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Zsófia Benedek & Bálint Balázs

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Current status and future prospect of local food production in Hungary: a spatial analysis

ZSÓFIA BENEDEK[a] and BÁLINT BALÁZS[b]

[a]Hungarian Academy of Sciences, Centre for Economic and Regional Studies, Institute of Economics, Budapest, Hungary; [b]Environmental Social Science Research Group, Budapest, Hungary

ABSTRACT

There is an increasing interest in Hungary to relocalize food. Spatial patterns and development potential of local food systems (LFSs) are analysed in this paper to help spatial planning practices. A composite Policy Intervention for Food Relocalization Index (PIFRI) is introduced to quantitatively reveal how rural development programme measures should be allocated efficiently to promote local food production. PIFRI points out lagging areas and hidden dimensions of development that need further support, and thus helps setting desirable and realistic policy goals. Besides socio-economic processes, biophysical limitations (availability of agricultural areas) are also accounted for. Results show that LFS development is at an early stage in Hungary. The present level of local food activity and future prospects mismatch. Eastern Hungary has the highest potential for further development as it has relatively widespread and intensive local food production activity. The few small-scale farmers operating in the Budapest area have been already engaged in short food supply chains to enjoy various benefits (and higher profit). Results imply a complex mix of several underlying causes behind the experienced patterns.

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Relocalization; local food systems; short food supply chains; rural development; quantitative analysis

Introduction

In recent years, a rapid increase in the interest in local food activity has been witnessed worldwide. Although it proved to be challenging to give an exact definition of 'local food' (Feldmann & Hamm, 2015; Kneafsey et al., 2013; Watts, Ilbery, & Maye, 2005), it is often defined in the public discourse against the industrial, placeless and seasonless food linked to the global food delivery network (Ilbery & Maye, 2005). Thus, it acts as a way of resistance to the globalization of food systems (Hendrickson & Heffernan, 2002). Consumers trust local farmers (Thilmany, Bond, & Bond, 2008), and preferences for local food and direct interactions may enable farmers to capture a better proportion of value added by skipping the middlemen in short food supply chains (SFSCs) (Alonso, 2011). Local food systems (LFSs) are expected to act as tools of urban regeneration (Janssens & Sezer, 2013) as well as endogenous rural development (Peters, 2012);

CONTACT Zsófia Benedek benedek.zsofia@krtk.mta.hu

they provide a way to maintain traditional land-use forms, local natural resources, communities, knowledge and traditions (Hendrickson & Heffernan, 2002). However, LFSs are not necessarily sustainable from an economic point of view: strong imperatives often make local farmers associate with conventional (commodity-based) food supply chains (Ilbery & Maye, 2005; Lass, Bevis, Stevenson, Hendrickson, & Ruhf, 2003) or bypass their most proximate agribusinesses (Pangbourne & Roberts, 2015).

The patterns and processes of LFS development in transition countries are particularly remarkable as they are not necessarily comparable to what is experienced in the US or Western Europe (Jehlička, Kostelecký, & Smith, 2013; Jehlička & Smith, 2011). Retail revolution in Central and Eastern European (CEE) countries is considered to have happened extremely fast (Dries, Reardon, & Swinnen, 2004; Swinnen & Maertens, 2007), which resulted in additional difficulties when small-scale farmers attempted to join modern food distribution channels (Bakucs, Fertő, & Szabó, 2012). Moreover, the rate of food self-provisioning is higher (Jehlička & Smith, 2011); it has a double role as a survival strategy and a recreational activity (Alber & Kohler, 2008; Jehlička et al., 2013; Mincyte, 2011). Still, semi-subsistence farming often gets little emphasis in the sustainable development reforms in the European Union (EU) new member states (Mincyte, 2011). This paper focuses on Hungary, where the dominant traditional forms of short food supply (*sensu* Kneafsey et al., 2013), such as farmers' markets, market halls and farm shops, are overdependent on public investments for their sustainable operation, while neo-traditional forms (box schemes, webshops, community supported agriculture (CSA) schemes and buying groups) reached a rudimentary success in urban and peri-urban areas (Balázs, 2012; Réthy & Dezsény, 2013).

Due to their importance and vulnerability, LFSs and SFSCs are in the centre of attention in the policy arena on the international level: 2014 was declared the 'Year of Family Farming' by the UN (smallholder farms and local food production are very closely related; Kneafsey et al., 2013; Lass et al., 2003). In the EU, the promotion of LFSs is used to enhance social inclusion rather than market competitiveness (Shortall & Warner, 2010). The Common Agricultural Policy Reform provides several opportunities to family-run farm businesses and promotes the development of SFSCs. Hungarian policy-making also seems to be willing to answer the call phrased by the actors of the originally bottom-up local food movement. The New Agricultural and Rural Development Strategy 2020 created a new vision for sustainable local agro-food systems and promoted relocalization as a policy tool for reconnecting producers with consumers, the city and the surrounding countryside. Exemptions and flexibility rules have been successfully introduced favouring LFSs, small-scale family farmers and small food-enterprises (Balázs, 2012). Within the Hungarian Rural Development Programme, a thematic subprogramme has been launched on the development of SFSCs to contribute to the implementation of the Multiannual Financial Framework 2014–2020 of the EU. On the other hand, in contrast with this strong political desire, the number of small-scale producers is decreasing (Balázs, 2012).

Details of any supporting scheme or favouring policy must be planned carefully. There is an increasing number of studies in the urban planning literature suggesting that planners should focus on LFSs specifically (Eckert & Shetty, 2011; Janssens & Sezer, 2013; Mah & Tang, 2013; Morgan, 2013), and the issue can be regarded in a wider, regional and rural development context, too. However, food systems planning in particular has difficulties in

finding a proper equilibrium between qualitative and quantitative evidence to rely upon (Lang & Heasman, 2004). Especially when food production is regarded, quantitative evidence is mostly missing (Kneafsey et al., 2013; Watts, Leat, & Revoredo-Giha, 2011). Rural development funds may not be efficient beyond the farm gate, if major experienced enterprises enjoy the benefits instead of those most in need of financial assistance in the maintenance of viable farm businesses (Ilbery, Watts, Little, Gilg, & Simpson, 2010). Rural development policy efficiency may be increased by better targeting on the bases of objective spatial analyses (van Berkel & Verburg, 2011; Torre & Wallet, 2015). Hence, the purpose of this paper is to help rural development planning by proposing a Policy Intervention for Food Relocalization Index (PIFRI), which ranks geographical areas according to their potential for local food production development. It is expected that at better performing locations policy-making might intervene more efficiently in supporting short food supply and possibly also wider regional development, environmental and public health objectives. Thus, the aim is to provide rural development planning experts with a measure that might be used in decision support on food relocalization.

Theoretical framework and research methods

In the socio-economic local food literature, qualitative and/or local case study-based studies are abundant (Chambers, Lobb, Butler, Harvey, & Bruce Traill, 2007; Feldmann & Hamm, 2015; Kneafsey et al., 2013; Roininen, Arvola, & Lähteenmäki, 2006). Quantitative studies are often used to reveal consumers' or producers' perceptions via questionnaire-based surveys (Benedek, Fertő, Baráth, & Tóth, 2014; Feldmann & Hamm, 2015; Lass et al., 2003). 'General' quantitative approach addressing higher spatial hierarchical levels is more typical when global environmental impacts of SFSCs are studied (Avetisyan, Hertel, & Sampson, 2014; Edwards-Jones, 2010; Mundler & Rumpus, 2012).

The approach of this paper (differentiating between geographical areas) can be well served by an index-based methodology. Indices are widely used in connection with food. Table 1 displays some major general directions (most of the indices have alternatives of a similar kind, only some examples are mentioned here).

As Table 1 shows, research already revealed several policy-relevant aspects related to sustainable and local food. Only two indices have been developed so far on food relocalization that can be relevant from a producer-centred point of view: the academic Food Relocalization Index (FRI) by Ricketts Hein, Ilbery, and Kneafsey (2006), and the advocacy-driven Locavore Index (LI). The latter presents an annual ranking of the 50 states of the US and the District of Columbia, created by a Vermont-based non-profit company (The Strolling of the Heifers) based on the number of farmers' markets, food hubs and CSA programmes per capita. LI mainly focuses on marketing possibilities, which, though an important area from a producer's perspective, tells nothing about production itself; therefore, LI is of limited use in the present context. Dimensions connected to marketing appear in the FRI, too; however, production is equally important (see Figure 1). Therefore, the work described in this paper is based on the (production sub-index of the) FRI of Ricketts Hein et al. (2006). (The conceptual framework is explained below and in Figure 1.)

Table 1. Examples of food-related indices.

Index/measure	Source	Description of policy relevance
Index for Food Relocalization	Ricketts et al. (2006)	Ranking of counties in England and Wales to reveal mismatches between production and marketing possibilities related to local food (later adapted to Scotland and Ireland)
Locavore Index	Strolling of the Heifers (NGO)	Ranking of marketing possibilities in US states (number of famers' markets, CSAs, food hubs, etc.)
SAFA Indicator set	Jawtrusch, Schader, Stolze, Baumgart, and Niggli (2013) (FAO and FiBL)	Sustainability assessment tool on the food sector
Sustainable food system indicators	Yakovleva (2007) (DEFRA)	DEFRA developed a set of sustainable food system indicators to measure the implementation of the Food 2030 strategy, UK. Scope is UK-wide; it also seeks to set the scene within the global context—to measure the global impact of UK food production and consumption
Metrics of sustainable diets and food systems	Allen and Prosperi (2014) (Biodiversity International)	Setting out dimensions of sustainable diets
Indicators for sustainable food systems	Feenstra, Jaramillo, McGrath, and Grunnell (2005)	Measuring 63 indicators for circa 20 sustainable food system goals.
Environmentally Sensitive Shopper Index	Panzone, Wossink, and Southerton (2013)	Measuring the environmental sustainability of food consumption at the household level
Ecological footprint of food consumption	Wackernagel and Rees (1996), Deumling, Wackernagel, and Monfreda (2003), Collins and Fairchild (2007), Vetőné Mózner and Csutora (2013)	Quantifying the (food-related) environmental impacts of countries, cities, socio-economic groups or individuals
Sustainable Food Index	Societe Generale Index	Tracking the stock market performance of companies that are active in the sustainable food business
Global Food Security Index	The Economist Intelligence Unit (consultancy)	Ranking of countries based on food security.
Global Food Index	Oxfam (NGO)	Ranking of countries based on the challenges people face getting enough of the right food (overconsumption included)
Healthy Eating Index	Kennedy et al. (1995); Center for Nutrition Policy and Promotion (US)	Measuring the diet quality of the US population based on national surveys
Nutrient-Rich Food Index	Drewnowski and Fulgoni (2008)	Nutrient-profiling of different food items

Note: DEFRA, Department for Environment, Food and Rural Affairs; FAO, food and agriculture organization of the United Nations; FiBL, research institute of organic agriculture; NGO, non-governmental organization; SAFA, sustainability assessment of food and agriculture systems.

The FRI is unique in a sense that statistical data associated with local food activity are used, structured and analysed. The Index was developed in order to map and reveal the strengths and weaknesses of different socio-economic aspects of local food activity in England and Wales. However, due to the context dependency of the indicators (such as the number of Women's Institute co-operative markets that are emblematic in England and Wales but has no equivalent elsewhere), the index cannot be used directly. After adaptation to the local context, the index was successfully introduced in Scotland (Watts et al., 2011) and in Ireland (Ricketts Hein & Watts, 2010); but it has not been applied yet out of the Anglo-Celtic environment. Besides being a visually attractive (easy-to-communicate) tool, the Index provides an overview of local food activity and also, it is apt to reveal different levels of development related to different aspects and dimensions of local food production—which potential has been exploited so far to a limited extent. For example, in the current form, FRI does not refer to the potential for LFS development, and there is no reflection on the biophysical conditions of the spatial locations that are also crucial from a production point of view. Thus, our aim—in addition to the mere adaptation of

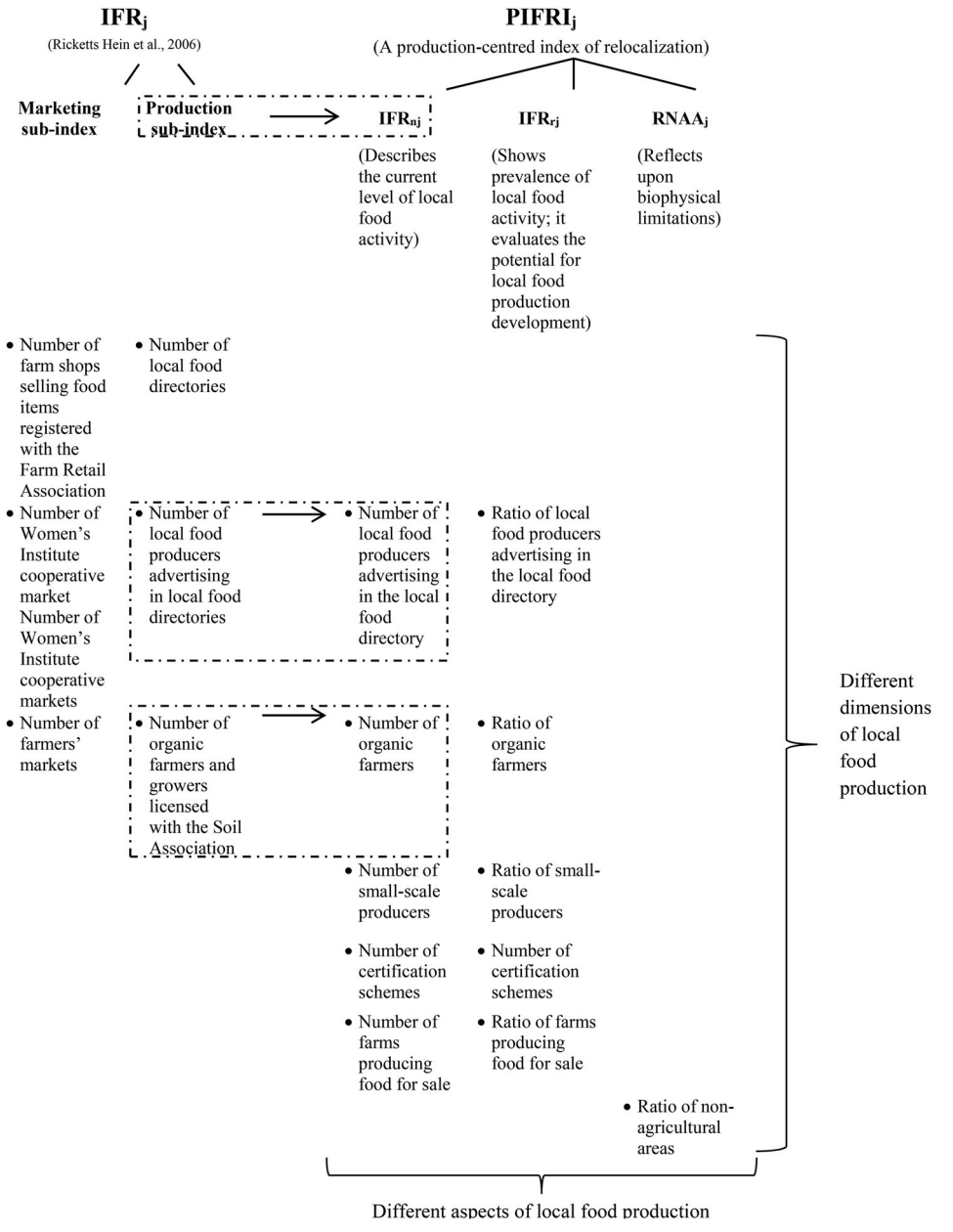

Figure 1. Conceptual framework. The FRI production sub-index of Ricketts Hein et al. (2006) is used and applied to Hungary to map the IFR$_{nj}$ in the Hungarian counties and Budapest. The boxes show measures that can be interpreted in both the British and Hungarian contexts. A methodological refinement is suggested to account for the potential for local food production development (IFR$_{rj}$). The ratio of agricultural areas expresses the biophysical limits; for convenience, in the model the ratio of non-agricultural areas in county *j* is used. The newly introduced PIFRI shows where rural development programme measures are expected to be the most successful in the support local food production.

the Index to a Hungarian context—is its methodological refinement to better fit the general purpose of decision support on the production side and rural development planning.

Adaptation of the FRI (production sub-index)

The Index is composed of two sub-indices. As the interest of this paper lies in local food production, the production sub-index is adapted for Hungarian application (see Figure 1 for conceptual framework).

There are a variety of potential indicators to quantify the activity of small-scale farmers, but only a few of them are available for all the 19 counties and Budapest. The following five indicators are used:

- *Number of organic farmers*. LFSs and organic food production are closely intertwined. First, they share some important features, such as environmentally beneficial production methods that promote local agro-biodiversity or the intention to reduce the impact of transportation and logistics by selling as locally as possible, etc. Many organic farmers utilize SFSCs (usually organic markets, farmers' markets, CSA initiatives and vegetable box delivery schemes) to distribute their produce (Benedek et al., 2014). Evidence shows that many local farmers adopt organic techniques (usually without certification) to satisfy the complex demand of their customers (Higgins, Dibden, & Cocklin, 2008). A similar indicator was used by Ricketts Hein et al. (2006). Data (as of August 2013) were gained from the homepages of the two Hungarian organic certification bodies, Biokontroll Hungária Nonprofit Ltd. (HU-ÖKO-01) and Hungária Öko Garancia Ltd. (HU-ÖKO-02).
- *Number of local food producers advertising in the online local food directory*. The number of directories that list local farmers is increasing. These lists are mostly created and maintained by local non-governmental organizations (NGOs) being involved in rural development. Directories with countrywide relevance are much sparse. The homepage of the 'termelőtől.hu' Ltd. is well known among local food consumers and professionals and contains almost 12,500 records (August 2013). Farmers advertise themselves for free and on a voluntary basis. Organization of several channels of direct selling heavily relies on the online (and social) media. Therefore, this indicator is to show how much farmers intend to use the increasing number of online possibilities.
- *Number of small-scale producers*. Among local food producers, small family enterprises and also individual producers can be differentiated; however, data are available only for the latter: 'small-scale producers' is a taxation category involving individuals only; this could be used as a proxy for the number of all local food producers. Small-scale producers are the most likely to use direct marketing channels, because instead of competing on the global market they aim to capture more added value and increase their profit through SFSCs. Data of Land Information System are used.
- *Number of certification schemes*. Certification schemes are used to differentiate local products from their conventionally produced equivalents based on the place of production. Though some authors consider the use of such certificates as a proof that a product has not integrated in the local socio-economic environment (Watts et al., 2005), other studies suggest that consumers are willing to buy certified products, due

to defensive localism (Winter, 2003) and ethnocentric buying behaviour (Chambers et al., 2007). The number of such schemes shows the engagement of farmers towards regionalism. More importantly, it shows the level of activity of intermediaries that have a crucial role in facilitating LFS development (Balázs, 2012). Thus, the number of certification schemes indicates the current level of activity. Data are from the Hungarian Intellectual Property Office (August 2013). All food trademarks with the word 'local' in the name were listed, except those owned by individuals and wholesale or retail companies. Trademarks with countrywide relevance (e.g. brands of national associations) were excluded from the analysis to ensure localism. Altogether 34 initiatives have been analysed and 19 were identified as NGO-launched.

- *Number of farms producing food for sale*. This indicator shows the number of farmers' owned farms (i.e. that are managed by individuals, not corporations) that use agricultural area and produce food for sale. This way farms that are entirely or partially involved in food self-provisioning were excluded from the analysis. Data of the General Agricultural Census 2010 were used.

Small-scale farming and sales through SFSCs are regarded as bases of LFS development. The indicators displayed above focus on different dimensions; thus, none of them is perfect for diagnosis. The use of several indicators has the advantage that minor shortcomings are ameliorated in order to show general trends. Instead of the use of absolute numbers, counties were ranked for each indicator. '1' was given to the county with the highest number to indicate the highest level of engagement.

The 'Index of Food Relocalization with respect to current level of local food activity' in county j (IFR_{nj}) is derived as follows (Model 1):

$$IFR_{nj} = \frac{100R_j}{NC}. \quad (1)$$

The subscript 'n' refers to the fact that the indicators are expressed in absolute numbers (not in ratios like in case of IFR_{rj} in Model 2). R_j is the sum of individual indicator rank scores for county j, N is the number of indicators and C is the number of cases (counties). Budapest was regarded also as a county, following the official administrative subdivision in Hungary. Index values vary from 5.0 to 100 if a county gets 1st (top) and 20th (bottom) scores in every indicator, respectively. Lower IFR_{nj} values indicate higher potential for being involved in the local food movement.

Evaluation of the potential for local food production development

The indicators presented above reveal the current level of local food activity. However, for planning purposes, information on the prevalence in a region is equally important. In many cases, the National Advisory Network seems to be inefficient in terms of outreach; instead, other farmers and the word of mouth are important sources of information. The positive example of a successful farmer involved in a SFSC may influence the others, so the more active the local food movement in time t is, the faster development can be expected during the following period (until all consumer demand is fulfilled and the market becomes saturated. Based on field experience, the local food movement is still at an early stage in Hungary, and further growth is anticipated). To quantify the prevalence, the absolute numbers were compared to the overall number of agricultural businesses.

Data on agricultural businesses were drawn from the General Agricultural Census (2010), which is the latest available data source. Thus, ratios were calculated for all indicators (except for the number of certification schemes, which implies the level of NGO activity). Following the layout of the IFR_{nj} a new index, the 'Index of Food Relocalization with respect to the prevalence of local food activity' in county j (IFR_{rj}), is defined (Model 2). IFR_{rj} is based on the indicators 'ratio of organic farmers', 'ratio of local food producers advertising in the online local food directory', 'ratio of small-scale producers', 'number of certification schemes' and 'ratio of farms producing food for sale' (see Figure 1).

The outcomes of the two models are compared with each other and with the ratio of agricultural areas (data referring to 2010 are derived from the Central Statistical Office) with Pearson correlation. Normal distributions are tested with Shapiro–Wilk, Shapiro–Francia and Kurtosis tests. Comparisons with gross domestic product (GDP) per capita rankings (Central Statistical Office, 2012) are performed with Spearman rank correlation.

PIFRI

Concerns about the biophysical limits of food production should be also regarded when deciding about LFS development plans. Such biophysical limits can be represented by the ratio of agricultural areas. To use a similar scaling system as in the case of IFR_{nj} and IFR_{rj} (where lower values express higher capacity), the ratio of non-agricultural areas (RNAA) is used.

More resources should be allocated to those counties where all the prerequisites (the human and biophysical bases of production potential are given) and the policy intervention are expected to be the most efficient (fastest in reaching the goals—the increase in the number of small-scale farmers being involved in local food initiatives). Thus, a PIFRI is suggested (see Figure 1):

$$\mathrm{PIFRI}_j = \mathrm{IFR}_{nj} + \mathrm{IFR}_{rj} + \mathrm{RNAA}_j. \quad (2)$$

Counties should be regarded according to their rank that is based on equation (2): the county with the lowest score is expected to perform the best; thus, the highest ratio of funds should be allocated there.

Besides adding the terms, multiplication is also considered.

Results and discussion

The indicators of local food production and the IFR with respect to the current level of local food activity (IFR_n) are shown in Table 2. Individual indicators are considered as absolute numbers (Model 1). Results are visualized in Figure 2.

In terms of GDP, the economically most developed area, Budapest, has bottom scores for most indicators. Small-scale farming activity is the most intensive currently in the eastern (and economically least favoured) part of Hungary. Consequently, it has high potential for development as the foundation (presence of small-scale farmers) is strong, and local food activity is widespread there. The experienced distribution weakly coincides with the ratio of agricultural areas displayed in Figure 3 ($R^2 = 0.2686$; $p = 0.0192$; the results of the tests on normal distributions are shown in Table 3). This outcome may be the consequence of certain geographical characteristics (the Great Plain lies at the

Table 2. The values of the IFR_n and the composing indicators for the Hungarian counties and Budapest (Model 1). Lower IFR_n indicates better performance.

	Number of organic farmers[a]		Number of local food producers advertising in the online local food directory[b]		Number of small-scale producers[c]		Number of certification schemes[d]		Number of farms producing food for sale[e]		
County	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	IFR_n
Szabolcs-Szatmár-Bereg	146	1	934	5	864	5	2	7	5082	9	**27.0**
Bács-Kiskun	119	2	122	20	1847	2	4	2	13 442	2	**28.0**
Hajdú-Bihar	112	3	542	12	1080	3	1	9	9444	3	**30.0**
Pest	81	6	822	7	598	9	4	2	5464	7	**31.0**
Jász-Nagykun-Szolnok	72	9	654	10	772	6	2	7	19 269	1	**33.0**
Csongrád	49	10	374	15	947	4	5	1	7651	5	**35.0**
Győr-Moson-Sopron	89	4	486	13	564	10	1	9	4175	11	**47.0**
Borsod-Abaúj-Zemplén	87	5	290	16	355	14	3	4	5375	8	**47.0**
Békés	80	8	234	17	2130	1	0	17	9235	4	**47.0**
Tolna	29	16	990	4	732	7	1	9	3079	12	**48.0**
Zala	25	19	1158	1	332	15	3	4	2644	13	**52.0**
Heves	32	13	598	11	386	13	1	9	5937	6	**52.0**
Veszprém	35	12	1102	2	267	17	1	9	2103	17	**57.0**
Baranya	40	11	178	18	536	11	3	4	2346	15	**59.0**
Somogy	31	15	878	6	518	12	0	17	4972	10	**60.0**
Vas	26	18	1046	3	274	16	1	9	2148	16	**62.0**
Fejér	32	13	430	14	626	8	0	17	2608	14	**66.0**
Budapest	81	6	166	19	227	18	1	9	345	20	**72.0**
Nógrád	28	17	766	8	71	20	1	9	1132	18	**72.0**
Komárom-Esztergom	24	20	710	9	212	19	0	17	1005	19	**84.0**
Sum	**1218**	–	**12,480**	–	**13,338**	–	**34**	–	**10,7456**	–	–

Note: Bold values indicates outcomes of the calculations (IFR_n), and sum of the composing indicators' scores.
[a]Source: HU-ÖKO-01 és HU-ÖKO-02 (2013).
[b]Source: 'Termelőtől.hu' Ltd. (2013).
[c]Source: Land Information System (2011).
[d]Source: Hungarian Intellectual Property Office (2013).
[e]Source: General Agricultural Census (2010).

eastern–south-eastern part of Hungary) as well as land-use traditions. The northern part is hillier, where forested landscapes are prevailing.

Different indicators of local food production score remarkably different in case of certain counties, which implies uneven development. For example, the number of small-scale farmers and the number of farms producing food for sale rank among the lowest in the case of Budapest, but the level of organic production is relatively high, which is in line with the highest purchasing power and the highest level of consumer interest in local and organic food (Balázs, 2012). Nine out of the twenty counties can be characterized with indicators that rank in the beginning (1st–5th places) *and* in the end (15th–20th places) of the lists, depending on which aspects are regarded (Bács-Kiskun, Csongrád, Borsod-Abaúj-Zemplén, Békés, Tolna, Zala, Veszprém, Baranya, Vas). (The spatial distribution of these counties is without a definite tendency as they can be found in the east as well as in the west.) The most extreme example is that of the Bács-Kiskun County, which occupies the second place in the IFR_n ranking, so it can be regarded as highly developed (compared to other Hungarian counties). Local food activity is relatively intensive there; but the use of online media for marketing purposes is the least typical among farmers, which should be strengthened in the future. The example of the Bács-Kiskun County shows how the proposed method can be used for detecting problematic

Figure 2. IFR$_n$ in the Hungarian counties and the capital (Model 1). Darker colours show better performance. Source: Own compilation, based on the calculations. Prepared with Esri ArcGIS, Adobe Illustrator. No permission was needed to publish the image.

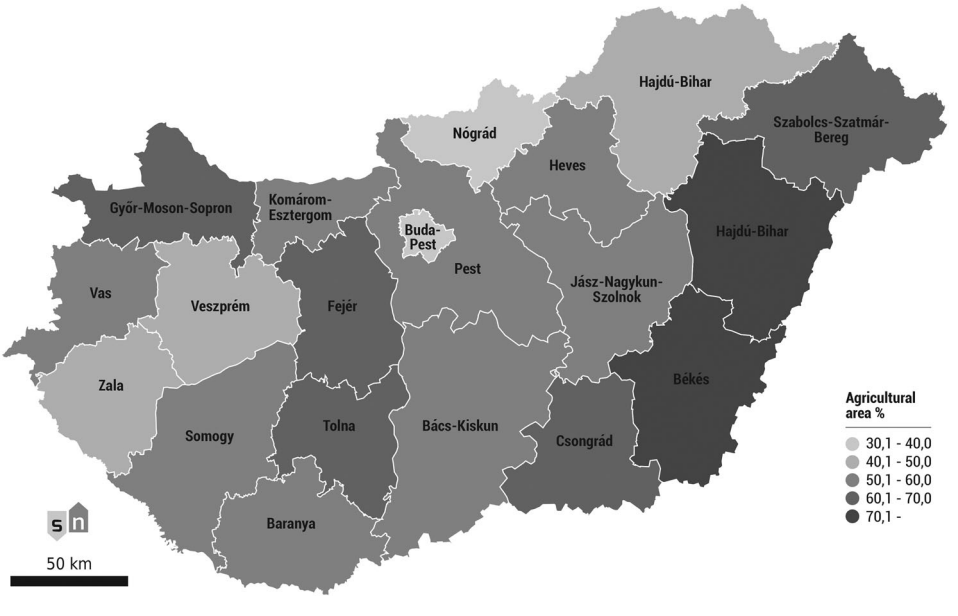

Figure 3. The ratio of agricultural areas in the Hungarian counties and Budapest. Darker colours show better biophysical conditions for agricultural production. Country average: 57%. Source: own compilation, based on the data of the Central Statistical Office. Data refer to 2010. Prepared with Esri ArcGIS, Adobe Illustrator.

Table 3. The results of the tests on normal distributions

	IFR_n	IFR_n	Ratio of agricultural areas
Shapiro–Wilk *p*-value	0.49025	0.96195	0.97000
Shapiro–Francia *p*-value	0.63687	0.95176	0.99117
Kurtosis test *p*-value	0.7027	0.7016	0.9178

dimensions; hence, with the detailed analysis of the indicators, desirable and realistic policy goals can be set.

Table 4 displays the indicators of local food production and the IFR with respect to the prevalence of local food activity (IFR_r) in the capital and counties of Hungary, when the individual indicators are considered as the ranks of ratios (Model 2). Results are visualized in Figure 4. The indicator values (ranging from maximum 5.19% to 33.34% in case of different variables) show that the development of the local food production sector in Hungary is at an early stage. Evaluation of the potential for further growth is the easiest in the case of the organic sector as comparable data exist from other European countries; the share of organic land is half of the EU average in general, and probably it is even

Table 4. The values of the IFR_r and the composing indicators for the Hungarian counties and Budapest (Model 2). Lower IFR_r indicates better performance.

	Ratio of organic farmers[a]		Ratio of local food producers advertising in the online local food directory[b]		Ratio of small-scale producers[c]		Number of certification schemes[d]		Ratio of farms producing food for sale[e]		
County	Ratio	Rank	Ratio	Rank	Ratio	Rank	Score	Rank	Ratio	Rank	IFR_r
Budapest	5.19	1	10.64	1	14.55	1	1	9	22.12	7	**19.0**
Szabolcs-Szatmár-Bereg	0.55	2	3.54	8	3.27	5	2	7	19.24	9	**31.0**
Győr-Moson-Sopron	0.50	3	2.73	10	3.17	6	1	9	23.46	6	**34.0**
Bács-Kiskun	0.22	7	0.22	20	3.39	4	4	2	24.66	4	**37.0**
Heves	0.18	12	3.36	9	2.17	11	1	9	33.34	1	**42.0**
Csongrád	0.15	14	1.16	15	2.94	7	5	1	23.76	5	**42.0**
Tolna	0.14	16	4.88	6	3.61	3	1	9	15.16	10	**44.0**
Hajdú-Bihar	0.24	5	1.18	14	2.36	10	1	9	20.64	8	**46.0**
Békés	0.21	8	0.63	19	5.71	2	0	17	24.77	3	**49.0**
Veszprém	0.20	9	6.36	4	1.54	15	1	9	12.14	13	**50.0**
Nógrád	0.26	4	7.11	2	0.66	20	1	9	10.50	18	**53.0**
Vas	0.15	15	6.07	5	1.59	13	1	9	12.46	12	**54.0**
Baranya	0.19	11	0.84	17	2.53	9	3	4	11.08	16	**57.0**
Komárom-Esztergom	0.22	6	6.57	3	1.96	12	0	17	9.31	20	**58.0**
Pest	0.17	13	1.77	13	1.29	16	4	2	11.79	15	**59.0**
Jász-Nagykun-Szolnok	0.10	18	0.92	16	1.08	18	2	7	26.96	2	**61.0**
Borsod-Abaúj-Zemplén	0.20	10	0.65	18	0.80	19	3	4	12.12	14	**65.0**
Zala	0.10	19	4.45	7	1.28	17	3	4	10.17	19	**66.0**
Fejér	0.13	17	1.80	12	2.63	8	0	17	10.95	17	**71.0**
Somogy	0.09	20	2.65	11	1.56	14	0	17	15.00	11	**73.0**
Sum	–	–	–	–	–	–	**34**	–	–	–	–

Note: Bold values indicates outcomes of the calculations (IFR_r), and sum of the composing indicators' scores.
[a]Source: HU-ÖKO-01 és HU-ÖKO-02 (2013).
[b]Source: 'Termelőtől.hu' Ltd. (2013).
[c]Source: Land Information System (2011).
[d]Source: Hungarian Intellectual Property Office (2013).
[e]Source: General Agricultural Census (2010). Data were compared to the number of agricultural businesses (General Agricultural Census, 2010).

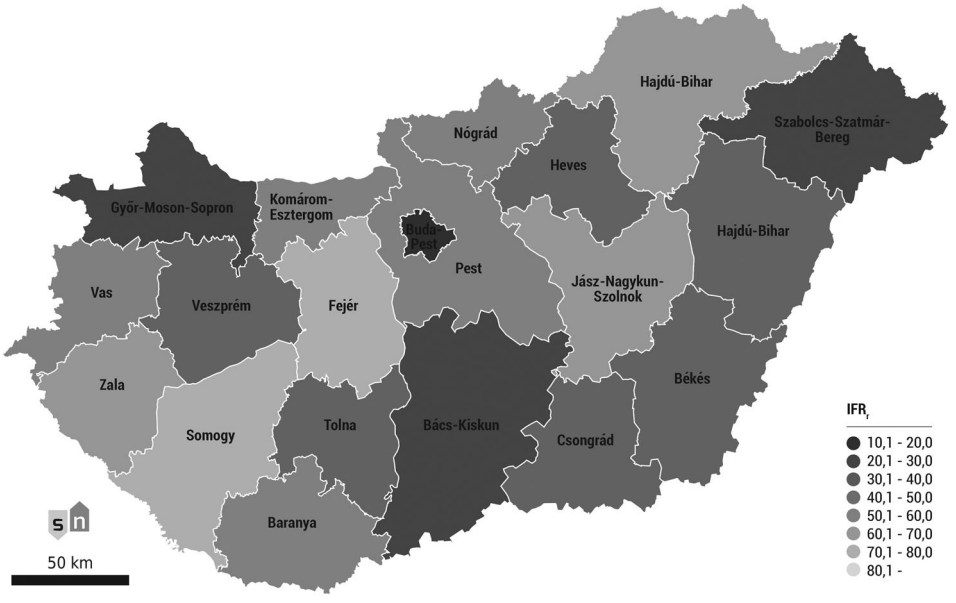

Figure 4. IFR$_r$ in the capital and counties of Hungary (Model 2). The index reflects the expected speed of local food production development. Darker colours show better performance (faster development). Source: Own compilation, based on the calculations. Prepared with Esri ArcGIS, Adobe Illustrator.

smaller among small-scale (not export-oriented) organic farms (Dezsény & Drexler, 2012). Thus, saturation (when the rate of further growth is declining) is not expected in the near future, which supports our notion that prevalence of local food activity should be also taken into account in Hungary during the planning process. The ratio of organic farmers weakly coincides with GDP per capita (Spearman rho = 0.3931; $p = 0.0864$); however, no similar pattern can be detected for the rest of the indicators or the overall IFR$_r$ (or PIFRI) values.

Further outcomes of Model 2 confirm previous findings of Model 1. The indicators often show uneven development: eleven counties have indicators that are ranked in the beginning *and* in the end of the lists reflecting different aspects. The set of 'unevenly developed' counties overlap: seven counties are found in both groups, while Bács-Kiskun and Veszprém counties are replaced by Nógrád, Komárom-Esztergom, Pest and Jász-Nagykun-Szolnok in the case of IFR$_r$. The situation is the most extreme in the Jász-Nagykun-Szolnok County: although the ratio of farms producing food for sale is relatively high (ranks the second), the ratio of small-scale farms (in spite of the fact that their absolute number is relatively high, it occupies the 6th place on the IFR$_n$-related list) is among the lowest. Prevalence is by far the highest in the capital, Budapest—where the absolute numbers are very low: Budapest has bottom scores for most of the indicators (see Table 2).

There is one big difference between the key findings of Model 1 and Model 2. When ratios are considered instead of absolute numbers, the definite east–west distribution of more and less developed countries is much less remarkable (see Figure 4). In other words, there is no correlation between the IFR$_n$ (food activity level) and IFR$_r$ (prevalence) values (see the Pearson's p-value in Table 5 that compares Model 1 and Model 2, and also

Table 5. Comparison of Model 1 and Model 2 and the values of PIFRI. PIFRI shows where an intervening policy measure is expected to be the most efficient, when food production is considered.

	IFR_n		IFR_r		RNAA		PIFRI	
County	Score	Rank	Score	Rank	Score	Rank	Score	Rank
Szabolcs-Szatmár-Bereg	27.0	1	31.0	2	35.5	5	93.5	1
Hajdú-Bihar	30.0	3	46.0	8	27.7	2	103.7	2
Bács-Kiskun	28.0	2	37.0	4	40.7	8	105.7	3
Csongrád	35.0	6	42.0	5	34.2	4	111.2	4
Békés	47.0	9	49.0	9	23.1	1	119.1	5
Győr-Moson-Sopron	47.0	7	34.0	3	38.7	7	119.7	6
Tolna	48.0	10	44.0	7	30.8	3	122.8	7
Jász-Nagykun-Szolnok	33.0	5	61.0	16	41.5	10	135.5	8
Pest	31.0	4	59.0	15	46.9	12	136.9	9
Heves	52.0	12	42.0	6	47.1	13	141.1	10
Budapest	72.0	18	19.0	1	62.5	19	153.5	11
Baranya	59.0	14	57.0	13	41.1	9	157.1	12
Veszprém	57.0	13	50.0	10	56.2	17	163.2	13
Vas	62.0	16	54.0	12	48.5	14	164.5	14
Borsod-Abaúj-Zemplén	47.0	8	65.0	17	53.9	16	165.9	15
Fejér	66.0	17	71.0	19	38.2	6	175.2	16
Zala	52.0	11	66.0	18	57.6	18	175.6	17
Somogy	60.0	15	73.0	20	48.8	15	181.8	18
Komárom-Esztergom	84.0	20	58.0	14	45.3	11	187.3	19
Nógrád	72.0	19	53.0	11	64.1	20	189.1	20
Pearson correlation *p*-value			0.3660		–		–	

Note: Calculation is based on the ratio of agricultural areas (Central Statistical Office, 2010).

shows the results of PIFRI, which reveal where the policy about the support of LFSs is expected to be the most successful). Noticeable disparities between the rankings of IFR_n and IFR_r reflect dissimilar development patterns and potential especially in Budapest, Jász-Nagykun-Szolnok and Pest counties. Local food production is at a relatively low level in Budapest; however, producers are the most exposed to the changing consumer preferences and they react quickly, thus the prevalence is the highest. In case of further support, spectacular future development seems likely in the absolute number of small-scale farmers involved in LFSs; however, due to the less favourable biophysical conditions, exploitation of Rural Development Programme measurements is expected to be less efficient. Jász-Nagykun-Szolnok and Pest counties are quite engaged in current local food activity, thanks to significant NGO activity in the region and the proximity of the marketing possibilities in the capital. However, as the number of agricultural farms is high in these counties, they relatively underscore in local food prevalence; which means that an intervening policy would be expected to require longer timescales to reach prevalence.

When all the models and aspects are considered in the PIFRI, eastern Hungary (especially the Szabolcs-Szatmár-Bereg County) shows the highest potential for development as local food production capacity (human resources and land availability) is the highest there. Addition and multiplication of the terms result only in minor differences in the final rankings, and qualitative conclusions do not change; thus, these results are not shown in Table 5.

Compared to the British experience, several difficulties emerged when the IFR (Ricketts-Hein et al., 2006) was applied in Hungary. In some cases it was possible to find similar indicators from statistics or by integrating available data sets to the indicators, but some stayed without the necessary cultural equivalent form, such as the Women's Institute co-operative markets. Similarly to the original study, data availability was a

limiting factor. Still, we can agree with Ricketts Hein and Watts (2010) and Watts et al. (2011) in that the Index is easily adaptable. Also, it is found to be a valuable tool for mapping local food (production) activity and so it can support rural development planning processes.

Further thoughts have been inspired by the refinement of the original IFR. The collection of indices in Table 1 reveals that many different aspects (production, consumption, current possibilities and gaps of the infrastructural requirements, health issues, environmental considerations, etc.) have been differentiated with regard to local food. (Complexity is increased by the fact that a variety of dimensions can be used—if data availability allows—to characterize a single aspect.) These aspects are analysed by professionals of entirely different area of expertise, so academic and policy knowledge increases along diverse disciplines. Future research should apply an integrated approach to frame and tame diverse assessments.

The policy application of the food-related indices should also be considered. Some of the indices displayed in Table 1 are known in the policy arena, too; for example, some decisions at the local level, even if they are not based on, but influenced by the Ecological Footprint (Collins & Flynn, 2007). Or, the Healthy Eating Index was introduced by the Center for Nutrition Policy and Promotion in the US. The US Department of Agriculture has been using the Index as a tool since then, for example to measure the effectiveness of nutrition intervention programmes, or to assess the quality of food assistance packages, menus and the US food supply (Kennedy, Ohls, Carlson, & Fleming, 1995).

The question of local food typically arises among urban planners, and usually marketing-focused measures are pursued, such as the number or location of farmers' market within the city, etc. (see the LI; Pothukuchi & Kaufman, 1999, 2000; Reynolds, 2009). Almost ten years passed after the introduction of the IFR by Ricketts Hein et al. (2006), but no proof can be found for the application of a production-centred index in the planning of rural development so far in spite of the fact that local governments are increasingly interested in quantitative evidence connected to local food production (Watts et al., 2011). It is believed that by offering more and more alternatives, future use might come closer, according to the needs of decision-makers. Current EU-level interest in the development of SFSCs and the support of small-scale farmers is expected to urge such a demand.

Finally, the increasing academic interest in local food production might as well benefit from appropriate (reliable, widely collected, etc.) data, which are required to produce evidence for favourable local food policies.

Conclusions

LFSs and SFSCs are to be promoted in the 2014–2020 EU financing period, which requires careful planning supported by quantitative evidence. In this paper, efficient entry points for policy-making are revealed based on current small-scale food production patterns in the counties of Hungary. An uncommon, quantitative approach and new metrics relying on statistical data are introduced. The 'PIFRI' shows where LFSs can be most efficiently facilitated. PIFRI might be a valuable, easy-to-use tool for mapping local food activity and so it can support rural and development planning processes.

In general, local food movement in Hungary is still at an early stage; further growth can be easily promoted in the future. However, results show that present level of food activity

and future prospects often mismatch. After mapping the different aspects of local food production activities, some attempt is made to uncover underlying mechanisms that might drive the experienced patterns. Nevertheless, these mechanisms seem to be complex; geographic ones in some cases and economic in others, which calls for additional research. Also, analysis of spatial patterns of consumer demand (including the rate of food self-provisioning) will be needed in order to fully understand the spatial differences in the potential for the local food sector development in Hungary.

Besides reporting about local food production activity from a CEE country, our paper also draws attention to the importance of the national level in the local development planning, which is needed to harmonize national development processes with wider European initiatives.

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