

RENEWABLE ENERGY POTENTIAL AND OPPORTUNITIES FOR ORGANIC FARMING IN THE REGION OF THE ŠALEK VALLEY

OBNOVLJIVI ENERGETSKI POTENCIALI IN SONARAVNO KMETIJSTVO ŠIRŠEGA OBMOČJA ŠALEŠKE DOLINE

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Abstract

The purpose of this research paper is to examine the rural area of the Šalek Valley and to determine what the potential for the promotion of organic farming is in an area that is traditionally better known as an electricity producer and industry supplier. The predominant agricultural activity is livestock, and there is almost no market-oriented horticulture. The farms included in the study were from three neighbouring municipalities: Velenje, Šoštanj and Šmartno ob Paki; 1218 farm owners were invited to participate, and the research was presented orally to 370 farmers. Only 40 surveys were returned and completed; nine of these were declared to be organic farms and four to farms in conversion. The average age of the surveyed farm owners was over 50 years and was not significantly different regarding the farms' orientation; 63% of family farms have already planned for a successor, less so with the organic agricultural holdings. Since organic farms also showed livestock to be the predominant agricultural activity, a good potential for the renewable (biomass) energy production, e.g. co-generation of electricity and heat, was assumed.

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As we were interested in the economic prospects of the farms, we wanted to know their attitude to energy supply as a supplementary farm activity or whether they had had any experience with renewable energy sources.

With these input data, we want to check: a) agricultural holdings, especially those that were organic-oriented, which are expected to have the prominent role in the future food supply; b) how the owners plan the on-farm activities; and c) the current energy supply and openness of farmers to using other energy sources.

Povzetek

Uvodoma smo želeli preučiti lokalno ponudbo podeželja Šaleške doline in ugotoviti možnosti za pospešitev razvoja ekološkega kmetijstva na območju, ki je tradicionalno bolj znano kot območje termoenergetike in industrije. V raziskavo so bile zajete kmetije 3 občin: MO Velenje, občine Šoštanj in občine Šmartno ob Paki. K sodelovanju je bilo povabljenih 1218 nosilcev kmetijskega gospodarstva, od tega je bila 370-tim kmetijam raziskava predstavljena še ustno. V raziskavi je sodelovalo 40 kmetijskih gospodarstev, od tega 9 ekoloških in 4 integrirane kmetije. Povprečna starost nosilcev kmetijskega gospodarstva v Šaleški dolini je nad 50 let in se ne razlikuje pomembno med ekološko usmerjenimi in ostalimi kmetovalci. Na 63 % kmetijah je že znan naslednik, na registriranih ekoloških kmetijah je odstotek manjši. Ker tudi na ekoloških kmetijah prevladuje živinorejska usmerjenost, predvidevamo še neizkoriščene možnosti za uporabo biomase (organskih odpadkov) za namen proizvodnje obnovljive energije, tudi v obliki kogeneracije električne in toplotne energije.

V nadaljevanju nas je zanimala ekonomska perspektiva kmetij, kako razmišljajo o energetski preskrbi kot dopolnilni dejavnosti kmetije, kakšno je njihovo mnenje ali že izkušnja z obnovljivimi viri. Z omenjenimi vhodnimi podatki želimo preveriti: a) usmerjenost kmečkih gospodarstev, predvsem ekoloških, od katerih se v prihodnje pričakuje vidnejša vloga v prehranski preskrbi, b) kako nosilci kmetij načrtujejo proizvodne dejavnosti na kmetijskem gospodarstvu ter c) aktualno energetsko oskrbo in odprtost kmetovalcev za koriščenje drugih energentov.

1 INTRODUCTION

The transformation of conventional farms to organic farming is an appropriate goal, which also coincides with European agricultural directives and ensures a monitored food network, safe food, the revitalization and strengthening of rural areas and healthy ecosystems. Many potentials for organic farming and local food supply have been studied (Slabe et al., 2011):

- to increase supply of Slovene organic products (especially vegetables and fruit), direct sales at farms and agricultural holdings of larger size should be encouraged,
- obstacles to producers in terms of cooperation and market connections should be removed,
- more knowledge transfer at production and market areas should be supported and realized.

The goal of developing sustainable agriculture is the responsibility of all participants in the system, including farmers, workers, policy makers, researchers, retailers and consumers. Each group has its own part to play and its own unique contribution to strengthen the sustainable agriculture community (De Lauwere et al., 2004).

The number of organic farms in Slovenia has been increasing; in 2005 1.6% of family farms declared themselves to organic; by 2010, that number has risen to 2.5%. In addition, 0.4% farms were in the process of conversion (Agriculture Census, 2010). Among gainful activities on family farms, renewable energy production is a promising supplementary activity, with regard to the increasing number of farm families in recent years (Table 1).

Table 1: Complementary activities on family farms (in number), Slovenia, 2000–2010.

Supplementary activity/year	2000	2010	Index _(2010/2000)
Meat processing	221	155	70.14
Milk processing	247	242	97.98
Fruit and vegetable processing	394	502	127.41
Farm tourism	692	642	92.77
Renewable energy production	38*	78	205.26
Handicraft	268	167	62.31
Aquaculture	75	28	37.33
Sale of wood products	104	28**	26.92
Forestry	-	9078	-
Wood processing	699	513	73.39

(Source: SORS, 2013)

Legend: * data values for 2003; ** data values for 2007; - no data

Further, we attempted to make some common findings between food production on agricultural holdings and their openness to using renewable energy sources.

Before the project (European Agriculture Fund for Rural Development), there was no information on the food supply characteristics and the prevalence of organic farming in the Šalek Valley. The original idea of the research was to present it to the food-producing farms and help them in connecting and communicating with the local people who are interested in organic-produced and healthy food supply of local origin.

We were following these project goals:

1. to check the farmers' marketing interests, collect data on farms' locations and their supply at home for potential buyers,
2. to enable farmers to sell their products directly to consumers interested in safe food consumption,
3. to connect the organic farmers with the potential clients, and
4. to verify the status of the use of renewable energy sources.

The project was focused on organic food production and processing, in the local environment and directly accessible to local people. The research goals were to involve and promote farms that have already introduced the organic food production guidelines. The results should have encouraged the majority of farmers in the valley that use conventional work methods, i.e. following the European and national guidelines, and guiding producers and consumers to full local food self-sufficiency.

Indirectly, we intended to educate young people, future consumers and potential actors in organic farming. At the same time, farmers were introduced to renewable energy production, and we noted that a workshop on this topic would be very welcome by them.

We wished to inspire farmers for organic food production and the acceleration of sustainable farming with other supplementary activities, especially in the areas with limited factors for farmland (mostly steep terrain with a prevailing share of grassland), which would help to revitalize the agricultural landscape of the Šalek Valley.

2 AREA OF RESEARCH

2.1 Agriculture and land use in the researched area

The Statistical Office of the Republic of Slovenia data, published in Statistical GIS land cover of Slovenia, showed the spatial distribution of the cover categories and the decreasing of the rural land between 1993 in 2001 (SORS, 2013). The precise structure of agricultural land database in 2001 reports that the biggest share in the Savinjska statistical region belongs to meadows (25.9%) and only 3.2% to arable land. In the evidence of the last observation period (2011), the share of forest land had the same value as in previous periods, the increase (+3.2%) of the agricultural area was surveyed and developed areas in the region expanded by 2.6%. The register of the actual land use of agricultural and forest land for 2005 and 2011 showed more extensive farming in the region (the meadows' share rose up from 22.3% of the total agricultural land in 2005 to 24.8% in 2011 (Table 2).

Table 2: Land cover of the chosen categories in shares (%), Savinjska statistical region, 1993–2011.

Year/Category	Wooded areas	All agricultural areas	Developed areas
1993	55.2	39.8	3.1
1997	56.7	37.3	3.2
2001	60.9	32.9	3.3
2005	57.5	34.1	6.7
2011	56.7	36.1	5.9

(Source: Statistical Year book..., 2011; Analiza stanja ekološkega..., 2013)

In 2007, approximately 4.9% of employed Slovenians worked in agriculture. In Table 3, we can see the data of the same period (2007) for the researched area; the municipality of Šoštanj (7.7%), Šmartno ob Paki (10.6%). Meanwhile, the municipality of Velenje had a strong focus on employ-

ment in other sectors. A comparison with the surveyed data from 2002 showed a positive employment trend in agriculture, but not in Slovenia as a whole.

Table 3: Share (in %) of the persons employed in agriculture.

Municipality/Year	2002	2007	2011
Šmartno ob Paki	4.08	10.6	11.0
Šoštanj	5.71	7.7	5.5
Velenje	0.99	1.3	1.5
Slovenija (average)	5.5	4.9	3.6

(Source: Statistical Yearbook ..., 2011)

Regarding the change of number of people employed in agriculture, between 2007 and 2011 a slight increase was recorded in Velenje and Šmartno ob Paki, whereas the value of the Šoštanj returned to the state in 2002 (Table 3). The average Slovene share was steadily declining.

Considering the possibilities for more promising and profitable farming with sustainable methods, the availability and quality the land resources is important. The Statistical Office of RS data for the year 2000 confirms extremely dispersed agricultural land in Slovenia (SORS, 2013). The share of the smallest agricultural holdings was the highest. Only Šoštanj exceeded the Slovenian average with 6.1% in the largest agricultural holdings (over 10 ha) category; the other two municipalities were below average. By the year 2010 the share had dramatically changed; the lowest data were shown in Velenje whereas farms in Šoštanj had 60% in the largest size class (over 10 ha).

Table 4: Share (in %) of the agricultural holdings by size classes of utilised agricultural area (UAA) in 2000 and 2010.

Municipality/ size/year	0 - < 2 ha		2 - < 5 ha		5 ha - < 10		> 10 ha	
	2000	2010	2000	2010	2000	2010	2000	2010
Šmartno ob Paki	36.9	9.42	36.9	23.5	20.0	26.9	6.25	40.07
Šoštanj	27.7	3.38	26.1	10.0	27.4	26.28	18.7	60.3
Velenje	28.4	5.8	38.3	29.9	25.0	40.25	8.3	30.8
Slovenija	26.6	4.6	35.2	17.5	25.5	25.9	12.6	51.9

(Source: Agriculture Census 2010; SORS; 2013)

3 METHODOLOGY

After collecting and examining the statistics, the fieldwork provided basic input data for research, since we wanted to determine the actual characteristics that formed agriculture in Šalek Valley. Only the description questions in the interview yielded information about the opinion, values and points of view of the farms' owners. We planned to check the following topics:

- Are organic farms in average smaller than conventional/in conversion farms?
- Are the owners of the organic farms younger or more educated than owners of the conventional/in conversion farms?
- Do organic farms practice electricity production from renewable sources on a larger scale than conventional/in conversion farms?

The extensive content of the survey consisted of basic contact information of the farm, land use, livestock, evidence of the production of market vegetables, renewable energy production, persons in employment at family farms, forestry at farms, fish farming, tourism and other supplementary activities at farms, organic farming and biodynamic agriculture, permaculture and beekeeping. We attempted to include all fields of agriculture. There were no answers about fish farming, and very little interest was evident regarding beekeeping. Finally, we checked the farm managers' interest in renewable sources use.

4 RESULTS AND DISCUSSION

4.1 Agricultural holdings by size

Nine organic farms were included in the survey. The total area of their farmland was 459.8 ha. We also interviewed four farms in conversion, with a total of 59.3 ha. The average organic farm size was 26.23 ha, excluding one extremely large farm with over 350 ha (with rented land outside the surveyed area). The farms in conversion had an average of 18.83 ha large, and the conventional farms had an average of 25.93 ha.

Table 5 shows the administrative distribution of the family farms and the type of farming. Only some of them (15%) have registered the supplementary activities to their basic agricultural orientation.

Table 5: The researched family farms considering the municipality affiliation and type of farming.

Production/Municipality	Šoštanj	Šmartno ob Paki	Velenje	Total
Vegetables /fruit		1	1	2
Meat/milk	1			1
Sheep	2			2
Mixed		2	2	4
Vegetables /fruit		2	2	4
Meat/milk				
Mixed				
Vegetables /fruit	1		2	3
Meat/milk	4	3	6	13
Tourism	3		2	5
Other farms	beekeeping, winery, cereals – bakery products	2	solar cells	6
Total	14	10	16	40
Key	conventional farms	organic farms	farms in conversion	

The average farm size in the research area was 24.23 ha; in contrast, the average Slovenian farm size in 2010 was 6.4 ha, i.e. 18.45 ha less than our researched farms. The average farm in the Savinjska statistical region had 5.9 ha in the same period (Agriculture Census, 2010).

We recorded an organic farm owner that was distinct in its size, consisting of eight agricultural holdings located across the western part of the Savinjska statistical region. There were 45 ha of arable land, 5 ha of orchard and 300 ha of forest. Because it was such an extreme outlier, it was not considered in the calculation of average farm size, also because some parts were located outside the researched area.

The average farm size with the largest area (43.89 ha) was surveyed in the Šoštanj municipality (Table 6).

Table 6: Surveyed municipalities and their agricultural characteristics.

	Municipality			Total
	Velenje	Šoštanj	Šmartno ob Paki	
Number of researched farms	16	14	10	40
Agricultural land (ha)	253	614.58	101.7	969.28
Average farm size (ha)	15.81	43.89	10.17	24.23

(Source: Agriculture Census 2010 in SORS, 2013)

4.2 Agricultural managers by age and education attainment

We interviewed 40 farm owners and 92.5% provided their birth data. We wanted to determine how and whether the average age of farm owners would be reflected the actual state of agricultural holdings. The interviewed farm managers were on average 54.95 years old.

Organic farms are managed by younger owners (in average 3.64 years younger) than the conventional farms were, where the owners were 55.77 years old in average (Table 7). The youngest farm owner was 31 years old, whereas the youngest farmer who ran a conventional farm was 40 years old.

The oldest owner of an organic farm was 67 years old, and the oldest manager of a conventional farmer was 82. During the fieldwork survey, we established that additional administration needed for organic farming represented a kind of discouragement for organic farmers. The average age of a Slovene family farm manager was 57 in 2010 (Agriculture Census, 2010). The average age of Slovene farmers is probably also a reason that farmers and their products are hardly competitive on the agricultural market. New, younger farm managers are required. Our survey showed the 38% farms had no known successor.

If we consider average age of conventional/in conversion farm owners and the sex indicator, male owners are an average of 6.37 younger than female farm managers (59.25 years). The organic farm managers are less different by age and it was vice versa; men are 1.3 years older than women (Table 7).

Table 7: Average age of the researched family farm managers.

Farm type	conventional/in conversion			organic		
	total	male	female	total	male	female
Average age	55.77	52.65	59.25	52.13	52.6	51.3

Regarding the education, the organic farms' managers were better educated; three managers had B. Sc. Degree, one was Ph. D., three had finished trade degrees and two had graduated from secondary school (Fig. 1).

Conventional farms and farms in conversion were run mainly by farmers with finished professional and secondary school degrees.

These differences proved that organic farming requires younger, well-educated managers with competences, skills, knowledge and courage for facing and coping with stringent environmental and other regulations relating more modern farming attitude. In comparison with the Slovene average, the majority (37.2 %, SORS, 2013) had basic school education.

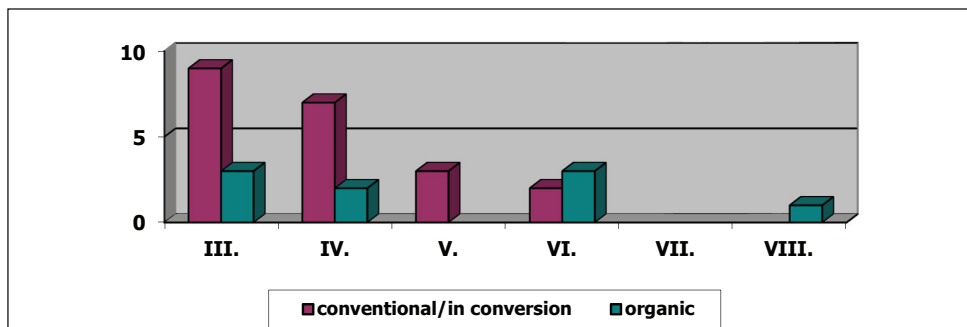


Figure 1: Interviewed family farm managers by educational attainment.

4.3 Family farms and renewable energy production

Our research found four organic farms and four conventional farms to be renewable energy producers, mostly with wood biomass. One integrated farm had its own electricity production from renewable sources. Using these data, we cannot conclude that the exploitation of renewable sources had any significant correlation with the farm orientation.

Although renewable energy production should be incorporated in sustainable farm management, most of the plants in the valley are owned by non-agricultural managers. There is one biogas plant (150 kW) and one small hydro power plant (35 kW) in the researched area. Solar plants are more common due to government subsidies, especially in recent years, because Slovenia has been following EU measures and is obliged to have a 25% share of renewable sources in final energy consumption by 2020.

Table 8: Solar plants in number and by capacity (in kW) in Šalek Valley installed, 2009–2012.

Municipality/Year	2009	2010	2011	2012	TOTAL
Šmartno ob Paki	0	2 (18)	1 (116)	3 (124.62)	6 (258.62)
Šoštanj	0	2 (98)	4 (847.05)	6 (442.91)	12 (1387.96)
Velenje	2 (19)	10 (633)	8 (249.06)	15 (1710.24)	35 (2611.3)
TOTAL	2 (19)	14 (749)	13 (1212.11)	24 (2277.77)	53 (4257.9)

(Source: Geographical Information system for RES, Sončne elektrarne v ..., 2013)

As a promising best practice case, renewable technologies or programs could play a significant role since they enable and are aimed to provide energy access to the poor in the “bottom of the pyramid” (BOP). Thus billions have been spent and will be spent on projects such as expensive line extensions or solar panels to the poor living in “last mile” communities (Santiago, Roxas, 2012). Renewables’ exploitation also prove a sustainable and responsible community model, which corresponds not only with the poor at the BOP, their traditional responses to income and energy poverty.

According to Klagge and Brocke (2012), decentralized electricity generation from renewable sources can become an important factor for local economic development in rural regions and their urban centers. Another advantage of regarding the internal resources is that local (pioneer) firms take up the business challenges associated with renewable energies and are successful in entering not only local, but also national or even international markets. Decentralized electricity generation from renewable sources can develop a region very dynamically. Based on the early activities of some pioneers, such regions introduce very specific organizational structures and enter development paths in which renewable energies are an important economic factor. However, special supporting conditions and constellations are needed to enable that type of development, including representatives of utilities/grid operators, local politics and administration, civil society, plant operators and other businesses involved in the renewable energy value chain.

5 CONCLUSIONS

The fieldwork has revealed a small share of the farms engaged in organic food production. The main point of organic farming should be awareness for sustainable environmental management to maintain soil fertility, water sources and air quality when planning agriculture development. In addition, renewable energy production and energy self-supply should be incorporated.

There are still many agricultural holdings with the owner is older than average, where the successor is known, but the actual manager has still not transferred the property and management rights to the descendant who would introduce innovations and manage the farm development. We determined that 38% of interviewed farms have not resolved the succession issue.

The research discovered that on average organic farms are larger than conventional and integrated agricultural holdings. There are two extremely large organic farms: one 230 ha and another 350 ha with some areas out of the researched region. The last farm was too much of an outlier to be included in data analysis of average agricultural holdings' size.

Organic farms' managers were younger and better educated than conventional farms' owners. We assumed that more skills and competences are required for running an organic farm (to obtain the organic farm certification, to edit all the documentation for application and farming after gaining the certificate, etc.).

We cannot declare organic farming to be more energy efficient since the same number of conventional and organic farms used renewable sources for their own energy production.

It would be very significant to encourage agricultural holdings and their successors (the Agricultural Census data for 2010 showed that the manager of a Slovenian farm was on average 57 years old, finished primary school and had no formal agricultural education). The average farm owner in the surveyed area was three years younger in comparison to the Slovene average (2011 data). The transfer from conventional farming methods to organic farming would assure the direct sale of the organic food to consumers, since demand for healthy food has been increasing, and the food without any chemical treatment is more perishable. According to the Agricultural Institute of Slovenia data, the country is only 68–75% self-sufficient in food production.

We aim at 10% increase, which would reduce Slovenia's dependence on foreign food markets. However, first more incentives of Chamber of Agriculture and Forestry and the relevant ministries should persuade farmers to manage their agricultural holdings in a sustainable way.

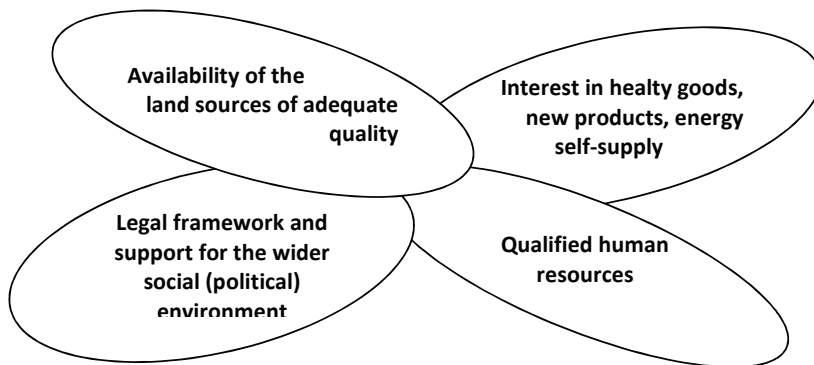


Figure 2: Sustainable farming factors.

Moreover, the main agricultural constraints (inefficiency and lack of competitiveness due to fragmentation and small farms, a large amount of hired land and the uncertainty caused by the global economic crisis) simply leads to the supplementary activities for Slovenian farmers. Renewable energy production is a highly appropriate supplement for organic farming and should be elementary in the sustainable agricultural management. Since it demands quite an investment and because was a high national priority recently to follow the EU commitments of the obligatory share of renewables, many solar plants were subsidized in the Šalek Valley. In 2012, there was more than half (53.5%) of total solar plants of the Šalek Valley were installed (total capacity from 2009–2012 amounted to 4.26 MW). Private investors were in the minority.

In 2009–2012, 53 solar plants were built with a capacity of 4.26 MW; in 2013, no solar plant was constructed due to the abolition of favorable conditions of construction. Recently (August 2014) farmers are no longer supposed to produce energy and have solar/hydro plant as a complementary activity. According the newly adopted legislation the possibility of electricity produced from all renewable energy sources was removed except from biomass, manure, slurry and vegetable substrate.

The action plan of European Commission until 2025 anticipates the sustainable growth and implementation of bio-economics, which means development of industries based on raw natural (biological) origin without fossil resources. It should be a promotion of a development guideline, which would connect different fields and activities, e.g. energy, chemistry, forestry with wood activity, agriculture etc. The case of agricultural activity should promote a sustainable farming with lower emissions, natural (renewable) sources stocks and biodiversity conservation.

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