood, charcoal, woodchips, wood sheets, wood pellets, and sawdust as well as a different mix of these materials. Fuelwood production is one of the significant components of renewable energy sector, which is one of determinants of sustainable development.

The aim of this paper is to identify current trends and to evaluate perspectives of fuelwood production in the European Union (EU). The tasks are to identify factors of fuelwood production, to evaluate how widely different countries use forest resources for fuelwood production and to assess perspectives of fuelwood production in the EU in general and in Slovakia in particular.

Material and methods

In this study, official Eurostat statistical data were used to analyse the situation with fuelwood production and forest resources. The data of EU on fuelwood production, import and export, forest resources and population were taken for every evaluated EU country during the long term period from 1992 to 2015. The data on fuelwood are measured in thousands of cubic meters, and forest resources are given in hectares. To make the data comparable between different countries the indicators of forested area and fuelwood production were calculated per capita using countries population data.

The first step of the analysis was to evaluate forest resources availability in EU countries. Fuelwood production depends on forest resources availability; therefore, it is useful to evaluate which countries and how deeply are deprived of forests.

For the purpose of this evaluation, the index of forest poverty has been designed and evaluated. Poverty generally means deprivation, shortage in one or several basic essential needs (Kakwani and Silber, 2008; Nussbaum, 2000; Sen 1985; Atkinson and Bourguignon, 1999; Bossert, D'Ambrosio and Peragine 2007). Poverty is considered not only as income deprivation (income poverty) but also deprivation of any significant value or resource such as water (Jemmali, 2017), energy (Sadath and Acharya, 2017) etc.

The analysis of poverty requires defining the minimal poverty threshold (Alkire and Foster, 2011). Values (in our case forests area per capita) under this threshold are considered as poor, but the threshold itself is a matter of discussions (Ravallion, 2011). The poverty threshold used in the Organization for Economic Co-operation and Development (OECD) and the EU is a level of income ordinarily established at 60% of the median household income, or individuals who fall into the bottom 20% of the income distribution might be considered as poor (Alkire and Foster, 2011). We decided to apply this criterion also for country-level forest poverty evaluation. Thus, we used 60% of EU average value of forest area per capita indicator as the threshold for identification of countries which are deprived of forests.

The level of poverty is measured as absolute or relative poverty gaps (Alkire and Foster, 2011). Absolute poverty gap is a difference between the factual value of any indicator and its poverty threshold in the case if this value is below the threshold. If the value is higher the poverty gap is considered to be equal to zero:

$$AFPG = \text{forests area per capita} - \text{forests area per capita}_{threshold} \text{ if } AFPG < 0 \quad (1)$$

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where:
AFPG – absolute forest poverty gap
forests area per capita – factual value
forests area per capita$_{threshold}$ – poverty threshold, which is defined as 60% EU aggregate for this indicator

Normalized (relative) forest poverty gap is a ratio of absolute poverty gap over its threshold:

$$NFPG = \frac{-AFPG_i}{forests\ area\ per\ capita_{threshold}} \quad (2)$$

We calculated the absolute and normalized forest poverty gaps for all EU countries and ranked them according to the level of forest poverty. This way, the EU countries most deprived of forests were identified.

The following stage was to evaluate how intensively countries use available forest resources for fuelwood production. For this task a new index of fuelwood production intensity (FPI) was introduced into this research. We propose to evaluate this index as the quantity of fuelwood produced annually in one hectare of forests:

$$FPI = \frac{fuelwood\ production, m^3}{forests\ area, ha} \quad (3)$$

We also ranked EU countries according to this "new" indicator and identified the countries which use forests for fuelwood production the most and the least intensively.

A linear regression model was applied to identify determinants of the level of fuelwood production in the EU. The Pearson correlation coefficient was calculated for the tested indicators and *t*-tests were applied for hypotheses testing regarding significance of factors influence on fuelwood production. *T*-test critical value for 5% significance level is 2.069.

All the operations with the data including extraction, cleaning, transformation, evaluation of indexes of forests poverty and fuelwood production intensity, ranking of EU countries and regression modelling were performed with Python scripts using NumPy, Pandas and SciPy libraries. The scripts were coded specially for this research. The results of the analysis were used to produce qualitative forecast of fuelwood production in most of the EU countries with the major emphasis on Slovakia.

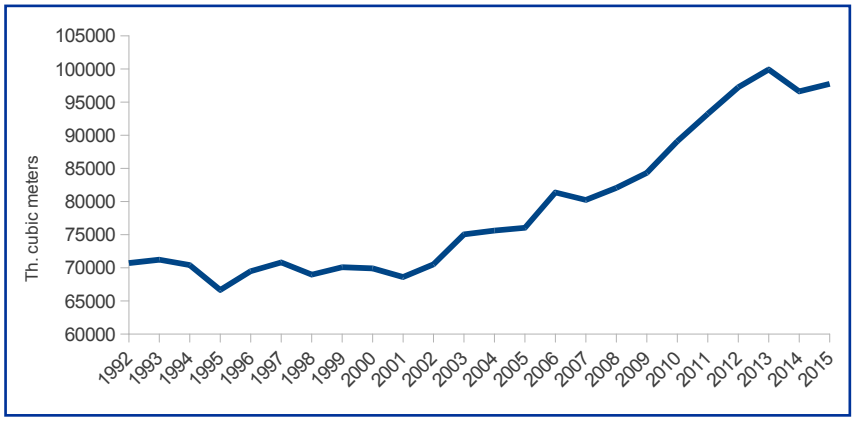

Figure 1 Fuelwood production in the European Union

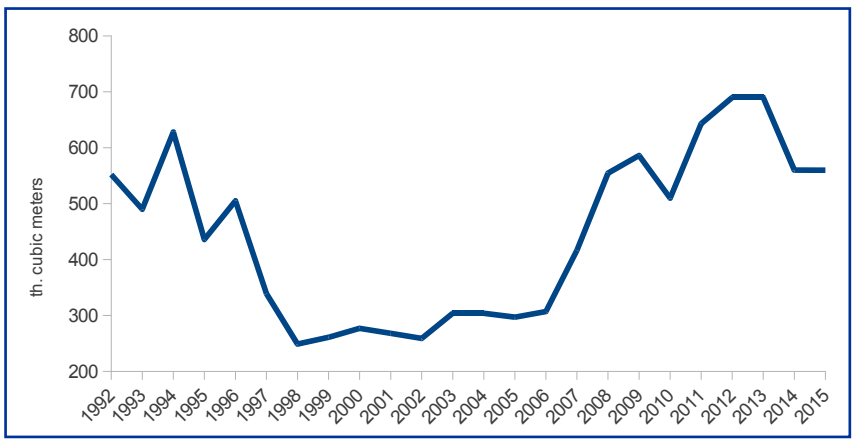

Figure 2 Fuelwood production in Slovakia

Results and discussion

The level of fuelwood production in the European Union has been growing since 2000 (Figure 1) and this source of energy has been becoming more and more important for European and Slovak economies.

Fuelwood production in Slovakia has experienced crisis in the recent years (Figure 2). The level of production has been decreased by about 30% comparing to the peak years of 2012–2013. However, this crisis was general for all of the EU (see Figure 1) but, different to Slovakia, the EU as a whole has started to renew this industry.

The level of forest poverty was evaluated for the year 2015. There are 10 forest-deprived countries (Table 1) where the indicator of forests area per capita is below the poverty threshold (60% of the EU average level).

The highest NFPG value 0.12 corresponds to the country most deprived in forest resources (Malta).

Further, we ranked the EU and some neighbouring countries by the level of fuelwood production per capita and fuelwood production intensity (see Table 2). The majority of countries which are poor in forests have low levels of fuelwood production (less than the EU average). The only exception is Denmark, which is the leader in fuelwood production, despite the deficit of forests.

As for Slovakia, the country possesses large forest resources, but the actual level of fuelwood production is significantly lower than in close countries, such as the Czech Republic, Romania, Austria, Hungary or Bulgaria.

We found out that the leader in intensive production of fuelwood is Denmark, which is a deprived country in the sense of forest resources. The Netherlands and Germany also use their forest resources very intensively. The position of Slovakia corresponds

to the countries with large areas of forests, such as Latvia, Finland, Norway or Sweden.

In general, it can be said that the level of fuelwood production depends on availability of forest resources, but forest resource itself is less significant than policies in the sphere of energetics. Economically developed countries which are interested in renewable energy usage growth, such as Denmark, Germany, and the Netherlands became the leaders of fuelwood production and use. And, in contrast, many countries rich in forests still underrate their own potential in this sphere.

Therefore, fuelwood production in the EU has a high potential of growth on the account of countries with underused forest resources. The level of fuelwood production is limited not by forests resource availability,

Table 1 Forest poverty in the EU countries, normalized forest poverty gaps (NFPG)

Rank	Country	NFPGs, 2015
1	Malta	0.12
2	Netherlands	0.11
3	United Kingdom	0.09
4	Belgium	0.08
5	Denmark	0.05
6	Germany	0.03
7	Cyprus	0.03
8	Luxembourg	0.02
9	Italy	0.02
10	Ireland	0.02

Table 2 Fuelwood production per capita and fuelwood intensity index

Fuelwood production per capita, 2015			**Fuelwood production intensity index, 2015**		
Rank	**country**	**cubic meters per capita**	**Rank**	**country**	**cubic meters per hectare of forests**
1	Estonia	1.84	**1**	Denmark	3.24
2	Finland	1.42	**2**	France	1.60
3	Lithuania	0.80	**3**	Hungary	1.39
4	Sweden	0.62	**4**	Switzerland	1.33
5	Latvia	0.61	**5**	Austria	1.28
6	Austria	0.59	**6**	Lithuania	1.12
7	Slovenia	0.55	**7**	Estonia	1.09
8	Norway	0.52	**8**	Germany	0.98
9	France	0.41	**9**	Slovenia	0.90
10	Bulgaria	0.37	**10**	Czech Republic	0.82
11	Denmark	0.34	**11**	Netherlands	0.77
12	Croatia	0.33	**12**	Romania	0.76
13	Hungary	0.29	**13**	Croatia	0.73
14	Romania	0.25	**14**	Bulgaria	0.73
15	Switzerland	0.21	**15**	Liechtenstein	0.71
16	Czech Republic	0.21	**16**	**European Union**	**0.62**
17	**European Union**	**0.20**	**17**	Italy	0.59
18	Germany	0.14	**18**	Poland	0.55
19	Poland	0.13	**19**	United Kingdom	0.51
20	Liechtenstein	0.13	**20**	Latvia	0.38
21	Slovakia	0.13	**21**	Slovakia	0.36
22	Spain	0.07	**22**	Finland	0.34
23	Greece	0.07	**23**	Ireland	0.28
24	Portugal	0.06	**24**	Norway	0.21
25	Ireland	0.05	**25**	Sweden	0.21
26	Luxembourg	0.03	**26**	Luxembourg	0.19
27	United Kingdom	0.02	**27**	Greece	0.19
28	Netherlands	0.02	**28**	Portugal	0.19
29	Italy	0.01	**29**	Spain	0.19
30	Cyprus	0.01	**30**	Cyprus	0.03
31	Malta	0.00	**31**	Malta	0.00

Table 3 Fuelwood production level changes in 2014/2015 by countries in thousands of cubic meters

Country	2014	2015	growth	%
European Union (28 countries)	**96,617**	**97,745**	**1,128**	**1**
Bulgaria	2,534	2,848	**315**	**12**
Czech Republic	2,111	2,336	**225**	**11**
Germany	11,114	10,494	-620	-6
Estonia	2,257	2,179	-78	-3
Ireland	206	203	-3	-2
Spain	3,709	3,709	0	0
France	26,116	25,962	-154	-1
Croatia	2,300	1,769	-532	-23
Italy	3,717	3,004	-713	-19
Cyprus	5	7	**3**	**55**
Latvia	1,299	1,200	-99	-8
Lithuania	2,316	2,110	-206	-9
Netherlands	4	357	**353**	**9,549**
Austria	5,059	4,979	-80	-2
Poland	5,185	5,152	-33	-1
Portugal	600	600	0	0
Romania	4,859	5,079	**220**	**5**
Slovenia	1,589	1,242	-346	-22
Slovakia	560	560	0	0
Finland	7,832	7,964	**133**	**2**
Sweden	5,900	7,000	**1,100**	**19**
United Kingdom	1,823	1,921	**98**	**5**
Liechtenstein	5	4	-1	-25
Norway	1,568	1,718	**150**	**10**
Switzerland	1,643	1,584	-59	-4

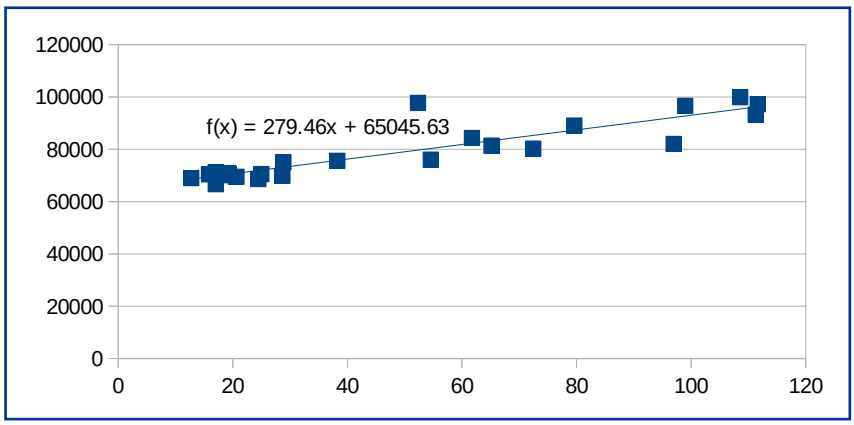

Figure 3 Regression analysis of fuelwood production in EU in thousands cubic meters on oil prices taken from the Brent Spot Price FOB (US dollars per one Barrel)

but by socio-economic factors which determine the demand on this kind of fuel.

The regression analysis showed that the main determinant of fuelwood production in the EU is the price of oil (Figure 3). The analysis is based on annual data for the period 1992–2015. Parameters of the model are the following: $R^2 = 0.7943335617$, standard error = 5,090.301069663, Pearson correlation coefficient = 0.8912539266, *t*-statistics = -35.3315295168. The model demonstrates that the crisis of fuelwood production in the years of 2014–2015 is predetermined by oil prices drop from about a hundred USD per barrel to 50 USD per barrel what decreased competitiveness of wood as a fuel.

The fuelwood production level of 2015, the last year of observation is an outlier in this model, since the level of fuelwood production has started to recover because of the low oil prices. To explain it, deeper view on fuelwood production level change is needed.

Only the countries, for which the data of 2015 is available, are included in the Table 3. The data showed that the level of fuelwood production in the majority of countries decreased, and this is in full correspondence to the oil prices model. Only a few countries demonstrated growth. These are not connected with forest poverty, with large forest resources and with relatively low level of fuelwood production intensity (see Tables 1–2). The countries of intensive fuelwood production, particularly those with forest poverty like Germany have shortened this industry. The only exception is the Netherlands with limited forest areas, but this country also has relatively low fuelwood production intensity index. The Netherlands almost stopped fuelwood production in the year of oil prices drop (2014), but afterwards restored it. All the countries which produced more than 0.9 cubic meter of fuelwood per hectare of forest area have shortened fuelwood production in 2015.

We consider that this dynamics may be explained by the higher costs of intensive fuelwood production technologies, like planting trees, forest cut specially for energy purposes while low intensive fuelwood production may be relatively cheaper (like usage of different available wood wastes). High costs could be covered in the condition of high fuel prices, but it became impossible after fuel prices drop. In contrast, cheap fuelwood may still meet its demand.

Fuelwood production forecast is on one hand limited by demand, which depends on fuel prices, but, on the other hand, it has a high potential of growth in the countries with large forest resources and with low fuelwood production intensity, where cheap wood raw materials are available for fuelwood producers. Slovakia meets these conditions. This is the country with large forests which are, due to statistics, almost not used for fuelwood production. The highest value of fuelwood production intensity index was 0.36 cubic meter of fuelwood per hectare in the peak year of 2013, but in 2014 and 2015, the country experienced a decrease of this indicator to 0.29 cubic meter of fuelwood per hectare. At the same time, the Czech Republic has already overcome the crisis and reached the fuelwood production intensity level of 0.88. The Hungarian data of 2015 is absent, but fuelwood production there was growing even in the crisis year of 2014. Similar situation is also in Romania with fuelwood production intensity index values 0.76, 0.72, 0.74 in 2013–2015, respectively.

Thus, actual situation with fuelwood production in Slovakia is controversial. The country has all prerequisites for fuelwood production growth, but there is no growth according to the Eurostat data. At the same time, fuelwood production is much higher and is growing in neighbouring countries with similar socio-economic and environmental conditions. Now, fuelwood production in Slovakia fluctuates together with oil prices and may grow significantly only if these prices grow what is unexpected in the next few years. But, objectively, the country may double or triple the level of fuelwood production even with low oil prices and reach the level of fuelwood production intensity of neighbouring countries if to eliminate invisible factors which prevent growth.

Conclusion

Fuelwood is an important component of renewable energy sector and its production has a trend to grow in Europe since the beginning of the century. Now, this industry is in crisis caused by the decrease of oil prices after the year of 2014 and the majority of European countries decreased the level of fuelwood production.

It is shown with the indices of forest poverty and fuelwood production intensity that fuelwood production continues to grow only in the countries with large forests and with low intensity of production, and we consider that this growth is caused by low costs of fuelwood production in the conditions of availability of wood raw materials.

Therefore, only the countries which meet the conditions of forests availability and low intensity of fuelwood production such as Slovakia have perspectives of fuelwood production growth with current low fuel prices.

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THE CONTROVERSIAL NATURE OF WORKFARE PROGRAMMES

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According to the OECD, active employment policies include all social expenditure that are directed at improving the chances of finding a job and income generation (except education). Active labour market policies are around to assist in enhancing labour market flexibility at the times of economic changes. Their key components are the so-called activation strategies that act as typical prerequisites of benefitting from unemployment security/support systems in every EU country. The workfare concept lies behind the public work programmes. There are serious professional debates whether public work can primarily be seen as a 'compulsion and work test' or, rather, as an opportunity of entering the primary labour market. The available efficiency analyses unanimously state that public work forms have the biggest role in testing willingness to work and the obligatory nature is the strongest of all active labour market policies. Research also indicates that public work reintegrates only few people back to the primary labour market and the majority are restrained from seeking a job and other income generating activities. There are several reasons for and against public work and opinions differ. The paper summarises the benefits and drawbacks on the basis of international and Hungarian analyses.

Keywords: labour market policy, poverty, public work, unemployment, welfare programme

Public work has always come to the foreground when the former economic and employment forms have undergone some changes as at that time the labour market equilibrium could not be kept so there was scarcity of income and the intervention of a central power was inevitable. Public work is such an active instrument that can sell well politically. On the one hand, it has a moral base easy to identify with, and its impact can rapidly be felt, on the other hand. At the same time, however, public work programmes are debated and have a controversial nature: they are rather expensive and their use and results are uncertain, especially in the long run.

Material and methods

The objective of our paper is to give a detailed overview of evaluating programmes that are in the centre of heated political debates primarily on the basis of international literature.

As most data in social sciences are intangible, i.e. human actions and views, products that are worth examining, exact hypotheses could not be formulated in our exploratory research so an abductee approach was applied.

Reconstructing past events is based on abduction as we can guess events by concluding on the basis of their consequences and current impacts. The statements at the end are thought awakening but we hope they can contribute to the everyday and scientific debate on public work programmes.

Results and discussion

The ideology

Public work stands at the intersection of two ideologies. Based on the classical approach it is regarded as a socio-political instrument while according to the neoconservative or neoliberal approach it approaches criminal policy in a sense that the state enforces the right lifestyle (Szabó, 2013).

Several examples prove that state or local governmental investments are realised within the framework of public work. In such cases public work is not seen as a labour market policy, rather, it is an instrument to reach some state or community goals that can also serve as an employment policy, in addition. The American New Deal programme was born to address the Great Depression of 1929–1933. Its objective was to create jobs to the masses of unemployed and reinvigorate economic development. The state assisted in alleviating the graveness of the crisis by generating additional demand and realising infrastructural investments that provide the private sector, the enterprises and employees alike with income (Smith, 2006).

In Europe in the 2000's public work is labour forced by the state. If one is unable to find a job after benefitting from the contributions in the form of unemployment benefit, they will get a slight amount lower than the former one as benefit on the one hand, and also they have to undertake the job offered by the state, on the other hand (Csoba, 2010). Only 10 percent of the participants of public

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work programmes are channelled back to the legal labour market while this ratio is twice this amount in the case of those who have not participated in such programmes. The systematic way of life demanded by labour, and the hours of the day spent on work are really important parts in preserving mental and physical capacities but it is dubious whether this compulsion can neutralise the positive impacts (Szabó, 2013).

The term 'workfare' currently used comes from the Republican James Charles Evers from 1968 as a coinage of "work" and "welfare" and became widespread after President Nixon's 1969 August speech on television. The main point is that there are certain prerequisites of benefitting from state welfare services such as trainings, rehabilitation and work experience as well as unpaid and low-paying jobs. Most frequently it means that the unemployed are reintegrated into the world of labour, in certain positions and the welfare payments are gradually reduced or stopped for them. There are two explanations behind: the tax paying citizens can feel that they can obtain higher value in exchange for their contribution to the welfare system when they experience the work performed by those living on the dole. The most important objective is to organise a useful type of job for those between jobs that can socially be accepted and creates a new value. On the other hand, the unemployed can gain work experience in corporate life (Smith, 2006). However, if the unemployed are reintegrated into the world of work, their income will generate taxes.

The workfare instruments are directed at reducing the number of those on the dole in two ways. On the one hand, they select and exclude those who are working (and not entitled to the benefit) or who are not seeking a job (as it is the prerequisite of the benefit). The filtering impact of the programme can prevail in attracting those who are really in need and keep off the wealthier, which can reduce the administrative cost of the government. The principle of 'little alternatives' prevails in the salary and work conditions, as well. Public work should not be more attractive from any aspect than the open labour market opportunities. On the other hand, individuals are pushed into situations where human capital can be improved and chances are higher for finding a job. Workfare includes such different programmes and approaches that are based on the different combinations of these two mechanisms (Heikkilä et al., 2002; Ko and Cho, 2017).

The developed and the developing countries

The concept of workfare lies behind the public work programmes. These programmes have become widespread in the developed countries mainly since the economic and financial crisis. Workfare principle prevails in the USA (Temporary Assistance for Needy Families; Work Experience Programme; Wisconsin Works; Community Jobs), Australia (Work for Dole) and Canada (Canada Health and Social Transfer; Ontario Works) (Marston and McDonald, 2008). The groups targeted are usually special social groups so these programmes frequently include re-employability (combined with trainings) and occasionally serve welfare functions (such as the programme of South Africa[1], France, China, South Korea, Latvia and Portugal) (Kim and Zurlo, 2007; Melo, 2009; Robbins, 2015; Bertrand, 2017).

In the developed countries they are only moderately used as they are expensive and other active labour market policies have proved to be more effective (Alegre, 2017) primarily due to their substitution and crowding out effects. Most typically, public work programmes are employed in the developed countries only in the short term as a reaction to a short term economic shock or in case of high unemployment rate. The developed countries have a well-functioning and fairly flexible labour market so public work programmes are usually launched to reintegrate the unemployed to the world of work (Beaudry, 2002). When launching public work programmes it is a must to consider that they should not impede the primary labour market, rather, they should support it (Eardley et al., 1996; Grover and Stewart, 1999; Bergin, 2018; Norton, 2018).

Public work is getting more and more widespread in the developing world to fight poverty, and with the objective of guaranteed employment or transition leading to self-employment such as in Argentina, Ethiopia, India (Adimassu et al., 2015; Shah and Steinberg, 2015; Ismail, 2016; Rosas and Sabarwal, 2016; Mourelo and Escudero, 2017; Karimi, 2018). The National Rural Employment Guarantee Act (NREGA) of India offers 100 paid working days to those entitled instead of the unemployment benefit known in the western model. The Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) programme available for 54 million households also contributes to reducing poverty by raising agricultural wages in the market where most people are affected by the programme as an indirect effect. Argentina (Programa Intensivo; Trabao, Programa Trabajar; Programa Jefes de Hogar) has been affected since its grave economic situation (1992) where projects to improve agricultural enterprises (such as irrigation) are supported or direct agricultural production is another example due to community gardens. In Ethiopia implementing the irrigation system was realised within the framework of small scale farms managed by well discernible social groups, i.e. women at a disadvantaged situation (Fachelli et al., 2004; Ronconi et al., 2006; Ravi and Engler, 2015).

The most important difference between the developed and the developing countries is that in the latter ones the public work programmes are aimed at managing structural, long lasting problems and not temporary economic shocks and typically they are linked to developing infrastructure. In the developing countries the most underdeveloped settlements are targeted, which is a kind of selection, and the public work wages are below the average market wages of the poor. Public work programmes offer few opportunities of breaking out for those in a very disadvantaged situation (Koós, 2016).

In Hungary it is also typical that public work is the only form of connection to the formal world of labour in the

1 The labour market of South Africa has significantly been transformed since 1994. Several laws and labour regulations were made since the mid-1990's to eradicate the labour market injustices and inequalities of the past and improve the general conditions of employment.

peripheral rural areas. For those living there this is the much desired source of living as their poverty is not temporary, but it is a lifestyle. In this way, several jobs are created in rural areas, especially in agriculture, that do not require much expertise. Participation in agricultural programmes means a salary which is lower than the minimum wage but is a fixed source so it has become an alternative for seasonal employment and commuting to work (Uszkai, 2014; Koós, 2016; Váradi, 2016; Kovács, 2018). The broad acceptance of workfare can be due to the fact that for the local governments it provides cheap labour and sources that generate significant local developments. Within the framework of public work programmes there have been a lot of good practices to share (e.g. the streets of Tiszakécske, wood products of Csávoly, jam specialities in Boldogasszonyfa) that are backed by local efforts (László, 2016) that had been in existence previously, though without enough sources.

The employment capacities of the primary labour market are either totally absent or very limited. It is also well known that the participants of the workfare programmes as employees do not have the assets regarding qualification, social status, connections or work experience that would set productivity on the primary labour market as an example for them. The formal job opportunities have disappeared from the gypsy villages in the periphery of the country and the only source of income for those living here is family support, social transfer and participation in public work in addition to the very occasional odd job opportunities (Csoba, 2017; Virág, 2017). At the same time, however, for those not having a job for a long time there are no other employment and job opportunities. In an examination (Csehné, 2018) such opinions were voiced that do not debate the success of the programmes. Participants compare the positive and the negative experience of everyday work with their own ambitions and purposes and on the whole, they are satisfied. If the programme succeeds, it does not mean employment on the supported or open labour market, rather, it would result in decreasing the number of those living on the dole and justifying the fact that access to goods can only be granted through work (Koós, 2016; Váradi, 2016; Czibere and Molnár, 2017).

Researchers also draw attention to the negative aspects of the programme (Cseres-Gergely and Molnár, 2014) as it turned out that the number of those having spent a long time in the labour system without participating in any active labour market programme is extremely high. The analyses of the researchers point out that the chances for being pushed out of the system of public work are lower than those of other programmes and the more one has been involved in public work, the lower the chances of getting out of the system are. To date, public work will be transformed from its original function of being an active labour market policy that transforms temporary employment into an employment opportunity available for everybody in Hungary.

The situation analysis of the post socialist (Lissowska, 2017) and V4 countries (Sulich, 2016) concludes that public work previously considered as a temporary instrument provides job opportunities for the unskilled who have been unemployed for a long time. After the careful analysis of the current situation of the Visegrad group, it is difficult to envisage the dramatic decline of unemployment in the forthcoming years as these governments do not have the proper financial means to support the labour market. Some critical analysts forget about it and conclude that the primary objective is not the decrease of unemployment, rather, the increase of employment.

The public work programmes of the developing and developed countries have some things in common. Basically, they ensure short term employment for the unemployed and reduce poverty due to income transfers. However, a difference is that regional development is the objective for the developing countries while for the developed countries it is the improvement of employment that is more significant. It is also reflected in the fact that the developing countries are project based while the developed countries are characterised by mostly programme based approaches. In general, it is stated that public work programmes can function as the instruments of social network fighting against poverty if they are well targeted by ensuring temporary employment if they are directed at very disadvantaged regions or special labour market groups (Subbarao et al., 2013, Ninno et al., 2009; Zimmermann 2012; Siemiatycki, 2016; Martín-Antón et al., 2017; Bertrand, 2017). At the same time, however, experts also agree that this effect can only be felt rather in the short term when the wages of public work remain under the minimum wage (Datta and Chakrabarti, 2016). However, public work programmes cannot be regarded as active programmes that would increase the chances of employment and reintegration as they are rather expensive (Brown and Koettl, 2015; McKenzie, 2017).

Pros and cons

One of the greatest challenges of the 21st century is unemployment, social exclusion and reducing regional differences. That is why it is necessary to think over the labour concept and work out new employment models. Workfare has become a dominant social welfare approach in many different cities of the world to tackle unemployment. The current welfare system provides such a high level of supplies that it prevents people from working.

Those who are for the concept of workfare state if a person has very recent work experience, the chances are higher for a better paid job for a longer term.

The critics of the workfare system highlight that there is no evidence whether participation in the programme would increase the chances of finding a new job. They state that the chances of the participants for finding a job are even worse as they can waste their precious time on such a programme that does not provide them with practical knowledge or skill appreciated by their future employer. The workfare strategy based on the old fashioned labour concept can contribute to the depreciation and marginalisation of the work performed by the disadvantaged groups.

The following arguments are for workfare type public work programmes (Besley and Coate, 1992; Kálmán, 2015):

- political popularity – Public work is such an active policy that can properly be communicated in politics partly due to its moral basics and its spectacular nature as it yields results quickly;
- widening infrastructure – Creating jobs from state funds serve public goods and infrastructure. Realising

investments in infrastructure will result in income for the private sector, enterprises and employees alike;
- reducing poverty – The well targeted and closely monitored public work programmes in the developing countries are suitable for managing temporal poverty in micro regions even in longer terms. Public work wages are higher than the amount of benefits: they make life better, ease poverty and protect from final impoverishment;
- strengthening social cohesion – Occasional work can contribute to reducing exclusion;
- fighting against black work – Public work can ensure sources of legal income;
- regular work – The regular way of leading life, working days are really important parts of preserving mental and physical health. Due to public work everyone can make their living and take responsibility for managing their own lives.

Arguments against workfare type public work programmes include:
- segregation;
- performing demanding physical work – Most of the typical jobs in public work are physical that do not require any skilled labour;
- not providing useful work experience – Most tasks do not prepare and do not provide employees with work experience that would assist them in finding a job in the labour market;
- preventing job seeking – According to research public work reintegrates only a few people to the primary labour market and prevents most of them from finding a new job or other sources of income generation;
- crowding out effect – Subsidised companies can make advancement and gains over those not subsidised;
- "getting stuck" effect – Those concerned can be in a more disadvantaged situation because due to their participation in the programme their time spent on job seeking is reduced so they are in a vicious circle;
- budgetary substitution effect – The budgetary substitution effect on public expenditure can take effect if the too expensive or too long public work programme takes the sources away from other, possibly more effective pubic political programmes;
- dead weight loss can appear – A question can be raised whether the job concerned could have been created without public work subsidies;
- job distortion effect – Even the employees who could find a job in the primary labour market would rather find one in public work.

The most important objective of creating socially acceptable and useful jobs for the unemployed that create new values seems to be fulfilled. However, the idea according to which public work would decrease unemployment and reduce the number of those on the dole is only true if several impact studies are made on the work performed. According to generally accepted professional opinions the public work programmes cannot take the place of active labour market programmes that increase labour market chances and assist reintegration. In comparison with other active employment policy programmes (subsidising enterprises, wage subsidies, labour market trainings) the participants of public work have lower chances of finding a job, which can be explained by the components of the group (low level of education, higher participation in unemployment benefit). The members of the most disadvantaged group of dropouts who can hardly be motivated cannot be channelled to the open labour market at once with standard labour market policies. For those concerned the cooperation between the local labour, social and healthcare institutions is of vital importance.

Summary and conclusions

The paper tries to find an answer to the question of where exactly the objectives of public work could fit among the other employment policies, economic development and social political concepts. According to the available results public work can mean a solution only in certain cases and it raises as many questions as it answers. To sum up, the organisers do not expect public work to ensure supported or open labour market employment, rather, the reduction on the number of those on the dole and the acceptance of the principle that access to social goods can only be granted by performing work.

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POTENTIAL OF SHORT FOOD SUPPLY CHAINS, THEIR ROLE AND SUPPORT WITHIN THE RURAL DEVELOPMENT POLICY IN THE SLOVAK REPUBLIC

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Current unfavourable situation in agricultural sector of the Slovak Republic makes national public authorities to look for possible solutions for satisfaction of local producers and consumers as well. Increase of domestic production in the programming period 2014–2020 with focus especially on producing high quality products is a challenge for Slovak government and local producers, too. In this paper we reveal the theoretical determination, legal limitations, opportunities for support and the level of implementation of short food supply chains as a tool for farmers, producers and processors to increase the added value of their products through promotion of existing and creation of new local markets. The possible support is described both in terms of the rural development policy as well as the regional policy, under limitations defined in European and national legal documents. The level of implementation of short food supply chains in agricultural sector of the SR is described in relation to the Rural Development Programme of the Slovak Republic 2014–2020.

Keywords: short food supply chain, rural development policy, farmer, rural development programme

Rural development provides Member States with financial resources which can be managed on national or regional level within multiannual programmes. The new regulation on rural development for the period of 2014–2020 concerns six economic, environmental and social priorities, while Member States within their programmes identify problems to be solved and define clear objectives to be achieved in compliance with relevant priorities, taking into account national conditions and specific features of each Member State.

The Slovak Republic is a rural country with predominantly mountainous character, with 60% of its territory covered with mountains and 40% with lowlands. 48% of territory of the country is covered with agricultural land. Slovak agricultural sector is represented by a significant share of small enterprises with the standard output of less than 15,000 € and by a smaller number of large enterprises with the standard output of more than 250,000 €. The low added value to agricultural primary production mostly focused on production of cereals and oilseeds is the general character of agricultural production in Slovakia. Increasing export of agricultural primary production raw materials and import of final food products causes that only 65% of domestic production is processed in Slovakia, although Slovak agriculture and food industry can produce high quality products. Continuous reduction of number of employees in agriculture causes that in this indicator Slovakia reaches only half of the EU average. Land abandonment due to a very extensive agriculture is a very common phenomenon in some areas. The unemployment rate is 17% in rural areas; it is even 20% in some districts and villages – much more than the EU average (RDP, 2015).

As well as European public authorities and governments of Member States, the Slovak government realises problems in Slovak agriculture and the necessity to propose some effective solutions, which can be seen in reduction of costs connected to the sale and distribution through short food supply chains and in promotion of income of primary producers through the direct sale on farm – only 3% of agricultural production is sold directly, the objective is 7% until 2020. Nowadays there are only five farmers' markets in Slovakia, the objective is fifteen until 2020. The importance of local and regional markets increases because it is a key aspect for food producers to keep and improve their positions at the domestic market. The quality of products is another aspect which must be considered. It is necessary to increase the share of domestic production with higher added value through better quality of products, innovations, regional and local specialties, etc. – the objective is to process 80% of domestic production until 2020 (RDP, 2015).

Considering objectives defined it might seem that organising farmers in short food supply chains could be an appropriate solution for the identified problems. However, before we make such a simple conclusion, we should ask some specific questions: what has been done for achieving defined objectives? Are there tools defining rules and the way of support for farmers to achieve these objectives? Can farmers organized in short food supply chains achieve a higher added value than farmers doing the business individually? Can integration of farmers into short food supply chains bring social benefits in rural areas? And what in fact are the short food supply chains?

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Theoretical background

The development of food supply chains in recent years has brought a wide scale of terms and definitions within European and also global context. Considering the European context, it is necessary to recognise the two types of food supply chains – local food systems (LFS) and short food supply chains (SFSC). However, when studying theories on food supply chains, another term occurs, the so-called "alternative food networks" (AFN), which seems to be an umbrella term covering all the other types of food supply chains. To clarify this status, it is first necessary to explain what the term "alternative food networks" means.

There are several definitions for AFN. For example, AFN are "new and rapidly mainstreaming spaces in the food economy defined by – among other things – the explosion of organic, Fair Trade, and local, quality, and premium specialty foods" (Goodman et al., 2009). Initially, AFN products were sold through charity shops, food co-ops, farm markets, box schemes and community supported agriculture (CSA) schemes (Maye and Kirwan, 2010). The last three schemes are, however, classified within the local food systems (LFS) – the food supply chains limited by the geographic area and involving the whole life cycle of the food, i.e. from its production to the sale. Thus, it might seem that LFS are the subgroup of the AFN or at least they overlap through their characteristics. However, when we consider the fact that today AFN products are usually sold in supermarkets we come to the idea that AFN and LFS are two different schemes. Detailed observation of short food supply chains will show that these represent the further separated food supply chains with different characteristics and purpose.

Van der Ploeg (2000) defines new food supply chains as a "commonly recurring phenomenon in several fields of rural development centred on distinctive product qualities including organic farming, high quality production and region-specific products". Short food supply chains (SFSC) are based on their capacity to re-socialize or re-spatialize food, thereby allowing the consumer to make value-judgements about the relative desirability of foods based on their own knowledge, experience, or perceived imagery (Marsden et al., 2000). The SFSC concept is more specific than AFNs, and, rather, covers (the interrelations between) actors who are directly involved in the production, processing, distribution, and consumption of new food products (Renting, Marsden and Banks, 2003). As the term "short" indicates, there is a significant emphasis put on minimising the distance which the food has to overcome travelling from the producer to the consumer's table. Consumers do not need to travel long distances in order to purchase their desired favourite food from the farmer, food producer or processor. Instead of travelling to a remoted town and spending much time in a crowded supermarket, saving time and travel costs when shopping at the farm in the neighbourhood seems to be a great benefit of SFSC and environmental aspects (reduction of emissions) are considerable, too. The most highlighted is, however, the "development of trusting relationships between producers and consumers" (Kneafsey et al., 2013). The social aspect based on building relationship between the farmer/producer/processor and his/her customers and personal contact of both actors reinforced by mutual trust is a key characteristic of this relationship. A farmer is aware of his/her customer's importance for the business and the customer is aware of the quality of products – local, natural and healthy – provided by the farmer. If these characteristics are contained in the information and product embedded with this information, for example printed on the package or communicated in the face-to-face contact, reaches the customer, it allows him/her to make the association with the place of production (Marsden et al., 2000).

There are three main types of SFSC identified – face-to-face, spatial proximity and spatial extended. Marsden et al. (2000) provides their following characteristics:

1. Face-to-face – consumer purchases a product directly from the producer/processor on a face-to-face basis. Authenticity and trust are mediated through personal interaction. The Internet now also presents opportunities for a variant of face-to-face contact through on-line trading and web pages.
2. Spatial proximity – products are produced and retailed in the specific region (or place) of production, and consumers are made aware of the 'local' nature of the product at the point of retail.
3. Spatially extended – where value and meaning laden information about the place of production and those producing the food is translated to consumers who are outside of the region of production itself and who may have no personal experience of that region.

Starting from these definitions we can state that the distance (or radius) between the producer and the consumer or, in a broader perspective, the distance between the place of production (or sale) and the consumer's residence, is one of the indicators determining whether the supply chain where the product is made and provided, can be considered as "short". The product is thus bound to a specific geographic area. Because SFSC often involve intermediaries acting between farmers/producers/processors and consumers, number of intermediaries is a second indicator which is considered when identifying SFSC.

Despite concrete definitions of SFSC within large available literature it is necessary to define their qualitative and quantitative limitations. These limitations are important when identifying SFSC for the purpose of receiving support from national or European support schemes. Therefore, such limitations must be defined by official legal documents on European and national level.

Legal base

Legislation represents the basic tool for public authorities to define qualitative and quantitative characters of SFSC. Such explanation is, of course, too general and it does not render exactly the character of rules dedicated to rural actors carrying out activities within SFSC. To be more precise, such legal documents must first clearly determine basic terms – short supply chains and local markets. To allow the demarcation between these two, the quantitative limitations should be defined, taking into account specific geographic features of the area concerned. Last but not least, it is necessary to define the qualitative aspects, especially concerning the hygiene rules and obligations of producers.

Two European legal documents determine limitations of short food supply chains. The Commission Delegated Regulation (EU) No. 807/2014 and the Regulation (EU) No. 1305/2013 represent the basic European legislation determining SFSC from the point of view of distance and number of intermediaries. In accordance with the Article 11 of the Commission Delegated Regulation (EU) No. 807/2014:

- support for the establishment and development of short supply chains, as referred to in Article 35(2)(d) of Regulation (EU) No. 1305/2013 shall cover only supply chains involving no more than one intermediary between farmer and consumer;
- support for the establishment and development of local markets, as referred to in Article 35(2)(d) of Regulation (EU) No. 1305/2013 shall cover markets for which the rural development programme sets out a kilometric radius from the farm of origin of the product, within which the activities of processing and sale to the final consumer have to take place.

The Rural Development Programme of the Slovak Republic 2014–2020 (RDP) sets out the 100 km radius for local market from the place of origin of product or within the territory of a Higher Territorial Unit where the enterprise resides.

Concerning some complementary regulations, the Council Regulation (EC) No. 834/2007 lays down legal framework for all levels of production, distribution, control and labelling of organic products which may be offered and traded in the EU. The Commission Regulation (EC) No. 889/2008 lays down rules for implementation of the Regulation No. 834/2007. Requirements for SFSC determined within European legal documents are binding for farmers/producers/processors in each EU Member State. Concerning the national level, both the "distance" and "intermediary" criteria determined within the Commission Delegated Regulation (EU) No. 807/2014 have been implemented into the Rural Development Programme of the Slovak Republic 2014–2020. Other national legal documents set the rules concerning the direct sale of food to consumers and requirements for food establishments and small volumes, namely:

- the Slovak Government Regulation No. 360/2011 Coll. Laying down hygienic requirements for direct sale and supply of primary products of plant and animal origin small volumes and for supply of the milk and milk products to final consumer and other retail establishments;
- the Slovak Government Regulation No. 100/2016 Coll. Amending and supplementing the Slovak Government Regulation No. 360/2011 Coll.;
- the Slovak Government Regulation No. 359/2011 Coll. Laying down requirements on some food establishments and on small volumes.

The Regulation No. 360/2011 Coll. lays down hygienic requirements for direct sale and supply of small volumes of primary products to the final consumer or to local retails and determines obligations of such retail establishment operators. It also determines requirements for supply of milk and milk products from one retail establishment to the others, considering this supplying to be marginal, local and limited activity. Concerning small volumes of primary products, these involve fish, raw milk, eggs and bee honey, cereals, buckwheat, sorghum, millet, amaranth, legumes, oilseeds, potatoes, vegetables, fruit, herbs and cultivated mushrooms. They must come from a separately registered own production, harvest or breed. Procession and packaging of these products must not significantly change their character and cause their contamination. They can be only sold at a farm or at a local market. The term "local retail establishment" has been identified for supply of small volumes of primary products. Local retail establishment represents a small shop, appropriately equipped market place or a facility for common catering. Facilities such as supermarkets, distribution centres, wholesale facilities, and activities such as the doorstep selling, mail order selling, Internet selling or intermediary selling are excluded. Requirements determined in the Regulation No. 359/2011 Coll. concern the rules for production of meat. For better orientation of farmers, the Ministry of Agriculture and Rural Development of the Slovak Republic published the methodological handbook for application of the mentioned regulations in practice.

The three mentioned national regulations modify rules of directly applicable EU legal documents (Regulation (EC) No. 852/2004 of the European Parliament and of the Council of 29 April 2004 on the hygiene of foodstuffs and Regulation (EC) No. 853/2004 of the European Parliament and of the Council of 29 April 2004 laying down specific hygiene rules for food of animal origin) modification of which has been entrusted to internal law of individual Member States, only respecting hygiene requirements. Other relevant legal documents defining requirements for animal health, protection of animals, identification of animals, control of residues, zoonosis, food labelling, general food law, animal by – products, etc. are not concerned. However, farmers are obliged to follow these requirements regardless of whether they act within the SFSCs or not.

Data and methods

The data used in paper have been collected from the following resources:

- EUROSTAT database for the time period 2005, 2007, 2010 and 2013. The 2 indicators have been considered – the area of agricultural holdings and the standard output of agricultural holdings;
- Agricultural Paying Agency (Annual Report on the Rural Development Programme of the SR 2014 – 2020) for the time period 2015 and 2016. The following indicators within the sub-measure 4.2 – Support for investments for processing/placing on the market and/or developing agricultural products have been considered: number of submitted projects, total requested grant, number of approved projects, total approved grant and the share of budget contracted.

We focus on the potential of the short food supply chains development through level of concentration of small and medium enterprises in the primary production sector into the short food supply chains. Subsequently, the efficiency of the Rural Development Programme of the SR 2014–2020 measures will be evaluated.

Results and discussion

In the first part we focus on analysis of indicators representing the trend in development of small and medium enterprises within the observed time period. The development of small and medium enterprises had negative tendencies especially in case of agricultural enterprises with the area of less than 2 hectares (Figure 1). While in 2005 these enterprises represented almost 50% of area of all agricultural holdings, it was only 37% in 2007, 36% in 2010 and 34% in 2013. The situation of holdings with 2–4.9 hectares is much more stable at the level of approximately 26% of the total number of agricultural holdings. Concerning holdings with the area of more than 5 hectares, we have registered growing tendencies in number of these holdings from 24% in 2005 up to 40% of the total number of agricultural holdings in 2013. However, this growth has been at the expense of smaller holdings with the area of less than 2 hectares number of which declines, as they are less profitable and often absorbed by larger farms. This fact shows how vulnerable these holdings are in comparison with larger farms.

The figure 2 indicates the numbers of agricultural holdings in connection to their overall economic size through the standard output. There are significant differences between observed time periods considering especially agricultural holdings with the standard output less or equal to 2,000 €. While in 2005 these holdings represented almost 78% of total number of agricultural holdings, it was 76% in 2007, 31% in 2010 and 27% in 2013. On the other hand, growing tendencies of holdings with the standard output 2,000–3,999 € are considerable, too, as they represented 12% of total number of agricultural holdings in 2005, while it was 13% in 2007, 27% in 2010 and 25% in 2013.

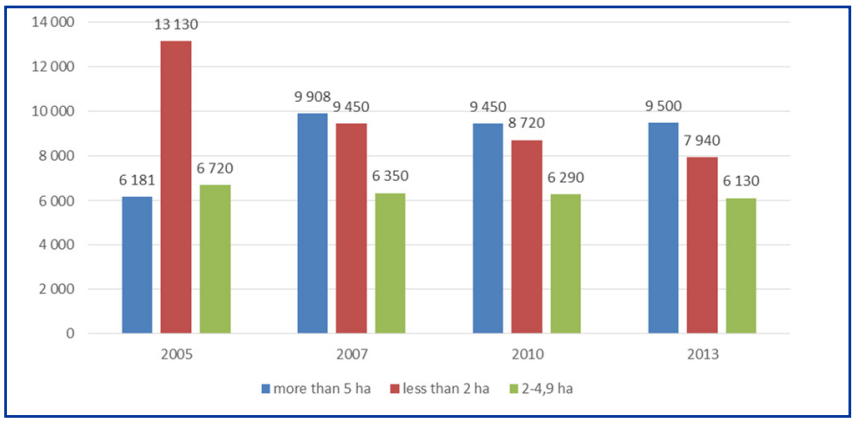

Figure 1 Number of agricultural holdings according to the area
Source: Eurostat

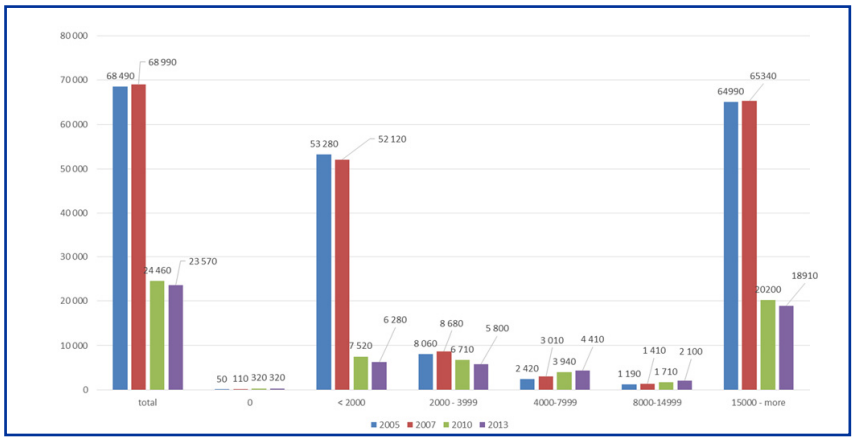

Figure 2 No. of agricultural holdings according to the standard output
Source: Eurostat

Numbers of agricultural holdings with the standard output higher than 4,000 € had only growing tendencies in the observed time period.

Support of the short food supply chains through the Rural Development Programme of the SR 2014–2020 and the level of implementation in Slovakia

Rural development generally involves activities and initiatives focused on improving the life standard in rural areas. Rural development activities especially focus on social and economic development of rural areas and they are part of the Common Agricultural Policy of the EU (CAP), usually known as the "second pillar" of the CAP. Direct payment schemes, usually known as the "first pillar" of the CAP, represent an inseparable, although independent part of the rural development. To define areas of support and activities within the rural development, each Member State prepared a rural development programme for its entire territory or, in some cases, a set of regional programmes or both a national programme and a set of regional programmes. Each programme identifies a strategy for meeting targets in relation to the Union priorities for rural development and a selection of measures and includes thematic sub-programmes to address specific needs in areas of particular importance to them. Thematic sub-programmes concern, among others, young farmers, small farms, mountain areas, women in rural areas, climate change mitigation and adaptation, biodiversity and the creation of short supply chains.

On European level, support of short food supply chains has been indicated by the European Commission in its Report to the European Parliament and the Council on the case for a local farming and direct sales labelling scheme. On national level, the support has been indicated by the Ministry of Agriculture and Rural Development of the SR in its Concept of Agricultural Development of the SR 2013–2020. Specific rules for support of short food supply chains are defined in the Rural Development Programme of the Slovak Republic 2014–2020 (RDP). In terms of the main priority 3 – Promoting Food Chain Organisation,

Including Processing and Marketing of Agricultural Products, Animal Welfare and Risk Management in Agriculture, the RDP defines conditions for support of actors within SFSC, addressing focus areas 3A – improving competitiveness of primary producers by better integrating them into the agri-food chain through quality schemes, adding value to agricultural products, promotion in local markets and short supply circuits, producer groups and organisations and inter-branch organisations, 6A – facilitating diversification, creation and development of small enterprises, as well as job creation and 6B – fostering local development in rural areas. The purpose of the synergy created among selected focus areas is to contribute to the increase of the added value creation in agricultural production, improvement of cooperation between farmers and between farmers and other actors within the food supply chain and, finally, contribution to development of SFSC. The support especially concerns investments into properties in terms of selling and processing agricultural products, starting the production of new and traditional products, introduction of new technique / technologies, and creation of small places for selling agricultural products. The support is provided within the Measure 4 – Productive investments, sub-measure 4.2 – Support for investments for processing/placing on the market and/or developing agricultural products, and is eligible for farmers and producers/processors of agricultural and food products, with the following eligible activities:

- construction, reconstruction and modernisation of objects for processing, storage, marketing and / or development of agricultural and food products;
- acquisition, reconstruction and modernisation of facilities, machines, apparatuses and technologies, processing and production capacities including laboratory equipment within the process of processing, storage, marketing and / or development of agricultural and food products, including products with protected designation of origin and the protected geographical indication and including traditional specialities guaranteed;
- investments into constructions or technologies for creation or modernisation of local collecting network – receiving, storage, adjustment, sorting and packaging;
- purchase of cold or refrigerated trucks or cars, trailers or semitrailers, transport trucks;
- introduction of technologies and procedures for creation of new or better quality products and opening new markets especially in connection with the SFSC;
- investments into construction or technologies for better use or elimination of by – products or waste;
- investments for creation and equipment of own company shops and for improvement of work environment of employees.

Assessing the level of implementation of short food supply chains projects, we used data provided by the Agricultural Paying Agency in its summary report up to 31. 12. 2016. There were 412 projects approved in terms of the sub-measure 4.2 in 2016 and the total approved grant was 166,486,768 €. This represents 83% of limits for public expenditures (EU + SR) for the whole period of 2014–2020 determined for the sub-measure 4.2. When we consider the fact that only 46 projects were approved in 2015 (these were projects continuing in terms of the RDP 2007–2013), we can say that the progress in implementation of the sub-measure 4.2 was significant in 2016. The following tables and figures provide an overview in terms of providing support for short food supply chains in 2016 within the sub-measure 4.2 – Support for investments for processing/placing on the market and/or developing agricultural products in Slovakia as whole and in individual regions.

Distribution of support for the sub-measure 4.2 is expressed in table 2 and in figures 3 and 4. There were 87 projects approved for the Nitra Region – this represents 21% of the total number of projects approved in Slovakia,

Table 1 Summary report on implementation of the sub-measure 4.2

Number of submitted projects	Total requested grant (€)	Number of approved projects	Total approved grant (€)	% of budget contracted
618	285 769 047	412	166 486 768	83

Source: Agricultural Paying Agency

Table 2 Summary report on implementation of the sub-measure 4.2 by regions of the SR

Region of the SR	Number of approved projects	Approved grant (€)
Bratislava (BA)	11	2 338 096
Banska Bystrica (BB)	66	34 777 531
Kosice (KE)	42	16 101 456
Nitra (NR)	87	39 294 963
Presov (PO)	61	29 952 083
Trencin (TN)	48	14 097 176
Trnava (TT)	57	20 490 804
Zilina (ZA)	40	9 434 658

Source: Agricultural Paying Agency

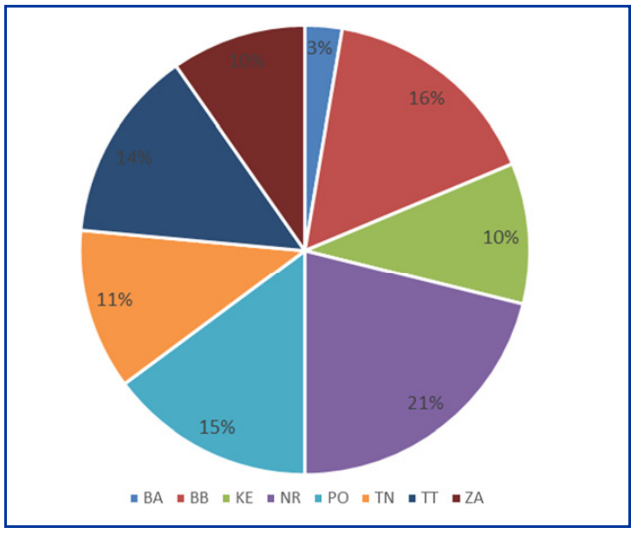

Figure 3 Summary report on implementation of the sub-measure 4.2 by regions of the SR – approved projects

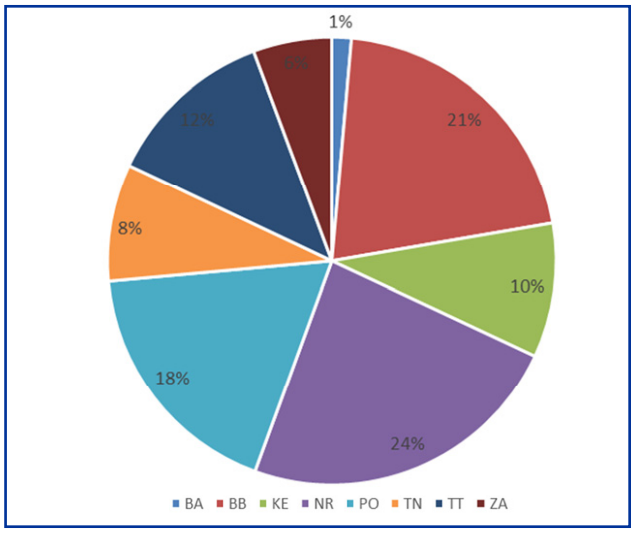

Figure 3 Summary report on implementation of the sub-measure 4.2 by regions of the SR – approved grants

the highest share of projects approved for the sub-measure 4.2 in 2016. Concerning the approved grant within the mentioned sub-measure, the Nitra Region keeps the 1st place with 39,294,963 €. This represents 24% of the total grant approved in Slovakia for the sub-measure 4.2 in 2016.

Horizontal and vertical cooperation of farms organised in SFSC, cooperation between SFSC actors when creating logistic platforms for promotion of SFSC and local markets, and dissemination activities can be supported, too. The support is eligible for farmers and producers / processors of agricultural and food products. Specifically, the following activities are eligible:

- studies or plans concerning the relevant area, feasibility studies, creation of business plans or other local development strategies;
- recovery of the relevant logistic platform, resp. the SFSC or local market with objective to ensure the project feasibility;
- relevant samples, measurements and tests for realisation of business plans, studies, surveys or cooperation.

In the programming period 2014–2020 the European Commission provides an option to use financial resources from other EU funds through the Community-led local development (CLLD). This principle includes the European Agricultural Fund for Rural Development (EAFRD) and the European Regional Development Fund (ERDF) and complementarity of both funds is ensured by different eligibility of applicants and activities. Support from the ERDF is provided by the Integrated Regional Operational Programme 2014–2020 (IROP). Conditions for providing the support are defined in the Priority axis 5 – Community-led Local Development and similarly to the RDP, IROP is oriented on the local context of labour market, with focus on sustainable jobs development and growth. The difference between both programmes is in the fact that IROP provides the support regardless the sector, except for support of investments in agricultural primary production which is the subject of support from the RDP. On the one hand, IROP supports creation of new or promotion of existing micro and small enterprises, self – employed persons and cooperatives through promotion of local food supply chains, networking on the level of local economy and exchange of experiences. On the other hand, the support is also of infrastructural character, as creation and reconstruction of municipal market places to support local producers are eligible activities, too. The support is provided to Local Action Groups (LAGs), municipalities and their associations, microregions, civic associations, and not for profit organisations, church organisations and self – employed persons, micro and small enterprises except for those eligible to receive the support from the RDP.

Conclusion – final statements and future challenges

In the RDP there are 400,390,000 € planned for the priority 3 – Promoting Food Chain Organisation, Including Processing and Marketing of Agricultural Products, Animal Welfare and Risk Management in Agriculture. This amount represents 19.25% of total financial resources planned for the RDP, the 2nd highest amount right after the priority 4 – Restoring, Preserving and Enhancing Ecosystems Related to Agriculture and Forestry. 200,000,000 € is planned for public expenditures within the sub-measure 4.2 – Support for investments for processing/placing on the market and/or developing agricultural products. This huge financial support, together with eligible activities in terms of the RDP measures and with qualitative and quantitative rules clearly stated in legal documents and explained in methodological guidelines should provide an answer to our questions we have asked at the beginning – what has been done for achieving defined objectives? Are there some tools defining rules and the way of support for farmers to achieve these objectives? The answer is – yes. Public authorities have correctly identified that in terms of agricultural production the support for small farmers and producers / processors is a key aspect for increasing the domestic production, while added value of agricultural products through the improvement of their quality is a basic step towards

increasing their sales. To achieve these challenges, farmers are encouraged to join and cooperate in short food supply chains and when we consider the figures concerning the sub-measure 4.2 in 2016, we can say that the progress in these challenges achievement is significant. Nothing is left to chance – additionally to the RDP, municipalities, associations and local action groups have the chance to get financial resources from the IROP to improve the local infrastructure and thus support local producers.

The added value of agricultural products is one of the key elements on which the whole strategy of short food supply chains promotion is built. This fact brings us to the resting two questions asked at the beginning: Can farmers organized in short food supply chains achieve a higher added value than farmers doing the business individually? Can integration of farmers into short food supply chains bring social benefits in rural areas? Because increase of added value is one of the main objectives and activities for its achieving are the subject of financial support, we should logically suppose that it should. It is expected that investments into the infrastructure, facilities, and devices will allow farmers to produce high quality products and through their participation in the short food supply chain they will achieve higher sales of their products and improve their social situation.

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FINANCING OF GRASSLAND HABITATS IN THE SLOVAK REPUBLIC IN 2010–2016

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The grasslands in the Slovak Republic are divided into 7 categories that have different way and conditions of management to protect and maintain them. From the area of 1,239,777 hectares of habitats in SR and payments per hectare, we calculated the amount of financial support that represents 130,265,701 € for the A–G habitats in 2010–2016. Based on the data about potential use of grassland habitats in livestock feeding (mountain meadows and alluvial meadows), the production potential of C 3.12 t.ha^{-1} biotope E 4.25 t.ha^{-1} of dry matter was calculated, as a result of 5-years long experiment of the Department of Grassland Ecosystems and Forage Crops of SUA in Nitra. We calculated the direct costs for the production of hay dry matter, which reached 116.78 €.ha-1 in the meadows, and 71.11 €.ha^{-1} in valleys. Direct costs per 1 hectare of hay dry production are with a support covered on 111.0% of mountain meadows and 74% of meadows. The annual value of ecosystem services of grassland habitats reached 579,789,008 €. Subsidies for permanent grassland habitats stimulate the economy of agricultural subjects and protect the biodiversity of permanent grasslands.

Keywords: direct costs, grassland habitats, supportive policy

Slovakia has a wide variety of natural conditions associated with the rich species diversity of flora and fauna. In our conditions, to the important species of flora belong permanent grasslands (PG) – meadows and pastures (Holúbek et al., 2007). They occur from the lowlands to the subalpine zone, from wet to dry locations (Krajčovič et al., 1968). The average area of grasslands used in 2011–2015 is 515,652 ha (Green Report, 2016).

As a result of the reduction of amount of ruminant livestock after 1990, we record 320 thousand hectares of permanent grassland not used for livestock feeding. This state causes the rise of non-woody vegetation (NWV), the start of the soils and consequently deterioration of the quality of the agricultural landscape (Midriak et al., 2011).

Their quality, as a habitat for plant communities and species, is heavily influenced by the way and intensity of management (Ružičková and Kalivoda, 2007). In the conventional management system and in the currently preferred low-input system, they have many benefits and are therefore considered to be highly perspective cultures (Holúbek et al., 2014). As a part of the agricultural system and countryside, they have economic value in production and contribute to SET group (rural interests) (Lehman and Hediger, 2004). In the Czechoslovak conditions, the research of authors Krajčovič et al. (1968), Rychnovská et al. (1985), Holúbek et al. (2007) was beneficial for the theory and practice of meadows and pastures. In the recent years, the supporting policy has significantly contributed to the sustainability of biodiversity, particularly in areas of European importance and in areas of high natural value. Supporting policy has crucial importance for the income stability of farms operating in production and less-favoured areas. Subsidies and supports, including habitat protection support, stimulate the economy of companies, the investment process and have also an effect on efficiency through reducing costs and increasing labour productivity (Chrastinová et al., 2010, 2013).

The worldwide project Milenium Ecosystem Assesment (MA, 2005) characterizes benefits as ecosystem services. The extent and quality of ecosystem services depends on the nature. Biodiversity and the health of ecosystems are basic requirements to be able to gain ecosystem services of nature. In September 2016, the 26th Meeting of the European Lieutenant Federation in Trondheim (Norway) took place. The motto of the scientific conference was the multifunctional role of grassland in European bio-economics. A significant contribution in this context is presented by Plantereux et al. (2016). Based on these findings, as well as the research activities of Slovak grassland and pasture, we evaluate the potential effects of grassland habitats, including utilities – ecosystem services in this paper.

Material and methods

Data and methodology

Currently, biotopes of semi-natural and natural grasslands can be found at different stages of development that have been created by long-term grazing and secondary succession after grazing. For the favourable state of habitats, management of grazing and mowing is necessary. Otherwise, the habitats in the process of succession can change and thus get into an unfavourable state. In order to provide support, it is necessary for farmers to accept the

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principles, and conditions of the grasslands management. The management of selected areas of semi-natural and natural grasslands aims to contribute to sustainability of biodiversity of major areas of European significance and areas of high natural value.

To the semi-natural and natural permanent grasslands covered by the supporting policy belong (codes of the relevant habitat types according the Habitats Catalogue in Slovakia are listed in the brackets):

A. Thermophilic and xerophilous grasslands (Tr1, Tr 2, Tr3, Tr4, Tr5).
B. Mesophile permanent grasslands (Lk1, Lk3, Tr8b).
C. Mountain meadows (Lk2).
D. Hydrophilous vegetation of lower areas (Lk7, Lk9, Lk10, Lk11, S11, S14).
E. Lowland alluvial meadows (Lk8).
F. Hydrophilous vegetation of higher areas, peat and molinia meadows (Lk4, Lk5, Lk6, Ra3, Ra5, Ra6, Ra7, S12).
G. High mountain grasslands (Tr8a, A11, A13, A16, A18).

Providing the support for protection of biotopes of semi-natural and natural grasslands is limited by compliance with the management conditions of individual types of grasslands.

Conditions for the management of grasslands:

- Fertilization allowed only organic, for types B and C.
- Limited to 50 kg.ha^{-1} N each second year.
- Prohibition of chemistry except for the spot use approved by the ÚKSÚP.
- Deadline for mowing till July 15, (professional organization may edit date).
- The grasslands are cut from the centre towards the edges.
- Type F (Hydrophilous vegetation of higher areas) are cut only manually or using light mechanization.
- In type F is passion completely excluded, in type C and type E is allowed only after cutting.
- Corralling is allowed only in Type B (mesophile meadows), and in type G stallions of livestock can be also permanent, with the permission of a professional organization.
- Prohibition of fenced pasture.
- Allowed load (0.3–1.0 VDJ).
- Types A, G are cut maximum once, others can be cut twice.
- Gentle cohorting for 10 meters square, daily transshipment of pens.
- Careful fencing 1VDJ to 10 metres square, daily changing of corrals for animals), shepherd's supervision.
- Prohibition of additional seeding, draining and mulching.

From the information about habitats of the SR and the payments, the amount of supports is calculated (Table 1).

Methods of determining support

The amount of support is aimed to compensate the financial loss from reduced production and additional costs connected with the special conditions for grassland CC (GAE + MR) and national legislation. This difference is reduced by the costs saved by respecting the conditions for the farming. Long-term research of semi-natural and natural PG including biotopes C – Mountain meadows (Lk2), and E – Low alluvial meadows (Lk8) respecting the conditions of management have enabled us to assess the production of hay dry matter, quality indicators and the cost of hay dry production in a double-scaled system of utilization.

Production of hay dry matter was obtained as a part of research project of the Department of Grass Ecosystems and Fodder Plants (Holúbek et al., 2007).

The cost of dry matter production per 1 hectare of area was calculated according to the technological and economic parameters used by the Research Institute of Agricultural Technology in Prague-Ruzyně (http://www.vuzt.cz/index.php?l=A35).

Direct costs of production of hay dry matter were exchanged at the current exchange rate from 31. 3. 2017 (1 € = 27.030 CZK). Costs of cutting have been converted according to the used mower TK 50 kW (rotary mower 2.5) at the price of 16.02 €.ha^{-1}, turning and hay-bending with a set TK 50 kW (tiller 6 m) at a price of 11.39 €.ha^{-1}, collecting of hay with trailer TK 50 kW (collector semitrailer 30 m^3) at the price of 4.62 €.ha^{-1}, transport of hay dry matter into hay-loft TK 50 kW (trailer 5t) at a price of 1.92 €.ha^{-1}, pressing hay into the parchment packages TK 90 kW (parquet press 80 x 90 cm) at the price 41.16 €.ha^{-1}.

Table 1 Financial support

Type	Protection of grassland habitats	Payment in €.ha^{-1}
A	Thermophilic and xerophilous grasslands	89.95
B	Mesophile permanent grasslands	74.57
C	Mountain meadows	128.88
D	Hydrophilous vegetation of lower areas	74.57
E	Lowland alluvial meadows	52.73
F	Hydrophilous vegetation of higher areas	158.60
G	Peat and molinia meadows	150.72

Source: PPA BA, 2016

Results and discussion

Financing of habitats of permanent grassland

A significant part of the Common Agricultural Policy (CAP) is the support policy for agriculture and subsidies aimed to help farmers to achieve prosperity. Subsidies are tools to implement the objectives of a particular policy. The choice of proper tools and their combination should be done based on the revised strategy and objectives, the knowledge of the environment and the overall economic situation of the country (Bečvarová, 2008; Ďuricová, 2014).

The application of the systems of pratotechnology in the assessed areas of habitats of natural and semi-natural permanent grasslands is aimed to contribute to the preservation of biodiversity, especially in areas of European importance and areas with high added value. Biodiversity has a significant impact on quality of life, ensures ecological functions and is the basis for food security.

In order to protect selected PG habitats, a project focusing on the inventory of PG in the SR (Daphne with the Royal Dutch Company) was implemented in 1998. As a result of this project, the Agroenvironmental Program for the Slovak Republic (Kováč and Sabo, 2001) was elaborated, after which the catalogue "Favourable state of habitats and species of European significance, Manual for Territory Care Programs Natura 2000" was created (Polák and Saksa, 2001). In this publication, Valachovič et al. (2005) prepared a management measure to sustain the favourable state of European (non-forest) habitat types. For the financing of semi-natural and natural habitats of PG, new types of habitats were defined in the Rural Development Plan RDP (A-G). In relation to the discussed issue, the basic role in the field of nature protection is the creation of a coherent European network of protected areas (Natura 2000). The objective of networking is to maintain or improve the favourable status of habitats of European significance. Each Member State is required to prepare the necessary plans to pursue this objective. According to the legislation of the Slovak Republic, these plans are called "Care Programmes." In this context, the definition of favourable state for each type of biotope and each species was formulated in the SR. During the process of this task, the way of assessing defined habitats and species as well as general principles for habitat types were created (Habitat Catalogue, 2005). By the accession of Slovak Republic to the EU in 2004, we committed to adopt the regulations of the Common Agricultural Policy.

Permanent grasslands in the SR are divided into 7 categories in our assessment and are covered by a supportive policy. Financial support for the protection of PG habitats is limited by the management conditions. The amounts of support were calculated from the hectare areas of the grasslands in SR during the years 2010–2016 and information about payments provided by the APA. The results are shown in Table 2.

Table 2 Payment on the area (ha) of PG habitats in years in thousands (€)

Year	2010		2011		2012		2013	
Habitat of PG	area in ha	€	area in ha	€	area in ha	€	area in ha	€
A	5,766	518,652	5,640	507,318	5,623	505,789	5,240	471,338
B	147,922	11,030,544	147,794	11,020,999	147,135	10,971,857	141,485	10,550,536
C	2,594	334,315	2,583	332,897	2,583	332,897	2,568	330,964
D	8,083	602,749	8,341	621,988	8,333	621,392	8,216	612,667
E	2,882	151,968	2,628	138,574	2,628	138,574	2,665	140,525
F	4,343	688,887	4,569	724,735	4,532	718,866	4,415	700,307
G	3,476	523,903	3,482	524,807	3,458	521,190	3,317	499,938
Sum	175,066	13,851,017	175,037	13,871,318	174,292	13,810,565	167,906	13,306,276

Year	2014		2015		2016		2010–2016	
Habitat of PG	area in ha	€	area in ha	€	area in ha	€	area in ha	€
A	5,153	463,512	6,539	588,210	7,712	693,679	41,673	3,748,498
B	140,079	10,445,691	154,619	26,991,861	164,841	28,776,339	1,043,875	109,817,827
C	2,562	330,191	3,409	439,412	3,321	427,958	19,620	2,528,633
D	8,115	605,136	9,694	722,846	9,244	689,331	60,026	4,476,109
E	2,643	139,365	2,528	133,313	2,383	125,661	18,357	967,982
F	4,368	692,852	4,882	774,220	4,850	769,228	31,959	5,069,095
G	3,283	494,814	3,705	558,400	3,546	534,505	24,267	3,657,557
Sum	166,203	13,171,561	185,376	30,208,262	195,897	32,016,700	1,239,777	130,265,701

Source: APA, own processing

In 2010–2016, the total area of the PG habitats (A–G) reached 1,239,777 ha with the total support of 130,265,701 €. In the 2010–2016 average, the highest yield of 149,125 hectares, with the support of 15,568,826 € reached the habitat B (Mesophile permanent grasslands). The smallest area of 2,622 ha with the support of 138,285 € was reached by the biotope E (lowland alluvial meadows). Comparing the areas of habitats (A and G) in the years 2010–2016, there was found out an increase from 175,066 ha to 195,897 ha, which represents an increase by 20,831 ha, resp. 8.9%. In 2016, the area of PG habitats in the SR reached 195,897 ha.

In order to make a comprehensive assessment of grassland habitats as well as used PGs in other years in the SR, we also evaluated ecosystem services – the benefits provided to society by nature. The methodology of Honigová et al. (2012) was selected. The value of ecosystem services of habitats (A–G) for 2010–2016 reached the amount 4,058, 523,057 €, annually 579,789,008.1 € (Table 3).

Assessment of production costs of hay dry matter

Long-term research of semi-natural grasslands habitats – C mountain meadow (Lk2) and lowland alluvial meadows (Lk8), respecting "Management conditions of PG", enabled the proper assessment of production, quality and cost of hay dry matter production in double-cutting system of use.

C – mountain meadow (Lk2), Association Lolio-Cynosuretum typicum. The grassland is a mesohygrotic community, taxonomically characteristic by low share of clovers, high share of grass, and medium share of meadow herbs. The Community is presented by 28 taxa: *Agrostis tenuis* Sibth., *Anthoxanthum odoratum* L., *Cynosurus cristatum* L., *Dactylis glomerata* L., *Festuca pratensis* Huds., *Festuca rubra* L., *Lolium perenne* L., *Nardus stricta* L., *Poa pratensis* L., *Tristeum flavescens* (L.) Beauv., *Trifolium pratense* L., *Trifolium repens* L., *Vicia cracca* L., *Acetosa pratensis* Mill., *Achillea millefolium* L., *Alchemilla monticola* Opitz., *Campanula patula* L., *Carum carvi* L., *Cerastium arvense* L., *Crepis bienis* L., *Cruciata glabra* Ehrend., *Daucus carota* L., *Euphrasia rostkoviana* Hayne., *Hypericum maculatum* Cranz., *Knautia arvensis* (L.), Coulter, *Leontodon hispidus* L., *Plantago lanceolata* L., *Plantago media* L., *Potentilla reptans* L., *Prunella vulgaris* L., *Ranunculus acris* L., *Rhinanthus minor* L., *Taraxacum officinale* Weber in Wiggers a *Veronica chamaedrys* L. (Vozár, 2009).

E – lowland alluvial meadow (Lk8), Association Festucetum pratense. The grassland is represented by a varied floristic composition with dominant taxa: *Festuca rubra* L. ssp. *Fallax* Hack., *Anthoxanthum odoradum* L., *Alopecurus pratensis* L., *Arrhenatherum elatius* Presl. a *Dactylis glomerata* L. A high share of clover has been reported in severeal species. They have been greatly expanded in *Lotus cornitulacus* L., *Trifolium pratense* et repens L., *Lathyrus pratensis* L., localy *Vicia cracca* L. a *Medicago lupulina* L. From the agro-botanic group of other herbs had a high share *Colchicum autumnale* L., *Equisetum pratense* Ehrh., *Rumex acetosa* L., *Centaurea jacea* L., *Leontodon hispidus* er *autumnale* L., *Ranunculus acer* L., *Galium* sp., *Plantago lanceolata* L. and other species rarely expanded, or only sporadically. Original herbage was very rich for the meadow herbs, which dominated in both cuttings (Lichner et al., 1971).

The main variables for the cost calculation in the production of hay dry matter are the cost of plants treatment and costs of harvesting. The cost analysis was carried out according to the technological and economic parameters for the forage production used by the Research Institute of Agricultural Technology in Prague (see methodology). The results are shown in Table 4. Assessed habitats, assuming their production use for livestock feed, are presented without any inputs by relatively high yields. A higher production potential, 8.7 m3 of dry matter, is seen in the habitat lowland meadows. The analysis of cuttings shows a higher production of hay dry matter in the first cutting 2.0–2.2 $t.ha^{-1}$. In the second cutting, the average yield of hay dry matter reaches from 1.2 $t.ha^{-1}$ to 1.9 $t.ha^{-1}$. In the production of hay dry matter, we used the same technological processes in mountain meadows, as well as in valley meadows, with the exception of harvesting methods. The results show higher costs for the production of hay dry matter by pressing (54.98 $€.ha^{-1}$), lower in the production of dry matter with a semitrailer (9.24 $€.ha^{-1}$). The different harvesting methods were subsequently reflected in the total direct costs per hectare, and reached 116.78 $€.ha^{-1}$ in mountain meadows, and 71.11 $€.ha^{-1}$ in lowland (valley) meadows. The costs of production of hay dry matter per hectare in mountain meadows are covered by the support policy at 110.30%; however, in the valley meadows it is only 74.15% coverage. Supporting policy has crucial importance for the income stability of farms operating in production

Table 3 Potential performance of PG habitats (ecosystem services) in € in 2010–2016

Habitats of permanent grassland	Area in ha	€.ha-1	2010–2016	Per 1 year
Thermophilic and xerophilous grasslands	41,673	2,584.76	107,714,703.50	15,387,814.78
Mesophile permanent grasslands	1,043,875	3,224.37	3,365,839,234	480,834,176.30
Mountain meadows	19,620	1,614.76	31,681,591.20	4,525,941.60
Hydrophilous vegetation of lower areas	60,026	4,497.91	269,991,545.70	38,570,220.81
Lowland alluvial meadows	18,357	4,180.64	76,744,008.48	10,963,429.78
Hydrophilous vegetation of higher areas	31,959	4,338.50	138,654,121.50	19,807,731.64
Alpine grasslands	24,267	2,797.95	67,897,852.65	9,699,693.23
Total	1,239,777	–	4,058,523,057	579,789,008.10

Source: APA, Honigová et al., 2012, own processing

Table 4 Direct costs (DC) of hay dry matter production of PG habitats in €.ha^{-1} – simulation for practice

Indicator	Mountain meadows	Structure od DC per ha in %	Lowland (valley) meadows	Structure od DC per ha in %
Dry matter in t.ha^{-1}	3.12	–	4.25	–
Cutting	36.07	30.88	36.07	51.56
Turning + collecting	22.78	19.49	22.77	32.02
Hay pressing (balers)	54.91	47.02	0	0
Hay harvesting with the collecting semitrailer	0	0	9.24	12.99
Transport	3.03	2.59	3.03	4.26
Sum	116.78	100	71.11	100
Costs per 1 tone	37.43	–	16.73	–

Source: VÚZT Praha-Ruzyňe, 2015, own processing

and less-favoured areas. Subsidies and supports, including habitat protection support, stimulate the economy of companies, the investment process and have also an effect on efficiency through reducing costs and increasing labour productivity (Chrastinová et al., 2013)

Conclusion

The supportive policy of habitats of natural and semi-natural permanent grasslands (A–G) was analysed in cooperation with the APA. From the achieved results the following conclusions can be summarized.

In the evaluated years 2010–2016 the total area of PG habitats reached 1,239,777 ha in the SR, with the total support of 130,265,701 €. In the 2010–2016 average, a maximum of 149.125 hectares with a support of 1,568, 826 € was presented for the biotope B (Mesophile permanent grasslands); the smallest area of 2,622 ha with support of 128,283 € was reached in the biotope E (lowland alluvial meadows). In the double-cutting system of habitat use, the production of dry matter mountain and valley meadows can be exploited in animal nutrition. Direct costs of production of mountain hay dry matter reached 116.78 €.ha^{-1}, in valley meadows only 71.11 €.ha^{-1}.

Financial supports of supportive policy covered 74.15% of direct costs of producing dry matter in lowland meadows and 110.36% in mountain meadows. The value of ecosystem services (A–G) 2010–2016 was estimated at 4,058,523,057 €. In order to ensure proper use of the support policy tools, the State Nature Protection focuses on completion of inventory of the PG habitats database in the SR. From the comprehensive assessment of the production and non-production functions of PG habitats, a request for the revitalization of valley meadows is required to protect the cultural landscape from the consequences of floods and other natural disasters.

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