

DIAGNOSTIC STUDY CLUSTER

"ORGANIC CROP PRODUCTION"

Municipality of Pljevlja



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1. NATIONAL CONTEXT

Montenegro is a country with significant agricultural potential. This potential is primarily reflected in the diversity of relief configuration. The central part of the country consists mainly of fertile plains on which crops that prefer warmer climate and altitude are grown, while the more mountainous northern part is suitable for crops that grow on higher altitude and continental climate. The total area of agricultural land is about 516,000 hectares, out of which 36% (188,889 ha) is arable land, 63% (324,531 ha) consists of meadows, and 0.5% (2,560 ha) are occupied by lakes, fish ponds and swamps.

The most commonly grown crops on the fields and in the gardens, which constitute about 25% (45,673 ha) of total arable land, include grains (buckwheat, wheat, barley and maize), vegetables (including potatoes, tomatoes, peppers, cabbage, onion and garlic, beans, and peas), fodder (fodder corn, meadows and pastures), industrial crops (tobacco), and fruit (incl. grapes, apples, pears, plums, olives, peaches, figs, and oranges). About 30% (13,769 ha) of arable land and gardens are still unused. The underdevelopment of agriculture in the country can be explained by a process that has been ongoing since the middle of last century. After the Second World War industry started to develop and many people emigrated from their villages to the cities to look for work in the factories. However, after years of transition during the nineties of the last century, the factories closed down and workers lost their jobs, unable to return to the village and re-engage in farming, mainly due to their financial situation.

Total Agricultural Production in Montenegro in 2009:

- Cereals:
- 10,009 tons of maize (3.76 t / ha)
- 3,004 tons of wheat (3.60 t / ha)
- 2,221 tons of barley (2.75 t / ha)
- Vegetable crops:
- 156,380 tons of potatoes (15.10 t / ha)
- 22,091 tons of tomatoes (22.96 t / ha)
- 18,181 tons of pepper (21.15 t / ha)
- 3,751 tons of onions (6.38 t / ha)
- 1,492 tons of beans (1.95 t / ha)
- 784 tons of garlic (3.88 t / ha)
- Fodder:
- 249,234 tons of meadow (1.96 t / ha)

- 84,830 tons of pastures (6.38 t / ha)
- 2,999 tons of fodder corn (20.00 t / ha)
- Fruit:
- 38,635 tons of grapes (2.27 t / ha)
- 10,243 tons of plums (9.10 t / ha)
- 8,107 tons of apples (17.60 t / ha)
- 4,599 tons of figs (23.20 t / ha)
- 3,796 tons of peaches (19.50 t / ha)
- 1,605 tons of olives (3.90 t / ha)
- Industrial crops:
- 272 tons of tobacco (2.16 t / ha)

Table1: Crop production of buckwheat in hectares

	2008	2009	2010
Pljevlja	12 hectares	25 hectares	29,7 hectares
Montenegro	100 hectares	171 hectares	130 hectares

*Advisory service for plant production, 2010.year

In the Durmitor region, buckwheat growing occupies dominant place, while barley, rye and wheat cereals are also grown. With regard to vegetables and fruits, the most common types are potatoes, beans, apples, plums and pears.

Table 2: Total crop production, The Durmitor region

	Y		Maize			Wheat			Rye		Barley		
	е	Harvested	Yield,	t	Harvested	Yield, t		Harvested	Yield,	t	Harvested	Yield,	t
	a r	area, ha	Total	Per ha	area, ha	Total	Per ha	area, ha	Total	Per ha	area, ha	Total	Per ha
	05	5	6,0	1,20	5	15,0	3,00	7	18,0	2,75	101	202,0	2,00
	06	5	6,0	1,20	-	-	-	10	30,0	3,00	130	260,0	2,00
PLJEVLJA	07	5	3,0	0,50	4	8,0	2,00	10	18,0	1,80	150	150,0	1,00
	08	5	7,0	1,30	10	30,0	3,00	15	45,0	3,00	84	185,0	2,20
	09	5	8,0	1,50	19	79,0	4,16	43	176,0	4,09	100	300,0	3,00
	05	131	92,0	0,70	4	10,0	2,50	3	8,0	2,70	27	67,0	2,50
	06	129	129,0	1,00	5	15,0	3,00	4	13,0	3,20	27	108,0	4,00
MOJKOVAC	07	130	91,0	0,70	5	6,0	1,20	4	5,0	1,20	28	28,0	1,00
	08	101	71,0	0,70	3	7,0	2,20	8	18,0	2,30	35	77,0	2,20
	09	117	94.0	0.80	3	8.0	2.70	19	64.0	3.37	36	97.0	2.70
	05	-	-	-	4	5,0	1,30	2	2,0	1,10	7	8,0	1,20
	06	-	-	-	4	6,0	1,50	2	3,0	1,30	6	8,0	1,30
PLUŽINE	07	-	-	-	1	1,0	1,00	2	2,0	0,90	3	3,0	1,00
	08	-	-	-	1	2,0	1,50	1	1,0	1,30	3	4,0	1,20
	09	-	-		2	5,0	2,50	-	-	-	1	2,0	1,60
	05	-	-	-	-	-	-	-	-	-	88	88,0	1,00
	06	-	-	-	-	-	-	-	-	-	71	71,0	1,00
ŽABLJAK	07		-	-		-	-	-	-	-	80	72,0	0,90
	08		-	-	-	-	-	-	-	-	80	72,0	0,90
	09	-	-	-	-	-	-	- 10	-	-	80	72,0	0,90
	05		-	-	-	-	-	-	-	-	16	18,0	1,13
	06	· · .	-	-	-	-	-	-	-	-	16	19,0	1,20
ŠAVNIK	07	-	-	-	-	-	-	-	-	-	15	14,0	0,95
	08	-	-	-	-	-	-	-	-	-	14	24,0	1,70
	09	- 10	-	-	-	-	-	-	-	-	11	18,0	1,60

*MONSTAT, Statistical Yearbook 2010

Table 2: Total crop production, The Durmitor region

	Y	Potatoes		Beans			Lucerne (Alfalfa)			Meadows			
	e	Harvested	Yield	, t	Harvested	Yield	l, t	Harvested	Yiel	d, t	Harvested	Yield	, t
	r	area, ha	Total	Per ha	area, ha	Total	Per ha	area, ha	Total	Per ha	area, ha	Total	Per ha
	05	814	9972,0	12,25	100	600,0	6,00	55	83,0	1,51	18511	22213,0	1,20
	06	813	9871,0	12,14	120	180,0	1,50	70	105,0	1,50	18582	24127,0	1,30
PLJEVLJA	07	804	5640,0	7,02	140	126,0	0,90	65	98,0	1,50	18615	24100,0	1,29
	08	753	11286,0	14,98	100	150,0	1,50	60	18,0	0,30	18616	18836,0	1,01
	09	804	14488,0	18,02	100	150,0	1,50	75	300,0	4,00	18594	27464,0	1,48
	05	211	1952,0	9,25	16	64,0	4,00	4	32,0	8,00	3944	16492,0	4,18
	06	212	2100,0	9,91	16	64,0	4,00	6	48,0	8,00	3945	16817,0	4,30
ΜΟͿΚΟΥΑϹ	07	212	1580,0	7,45	17	17,0	1,00	11	66,0	6,00	3942	10622,0	2,69
	08	179	1529,0	8,54	17	17,0	1,00	17	85 <i>,</i> 0	5,00	3973	11817,0	2,97
	09	175	1487,0	8,49	17	51,0	3,00	21	168,0	8,00	3942	11724,0	2,97
	05	285	5133,0	18,01	2	14,0	2,00	-	-	-	6545	7009,0	1,07
	06	257	2091,0	8,14	2	12,0	6,00	-	-	-	6795	13222,0	1,95
PLUŽINE	07	207	742,0	3,58	3	9,0	3,00	-	-	-	6795	8523,0	1,25
	08	166	664,0	4,00	3	9,0	3,00	-	-	-	6326	12166,0	1,92
	09	139	1112,0	8,00	2	3,0	1,5	-	-	-	6161	18354,0	3,00
	05	80	970,0	12,13	-	-	-	-	-	-	6178	5560,0	0,90
	06	85	935,0	11,00	-	-	-	-	-	-	6190	5523,0	0,89
ŽABLJAK	07	118	946,0	8,08		-	-	-	-	-	6275	4959,0	0,79
	08	118	1171,0	9,92	-	-	-	-	-	-	6311	4519,0	0,72
	09	103	824,0	8,00	-	-	-	-	-	-	6311	5084,0	0,81
	05	260	780,0	3,00	2	3,0	1,45		-	-	6713	7766,0	1,16
	06	260	1040,0	4,00	3	4,0	1,45	-	-	-	6723	6881,0	1,10
ŠAVNIK	07	261	914,0	3,50	3	4,0	1,40	-	-	-	6716	8455,0	1,26
	08	269	1076,0	4,00	3	4,0	1,20	4	20,0	5,00	6725	8134,0	1,21
	09	271	1355,0	5,00	4	5,0	1,20	3	18,0	6,00	6725	8760,0	1,30

*MONSTAT, Statistical Yearbook 2010

Table 2: Total crop production, The Durmitor region

	Y		Pastures		Apples				Pears		Plums			
	e	Harvested	Yield	, t	Harvested	Yield	l, t	Harvested	Yiel	d, t	Harvested	Yield	, t	
	r	area, ha	Total	Per ha	area, ha	Total	Per ha	area, ha	Total	Per ha	area, ha	Total	Per ha	
	05	40871	6131,0	0,15	19000	190.0	10,0	20500	205,0	10,0	95000	760,0	8,0	
	06	40853	6128,0	0,15	18500	185,0	10,0	18000	180,0	10,0	80000	480,0	6,0	
PLJEVLJA	07	40086	4012,0	0,10	18400	111,0	6,0	18000	90,0	5,0	79970	480,0	6,0	
	08	39937	3996,0	0,10	19000	380,0	20,0	18000	270,0	15,0	78000	780,0	10,0	
	09	39937	4715,0	0,12	20500	410,0	20,0	18000	270,0	15,0	85000	1275,0	15,0	
	05	8990	4175,0	0,46	5610	280,0	49,9	1560,0	94,0	60,2	889	53,0	59,6	
	06	8990	4857,0	0,54	5630	253,0	45,9	1700,0	68,0	40,0	900	18,0	20,0	
ΜΟͿΚΟVΑϹ	07	8990	3124,0	0,35	5630	169,0	30,0	1700,0	34,0	20,0	900	18,0	20,0	
	08	8990	3534,0	0,39	5855	117,0	20,0	2060,0	41,0	20,0	1438	14,0	10,0	
	09	8990	3534,0	0,39	5855	234,0	40,0	2060,0	82,0	40,0	1438	43,0	30,0	
	05	12433	9561,0	0,77	2900	52,0	18,0	2950	50,0	17,0	6170	183,0	30,0	
	06	12433	11400,0	0,92	2270	57,0	25,0	2420	36,0	15,0	4600	55,0	12,0	
PLUŽINE	07	12453	-	-	2310	35,0	15,0	2290	23,0	10,0	3690	44,0	12,0	
	08	12963	-	-	2440	32,0	13,0	2470	25,0	10,0	3940	32,0	8,0	
	09	13206	2324,0	0,18	2610	52,0	20,0	2540	38,0	15,0	4970	73,0	15,0	
	05	15660	4534,0	0,29	-	-	-	-	-	-	-	-	-	
	06	15659	4698,0	0,30	-	-	-	-	-	-	-	-	-	
ŽABLJAK	07	14967	2640,0	0,18	-	-		-	-	-	-	-	-	
	08	14967	2474,0	0,17	-	-	-	-	-	-	-	-	-	
	09	14967	5737,0	0,38	-	-	-	-	-	-	-	-	-	
	05	25071	5113,0	0,20	1000	15,0	15,0	600	12,0	20,0	6800	136,0	20,0	
	06	25065	- /	-	1050	37,0	35,0	550	6,0	10,0	7300	183,0	25,0	
ŠAVNIK	07	25074	5836,0	0,23	1050	26,0	25,0	650	8,0	13,0	7700	139,0	18,0	
	08	25073	5836,0	0,23	1090	23,0	21,0	710	13,0	18,0	8300	100,0	12,2	
	09	25073	4425,0	0,18	1170	26,0	22,0	720	12,0	17,0	8700	139,0	16,0	

*MONSTAT, Statistical Yearbook 2010

Table 3 contains information on spring sowing from 2010 (hectares of planted area).

Municipality	Barley	Oats	Maize	Clover	Lucerne	Potato	Buckwheat
Mojkovac	0	1.2	0	0	0	0.5	0
Pljevlja	45.48	21.55	1	2.3	25.9	2.4	29.7
Šavnik	1	0	0	0	0	0.5	1
Plužine	0.5	0	0	0	0	0	0
Žabljak	5.2	1.5	0	0	0	11.2	5.5
TOTAL:	52.18	24.25	1	2.3	25.9	14.6	35.2

Table 3: Spring sowing 2010. year (organic crop production)

*Advisory service for plant production, 2010.year

Montenegro has enormous potential in the field of organic production. However, in order to tap this potential, there is a need for investing in modernization, and support programmes, as well as for the introduction of standards in this sector – a process which is taking place only slowly. Businesses are still reluctant to register their production, pay taxes and change the way of production.

Since the Government of Montenegro declared the country to be an "ecological state" the development of **organic agriculture** stands high on its agenda, as it represents a system of sustainable agriculture, largely based on local resources that maintain the ecological balance and minimize the negative impact on the environment. The production in accordance with the law and standard defined conditions with a control of the entire production cycle by an authorized organization for the certification is also implied. Most of the necessary regulations and rules are in place. However, implementation in practice is a long process that is still ongoing.





2. DESCRIPTION OF THE CLUSTER



The organic crop production cluster is located in the municipality of Pljevlja, in the heart of the Durmitor region. In total it counts 14 separate units/producers that occasionally cooperate with each other with a view to achieving certain objectives, but are not necessarily connected in what could be defined as a well established network. Only a few years back, individual farmers produced fruits only with the objective to meet their personal yearly consumption needs - structured distribution and sales hardly existed. Nowadays, cooperation structures amongst individual producers have emerged, as they started to pursue additional income from their productive activities (growing). At present cooperation amongst the individual producers in this cluster is reflected in the mutual help they provide to each other – e.g. for harvesting, lending machines, etc. However, those activities are only of a very sporadic nature and do not yet represent what could be called an "organized production system".

The main activity of the cluster forms the production of organic buckwheat. In addition, farmers cultivate also barley, apples, plums, potatoes and clover, but only in very small quantities.

The cluster is classified as "mixed", meaning that the units/producers are linked in two ways - horizontally and vertically - with each other.

2.1. STRUCTURE OF THE CLUSTER

2.1.1. Geographical spread

In the rural part of the territory of Pljevlja, **seven adjacent villages** (Glibaći, Kosanica, Boljanići, Mijakovići, Kruševo, Potpeće and Varine) together form a compact unit, which is mainly concentrated on organic crop production. Households in villages are largely separated and houses are located in a certain distance from each other - on average about 500-1,000 meters due to the mountainous terrain in this area. As a result of this setup, plots of arable land are very compact and do not cut across barriers (e.g. limits of households, fences, or village roads).

2.1.2. Main cluster actors

The main actors in this cluster are the producers/farmers (land owners) and their co-workers, suppliers of seeds, farmers' associations, the local population and traders (local traders as well as purchasers from the central and southern parts of the country).

Farmers complete the entire process of crop production, from preparing land for planting to grinding of the dried grains. In doing so, they count on the help of their household members. Hiring support workers is a very rare practice in this cluster. The main workforce is comprised of the producers themselves, who also help each other for completing major works. This way of mutual cooperation is the result of several factors: (-) producers are concentrated in neighboring villages, (-) they are commonly interrelated (relatives, family ties), and (-) they face a similar difficult economic situation, which does not enable them to pay for external support workers. Fourteen producers have been identified in the cluster. All produce buckwheat, however, only eleven are producing buckwheat in larger amounts. In addition to buckwheat, these families are also producing other crops (e.g. cereals, vegetables and fruits) and deal with livestock, which all together contribute tot their livelihood. Nevertheless, the main source of income for these households still forms the production of buckwheat. Other manufacturers also produce buckwheat, but in smaller

quantities. They produce for their own needs, no more than a few hundred pounds. Some of them made a break in production and they are planning to continue sowing buckwheat after one or two seasons (farm "Boljanići"). As their reason is smaller income at the present time and the desire to try sowing some other crop.

The Association of Farmers was founded by the producers themselves in March in 2009. In addition, an association called "Golden Grain" was formed by producers of cereals from Pljevlja (as an NGO). Both bodies help firms to achieve their goals and complete their works through activities such as organizing work in groups (which helps their associates to finish the planned works for a day or two, and then move on to the next plot so that everyone in the village can complete the works quicker). Because farmers do not have all the necessary machines and equipment, they found a way to use these associations to acquire it (i.e. by applying for grants and support programmers). It is known that the line ministry and some national and international organizations are donating technology and machinery to associations of this type, usually from the NGO sector. In addition to the association "Golden Grain", which is the only one of its kind in the Durmitor region, there exists another association of cereals producers called "Ear" based in Kolasin, which was established in July 2008. Cooperation between these two organizations exists only in form of exchange of experiences and mutual visits.

Suppliers of seeds are an important link in the chain of the cluster, since there are not many of them existent. There are only two suppliers, one from Podgorica (Kalia) and one from Niksic (Atol) – both cities in the South, which are quite distant from Pljevlja. There is no standardized procedure through which the producers get their seeds. Sometimes they purchase the goods individually and on other occasions one producer from the cluster goes to buy the seeds for all of them. This challenge constitutes an opportunity for agricultural chemists in Pljevlja. Currently there are three of them, who could benefit from including buckwheat seeds into their product offer. Estimates are that in the territory of the cluster, around 1,500-1,900 kg seeds of buckwheat are planted in a single season. The market price of one kilogram of seed is €2.

The local population (the final consumers) forms the first and largest customer group for the cluster products. They are buying grains or flour, as well as fruits and vegetables. These customers only buy small quantities (about 5 kg per purchase, 7-10 times a year), but considering the number and the continuity of their purchases, they are an important link in the cluster. Currently, 2/3 of the organic buckwheat flour - also referred to as "golden flour" by the locals - produced is bought by the local population. The remaining quantities of flour (about 1/3) are sold to local traders - mostly from the central and southern parts of the country - or are consumed for personal use.

Local traders are the second group of customers for cluster producers. These are generally small bakeries, hotels and restaurants. There are not many such bakeries in the north, but hotels, restaurants and other catering operators are more numerous. They are using buckwheat flour and/or other types of flour as ingredients for national meals.

Big traders/purchasers from the central and southern parts of the country are a crucial factor for the further development of organic agriculture in general, and this cluster in particular. At present, their interest in the products of this cluster is not stable. Demand has no continuity and there are frequent breaks in the purchase (due to low involvement of customers in the southern part and transportation). Transport constitutes a big challenge for producers; they have to transport the goods by themselves, as the merchants from the south are reluctant to trade if it requires them to go to the northern region. In order to face this challenge, producers have started to cooperate in the sense that they do not only transport their own goods but also take and sell products of other cluster members. Passing the traders, purchased organic buckwheat usually ends up on the menus of luxury restaurants and hotels, where foreign guests from all over the world are the main end consumers of this product.

It can be concluded that there is already significant cooperation between the manufacturers in this area. Geographical proximity, family relationships, but also difficult living conditions and poor standards have created a need for collaboration. From the very beginning of the season, from preparing land for sowing and planting, to harvesting and processing of the grain, the cluster producers work together with the aim of finishing the work in shorter time. An important factor in this chain of cooperation is the Association of Golden Grain. Producers are meeting in the premises of this association to plan their works and take decisions jointly. Due to this legal form of organization (NGO), the association can apply for support programmes of specific institutions, which is the only way for the producers to acquire some of the highly needed equipment and machinery. Through one such programme ("STARS"), the cluster managed to acquire a dryer, which is now shared amongst all producers. Apart from the 'shared equipment' individual producers also lend their own machines to others without demanding any monetary compensation. In return they receive either similar service referring to another machine or support in the field works.

2.2. CLUSTER MAP



Cluster map: Organic crop production/Pljevlja

The above cluster map illustrates the key actors within the cluster and its backward and forward linkages. Producers are represented through differently colored boxes: those marked in green are the producers who grow large quantities of buckwheat (above 800 kg/year); orange colored fields represent manufacturers that grow buckwheat only in small quantities (below 300 kg/year). Dotted lines indicate that the linkages between two cluster actors are on the weaker side, while uninterrupted lines represent stronger connections.

Fable4: Organic	producers of	f buckwheat ir	n cluster
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Farm	Hectars	Organic production	Registered Yes/No
Macanović Željko	6.8	Transition period	Y
Petrović Dejan	2	Transition period	Y
Petrović Slaviša	6	Transition period	Y
Petrović Bojan	2	Transition period	Y
Borović Vesna	4.6	Transition period	Y
Petrović Vasilije	0.96	Transition period	Y
Sekulić Miljan	1	Transition period	Y
Vuković Radenko	1.8	Transition period	Y
Minić Kata	1.01	Transition period	Y

MMK doo - Jakić Vidak	1.5	Transition period	Y
Petrović Momčilo	0.82	Transition period	Y
USPPLj "Boljanići" - Rovčanin Dragica	0.9	Organic production	Y
Ostojić Branislav	1.4	Transition period	N
Mrdak Radisav	1	Transition period	Y

*Advisory service for plant production, 2010.year

Table 4 presents the producers of organic buckwheat in this cluster. It should be noted that three producers of buckwheat produce for the needs of their own households and the land is used for growing other crops. The majority of producers are registered. They, in cooperation with relevant institutions improved production methods and are in final stages of transition from inorganic to organic production. This phase is called transition period and can last three years. They are currently in the middle of this process. After the transition period those producers get certified.



3. PRODUCTION PROCESS - DESCRIPTION AND ANALYSIS:

Preparation of the land and sowing: Farmers are treating carefully arable land suitable to grain production. They are plowing fields every fall and leaving them until it is time for sowing. Plowing of the fields is repeated once more just before sowing. During the second plowing of the fields, manure (natural fertilizer) is added to enrich the soil. Sowing is done in the period between 25 May and 5 June, which is the ideal time considering the local climatic characteristics. It is important that the grains do not grow more than once on the same field (this is especially true for buckwheat), because the soil would lose nutrients and the yield would be reduced. Accordingly, producers change the plot for growing buckwheat regularly. Free plots are used for planting crops other than buckwheat, primarily clover due to its high nitrogen concentration that is known for enriching the soil. Clover is also used as fodder for livestock, which almost all producers own. This practice leads to a sustainable cycle from the growing of buckwheat to clover and finally the natural fertilization of the land.



Sowing

Harvesting and processing of fruits: The period between sowing and harvesting requires no special treatment of the grown plants. Harvesting time is between 15 and 30 September. During that period farmers are using a harvester for harvesting the mature cereals. The obtained grain is not sufficiently processed/cleaned though as it gets mixed with stalks and dust. Therefore, with the help of the trier machine sieving/cleaning and separation from other impurities has to be carried out. After sorting and obtaining the clean grain the process of drying follows as a next step. There is only one drier owned by the agricultural association and all producers of the cluster are using it.

The majority of producers in this cluster do not have all the machines necessary to go through the whole production cycle. Lacking equipment are primarily some of the extensions for tractors - seeding, harrow, tiller, or spreader for fertilizer. The main problem the cluster faces is the lack of combines: there is only one harvester available to the cluster. After completion of works, the owner lends it to other producers, but there is always a problem with time and weather. Sometimes, grain even gets destroyed due to delays, worsening weather conditions or the invasion of pigeons on fields with matured/ripened crops.

According to "rough" estimates made on the basis of interviews with individual producers, unfavourable climate conditions can reduce the yield by up to 10%. However, this does not happen very frequently as the weather conditions are generally favorable/suitable. A much bigger problem constitutes losses due to pigeons, which can go up to about 50%. In 2009, some growers from the village of Kosanica, for instance, lost up to 80% of their yield for that reason. Not all villages/producers are affected to the same extend by this problem though: in villages that are located at a higher altitude (e.g. Glibaci, 1,300-1,400m above sea level) the crop ripens several weeks later, so the birds generally remain in lower areas that already offer mature crop (e.g. Kosanica, 1,000-1,300 m).



Harvesting

Processing and packaging: Only dried grain is ready to grinding. As the cluster producers are lacking the mills, they grind their grain in the local water mills. This is an old established and obsolete method, but producers claim that flour that has been prepared in such a traditional and natural way is much better to sell. For grinding of organically produced grain the mill can only be used for that type – it cannot be mixed with flour produced in a non-organic way. Pljevlja counts three water mills, but only one of them is located within the territory of the cluster. Grinding buckwheat is more demanding and expensive than milling of other cereals due to its hardness, which requires more time. The price of milling of 100 kg of grain buckwheat is €10, while the cost of milling for other cereals such as barley, oats, or wheat is €3.

In some cases, the grain is not ground but directly packed and sold to final consumers or merchants. But as the machines required for packing of grain and flour are lacking the producers make use of primitive methods and improvise a lot. They usually buy bags (25-50 kg) and to package the flour. For smaller quantities they use simple plastic bags, and measure them through hand balances. Procurement of equipment for packaging would not only speed up this process but also enhance the appearance of the product (and ultimately demand and selling price would increase).



Field of buckwheat

Storage: Packed buckwheat in grain or ground into flour is stored in a small number of warehouses and storages, owned by the cluster producers. During the research, the lack of storage space has been indicated as one of the biggest challenges. Additional facilities have to be constructed according to special standards, which will lead to high investments. The standards that need to be achieved are related to temperature, humidity, and light intensity, amongst others. The producers are currently not in a position to start such a project by themselves as the loan conditions offered by banks since the global economic crisis are extremely unfavorable. In 2008, the Ministry of Agriculture, Forestry and Water launched a project for the construction of 5 silos in Glibaci together with a processing plant, drying and grind mill, which has not yet realized though due to a lack of financial resources (the planned investment was about 1 million Euros).

Processing of by-products is not happing at a larger scale. Recently, silage of green plant residues has been initiated with the help of FAO. Thus, processed residues are used for livestock feeding.

Transport and sale: Producers do not have an organized or joint distribution of their products on the markets, but in most of the cases do it individually, which is very inefficient. The majority of the goods are transported to the Montenegrin market, mainly to the southern parts of the country and Pljevlja itself (export does not exist).

4. PRODUCT SEASONALITY

Phase	J	F	Μ	Α	Μ	J	J	Α	S	0	N	D
Sowing												
Harvest												
Processing of grain												
Sale												





5. VALUE CHAIN ANALYSIS



Value Chain Analysis (Organic crop production - buckwheat):

The total area of farmland on which cereal crop is grown in the cluster has a dimension of about 32 hectares, which make on average about 2.3 ha per producer (this is only an average, but real figure range from a minimum of 0.9 ha, which constitutes the smallest property, up to 6 ha, for the biggest producer). On average it takes about 60 kg seeds of buckwheat per 1 hectare of land, or 1,916.4 kg of seed in total to achieve full capacity of the cluster. The price of seeds on a market is about $\frac{2}{kg}$, which for entire cluster makes approximately $\frac{2}{3}$,832.8 to fulfill the annual needs of the producers.

Producers can count on an average of 800-1,000 kg yield/ha, unless unforeseen circumstances happen during the season (e.g. delay in the works, climate change, pests or bird invasion). During a season this cluster produces on average about 28,746 kg of grain. In the process of grinding, about 5% are lost due to removal of shells goes. Consequently, the cluster members produce about 27,308.7 kg of flour per season.

Most of the flour produced goes to the local market (local merchants and citizens). It is estimated that about 70-75% is sold to this target group. The rest of the goods are destined to the South and Central parts of the country. About 10% of the produced flour are kept by the producers for own use.

In other words, the cluster sends about 24,557 kg of flour to the market every year, out of which 17,204 kg are sold locally, and 7,373 kg go to others parts of the country.

The price of the flour depends on the target market, ranging from €2.5 to €3 per kg for local buyers, while customers from the south pay €3.5 per kg.



6. SUPPORT INSTITUTIONS

The most important support institutions related to agricultural development in Montenegro include the Ministry of Agriculture, Extension Service for Plant Production, Institute of Biotechnology and Monteorganika. These institutions work together, cooperate and act as an organized system of support to agricultural development. The Ministry of Agriculture provides finances, the Extension service provides advisory on issues related to crop production, the Institute provides expertise for project development and implementation, while Monteorganika issues certificates and monitors the entire process up to and after the issuance thereof (control).

6.1. MINISTRY OF AGRICULTURE, FORESTRY AND WATER AND LOCAL GOVERNMENT

The Ministry of Agriculture, Forestry and Water mainly offers support (also through local authorities) in the following domains: (a) Payment for crop production (for crops and cultivation of medicinal herbs \in 150/ha; for vegetables, perennial crops and seed and planting material \leq 250/ha), (b) payments for livestock production (\leq 50 per slaughtered livestock; \leq 2 per piece of poultry; \leq 30 per hive).

The Ministry also finances the work of certification bodies which offer free control and certification services to all producers who registered as organic. Currently, 13 out of 14 producers within the cluster of organic plant production of buckwheat are registered.

6.2. ADVISORY/EXTENSION SERVICE FOR PLANT PRODUCTION

An Extension Service was established on 1 October 2003 as a professional service of the Ministry of Agriculture, Water and Forestry with the main aim of improving plant production (focus on fruits, viticulture, and arable farming, amongst others). Since the end of 2004, two regional centers are operational in Bar and Bijelo Polje, which are linked to the national centre in Podgorica.

The Extension Service Centre is in regular contact with the producers of the cluster. It provides support for agricultural producers in the Durmitor region for grains at €150/ha and especially for buckwheat at €180/ha. Advisory service for plant production has an excellent website that is regularly updated with the latest data from different agricultural areas. On this side, producers can find all relevant information and details about buckwheat. The institution also organizes seminars, trainings and workshops for producers.

For the research of this cluster in Municipality of Pljevlja it was found out that the use of computers is at a minimal level, but most manufacturers could overcome this skill with appropriate training.

6.3. INSTITUTE/FACULTY OF BIOTECHNOLOGY

Institute of Biotechnology is the oldest research institutions in Montenegro and one of the founders of the University. Since its establishment, the Institute has developed into a faculty – the biotechnical faculty. At the University of Montenegro agriculture studies were established in 2005. Studies were organized and carried on the Biotechnology Institute, which also provides educational and scientific-research experts and advisory activities. The mission of the Institute of Biotechnology is to educate young people and experts in the field of agricultural sciences through educational content, by using modern methods and techniques for education and research.

Biotechnical faculty today has: (i) total number of graduates – 270, (ii) total number of professors – 8, (iii) total number of PhDs with scientific titles – 22, (iv) total number of PhDs without titles – 5 and (v) total number of Masters – 18. For the organization and realization of the theoretical and practical courses, the Institute disposes of well equipped classrooms and laboratories located in Podgorica, Bar and Bijelo Polje, as well as experimental/pilot farms for students for practical work/training.

DANIDA project "Program for the development of organic agriculture" (OADP).

OADP is a three-year programme supported by the Ministry of Foreign Affairs of Denmark, and implemented by the Ministry of Agriculture, Forestry and Water Management and the Institute of Biotechnology. The project aims to support the development of organic agriculture in Montenegro, with a focus on the production of fruits and vegetables. In 2011, the program was extended to livestock production.

It includes grant scheme to support for investments in production, processing and distribution of organic products, including plant and equipment for processing as well as facilities and equipment for distribution of organic grains, vegetables, fruits (including olives and grapes) and medicinal and aromatic plants. Those grants only support new investments, and will not support the purchase of inputs such as seeds, fertilizers, bio-pesticides and packaging materials.

Priority is given to investments in production, processing and distribution of organic fruits and vegetables. Each producer, association or company engaged in the production, processing and distribution of certified organic grains, vegetables, fruits and medicinal and aromatic plants can apply for support. Grants are co-investments ranging from $\leq 10,000$ to $\leq 70,000$ (the beneficiary has to cover 50% of the investment). Only women and young users (under 40 years of age at the time of application) may be supported with up to 60% of investment value. A prerequisite for applying for a grant is that the user has entered in the Register of Organic Farming.

This DANIDA project has led to an increase in the number of registered producers from 30 to 68. By the end of the year it had 17 applications to obtain grants. The total value of all applications is $\leq 640,430$, of which, $\leq 93,355$ were approved by the end of the year. Of these 17 applications, 7 have producers received the payments under the grant schemes. All 17 applications were accepted but not all of them are implemented.

6.4. MONTEORGANIKA

After passing the Law on Organic Agriculture in Montenegro, "Monteorganika" has been formed as an agency for control and certification of organic production. It is the only national institution empowered to control the production and issuance of the certificate entitled "Montenegrin Organic Agriculture". Through its work, Monteorganika is sending a message to customers that the certified products are of good quality.

FAO project "Support to small producers in organic agriculture"

The project focused on providing support for rural development by strengthening the institutional framework and capacity building of national systems of certification and advisory services for organic agriculture in Montenegro. The most important results achieved include: (-) Strengthened capacity of the system certification and human resources; (-) Strengthened capacity of staff advisory services in organic agriculture; (-) Strengthened capacity and skills in selected areas of organic farming, (-) two demonstration fields with good practices of organic agriculture (DEMO 1 and DEMO 2 - dairy retail); Market Strategy for raising awareness on and promotion of organic products. One of the demo fields has been located in Zabljak - Durmitor HM.

Such institutions are usually involved in every project that is related to agricultural development. They are working together, because they all have the same goal. Also, institutions are stimulating manufacturers to start cooperate in such programmes and projects.



7. SWOT ANALYSIS OF THE CLUSTER

Strength	Weaknesses
 ✓ Land ✓ Favourable climate & geographical conditions ✓ Tradition ✓ High quality product 	 ✓ Poor infrastructure ✓ Lack of mechanization ✓ Weak financial position ✓ Lack of new technologies and knowledge
Opportunities	Threats
 ✓ Increased production ✓ Start of production of final products ✓ Development of other agricultural activities ✓ Promotion of natural, healthy and traditional diet ✓ Access to regional/export markets 	 ✓ Short planting cycle/period ✓ Lack of entrepreneurial spirit ✓ Poor understanding of the advantages of organic plant production ✓ Birds (pigeons)

7.1. STRENGHTS

- Land in this area is extremely suitable for growing organic food, especially cereals. Buckwheat thrives most, because the brown soil in this area composing of limestone and schist offers ideal conditions for the development of this crop. Potential for expansion exists (in terms of land availability), but producers currently have limited capacities (mechanization, storage, transport, etc.)
- Climate and geographical conditions are favorable for growing organic crops. The wind that blows in the mountainous regions is of extreme importance for development of buckwheat as this plant "prefers" higher altitudes and increased airflow.
- The local population has been traditionally focused on agriculture, which has survived for centuries only the modes of production changed and improved over time. This tradition is a significant force for the development of organic production.
- High quality product: Due to the favourable conditions for the development of crop production, which are typical for this region, the crop products are of very good quality and theoretically suitable for most of the markets.

7.2. OPPORTUNITIES

- Increased crop production could be achieved in multiple ways: (-) through investment in know-how and new technology, or (-) through increase the number of other crops (other grains, fruits and vegetables) that can be grown. This region is suitable for growing barley, potatoes, cabbage, plums, apples, pears, and raspberries. An increase in crop production would automatically follow the development of livestock due to the natural cycle of buckwheat-livestock manure-fodder.
- Start of production of final products from plants and their by-products. The current level of development of the cluster in crop production did not come to the stage of further processing the end products. The potentials are huge packaging, processing of grains to produce bread and rolls, national dishes, or desserts, or the processing by-products (e.g. buckwheat pillows).
- > Development of other agricultural activities, such as beekeeping, livestock, and eco-tourism.
- Promotion of a more natural, healthy and traditional diet in the region/country may lead to higher investments in crop organic production. Furthermore, the promotion of this segment in the wider context of tourism development could turn into another advantage for the cluster.

Access to regional/export markets (particular former Yugoslavian countries) is great. The cluster is located close to the border region in between three countries. The availability of those markets could also entail enhanced access to EU markets.

7.3. WEAKNESSES

- Poor infrastructure is a characteristic for and the entire northern region of the country. In particularly, the poor conditions of local roads leading to villages where farmers are living and working constitute a constraint. The problem with electricity is also significant, as it often comes to power cuts due to bad weather conditions.
- The lack of mechanization is one of the main problems that the cluster faces. Some of the machines are available, but in insufficient number (in particular referring to various connectors and extensions for tractors). The biggest obstacle for the cluster constitutes the lack of harvesters/combines. There is currently only one harvester which is not sufficient to fulfill the needs of all cluster members. Furthermore, a packing machine for the flour is lacking and, as a result, producers face difficulties to successfully place their products on the market.
- The financial situation of the population in this region is very constraining for the population in rural areas. The only source of income they have is agriculture, which is not the most profitable business in the country. Given the potential that exists in the field of agriculture, this weakness could be neutralized fairly quickly. Tailoring some of the lines of credit banks and development funds in a way that they favour agricultural industry would be a potential solution. As a major obstacle for obtaining credit at good/acceptable terms in the last few years has been the economic crisis, which hit Montenegro severely.
- Lack of new technologies and knowledge is a problem that affects the development of production in the cluster as well as the entire region. Producers rely on machines that are outdated and in use already for several decades. Similarly, up-to-date know-how when it comes to modern methods of organic agricultural production is lacking and puts them in a competitive disadvantage compared to producers from other countries.

7.4. THREATS

- > A short period of time for growing presents a challenge, as the slightest delay can lead to significant reductions of the yield and quality of the product.
- Lack of entrepreneurial spirit constitutes another thread to the cluster, which can be seen from the low motivation within the local population to start new businesses and a general lack of ideas.
- Poor understanding of the advantages of organic plant production in comparison with non-organic production. For agricultural producers is widely accepted that it is more profitable to produce a larger amount of non-organic products in relation to organic production. This threat is a problem that is slowly being resolved. By education, training and subsidies producers and consumers alike have more and more started to support organic crop production. Prices for organic pare higher than prices of inorganic products.
- Pigeons are a big problem for producers, as they are appearing in the flocks during the period of maturation/ripening of the crops. It is estimated that there are several thousands of them in the area. Standard forms of protection such as scarecrows and production of various sounds have turned out to be ineffective.



8. VISION OF THE CLUSTER

After a thorough investigation and identification of the situation, it can be concluded that the development of this cluster of organic crop production located in the municipality of Pljevlja has improved socio-economic situation of the local population, especially the poorest. The further development of this cluster would lead to the development of a network of related clusters in the north of Montenegro, as well as cluster development in other productive activities.

9. CLUSTER DEVELOPMENT STRATEGY

One of the main starting points for the further development of this cluster should be activities that **boost the motivation of farmers.** The analysis revealed that the numerous obstacles producers currently face, have led to a decline in the desire/spirit to contribute to further investment and improvement. This is something that needs to be changed from the outset. In addition, the following issues need to be tacked:

- The availability of inputs: It is necessary to ensure uninterrupted availability of seeds for sowing. This would eliminate the first obstacle in the production chain. Easily accessible and good quality seed will ensure a high produce quality and a good yield.
- Modern machinery: In order to raise quality and increase the yield of land and crops, it is necessary to find ways to modernize equipment and machinery and make it available to all producers. Investment in the availability of modern technology and know-how is crucial for the further evolvement of this cluster. It is estimated that in order to fulfill the current needs it is necessary to acquire 2-3 harvesters, at least one or two connections/extensions to/for the tractor (spreader for manure, seeders, trier, tillers, harrows, trailers, and plows), as well as devices for packing grain and flour (ideally up to 14 one for each producer).
- Construction of internal infrastructure: A further requirement constitutes the purchase of machinery for milling and packaging, and the construction of storage facilities for the cluster.
- Financial support: For implementation of all needs highlighted above, there is a need for funding resources this is why the entry of new capital is particularly important. This can be achieved by increasing state support, which would consist of the various grants and agreements with credit institutions, as well as increased support of advisory service in plant production by Monteorganika and other institutions.

The moment when the producers in this cluster are convinced that there is a direct benefit from joining forces to overcome the above-mentioned constraints, most of the problems could be solved. Their standard of living would increase and producers would be able to pay for workers to increase their capacity. Improved living standards and quality would result in greater activity in the field of entrepreneurship development, and local people would be motivated come up with ideas for further processing of organic products and turn them into reality. Some of the ideas that were identified during this research include the establishment of a section for packaging cereals in smaller packs/units, a section for the production of confectionary products (biscuits, chocolate and chocolate products, which are gluten free), a section for the production of pillows of buckwheat flakes, and the opening a restaurant with national dishes (bread and cakes made of buckwheat, buckwheat soup, pie buckwheat, buckwheat fritters, etc.), amongst others.

It was observed that the development of clusters of organic crop production would increase development of beekeeping, livestock and eco-tourism. The period of buckwheat flowering is very long and therefore offers a nutritional basis for bees. Also, the structure of the buckwheat flower is suitable as pasture for bees. Estimates state that from 1 ha of flowering buckwheat, one could obtain 80 to 100 kg of honey. Estimates indicate that a single village in this region can have about 100-150 bee hives. This number significantly increases during summer time, when beekeepers from Podgorica and the southern region come and bring their beehives with bees to the "pasture". The number of hives in that period can increase to 300 hives per village. This "migration" of beekeepers takes place because the flora of the northern region is particularly suitable for producing high-quality honey.

Livestock development would be a natural consequence, since fertilization techniques applied in organic production create additional fodder sources. Healthy lifestyle and diet could also attract tourists, which could complement the current initiatives for further developing eco-tourism in the region.

9.1. MARKETING

The consumption of organic food in developed countries is steadily increasing (particularly within the EU), while producers fail to meet the rising demand. This represents a great window of opportunity for producers in countries with lower levels of development that offer optimal environmental conditions to increase production of organic food, and then focus on the international market, where it will achieve much greater profits as compared to conventionally produced food exports.

However, in order to tap this potential on foreign markets, Montenegrin producers need to pay attention to current trends related to organic food products:

- ✓ Growing demand for healthy and safe, biologically more valuable and ecologically 'clean' food;
- Demand for high quality and the fresher products therefore, the distribution channels and delivery times play a crucial role in this respect;

- Demand for specific products and brands;
- ✓ Demand for practical and well-designed packaging, ideally made out of environmentally friendly material.

In a nutshell, the following parameters are of importance in order to be able to tap the export potential: product range, quality, packaging, certification (eco-sign), the regime of importing countries and cost competitiveness. Developed countries often times import only the raw materials and produce final products for re-export.

Montenegro currently does not have a lot of capacity for high-level processing of primary agricultural products, for which there is a large demand on international markets. Therefore, the focus should be in the shorter term to focus on exporting primary agricultural products or products of lower stages of processing, while in the longer term building the capacity for applying higher stages of processing.

10. CONCLUSION

Sustainable agriculture will enable survival, not just for rural people, but also for people in urban areas who are directly dependent on food production in non urban areas. Achieving better results in organic agriculture, environmental protection and overall rural development, enhances the quality of life of residents in a given territory, which can be an excellent example of farmers in rural areas throughout the territory of Montenegro.

If the cluster development approach can achieve positive results in the fields of ecology, agriculture and rural development and enhance quality of life for the local population, then the practice applied to the selected farmers of this pilot cluster, could be a good practice example / role model for other rural areas, regardless of the specifics of individual cluster locations.

This however requires constant education or producers, capacity building of support institutions and awareness raising on the importance of organic agriculture in terms of preservation of the environment and natural resources in accordance with the philosophy of sustainable development.

A pilot project long those lines needs to strengthen commitment to the promotion of organic agriculture, the collection and analysis of data on production, selection of types of production and selection of the best varieties/species, improvement of the use of modern equipment in production, the improvement of agricultural holdings, collaboration with entities that are able to promote organic farming, participation in trade fairs and similar events in the field of agriculture, farmer education, and development of promotional activities on organic production. From the point of mass distribution, individual farms can currently only produce 'symbolic' amounts of products through organic farming. However, through education, linking producers and manufacturers association of environmentally certified products, this problem can be successfully overcome.

