

THE CONSERVATION OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE: CONSUMERS' PERSPECTIVES ANALYSIS IN SIBIU AGRI-FOOD MARKETS

Camelia SAND SAVA, Maria-Mihaela ANTOFIE

University "Lucian Blaga" of Sibiu, Faculty of Agricultural Sciences, Food Engineering and Environment Protection, 7-9 Dr. Ioan Rațiu, 550012, Sibiu, Sibiu county Romania, Emails: camelia.sand@yahoo.com, camelia.sand@ulbsibiu.ro, mihaela.antofie@ulbsibiu.ro

Corresponding author: mihaela.antofie@ulbsibiu.ro.

Abstract

To understand the agri-food marketing landscape, in terms of associated factors influencing the future development from the local level it is essential among others to evaluate consumers as customers of agri-food markets. It is relevant to understand their choices on what values are based on and why they became customers of agri-food markets in Sibiu city. This is only one relevant end part of the food chain aside industry and hospitality areas. Their daily philosophy of ensuring agri-food products can support in the end the cost-efficient conservation and sustainable use of genetic resources for food and agriculture required for long-term maintenance food security. The scope of this article is to evaluate the orientation of Sibiu's consumers as customers of agri-food markets in order to understand if they are or not aware about the value of local food. These results may further support the development of public policies related to gastronomic tourism based on local products. The analysis of these results is proving that the customers of agri-food markets are aware about the value of local food and they are mostly oriented to buy them directly from producers, bypassing agri-food markets. The need to develop an appropriate infrastructure dedicated to the preservation of agri-food products appear to be one of the major barriers against trading local products, a major gap in the support of rural area development.

Key words: consumers, agri-food markets, producers, plant genetic resources for food and agriculture, landraces, local breeds, biodiversity conservation

INTRODUCTION

We live in a fast-changing world, news being present all the time in our real life, attractive but sufficiently disturbing towards an uncertain future [14]. Climate change and economic policies are real today's challenges for long-term sustainable development and, implicitly food security up to global level [17; 24]. Under such circumstances local policies needs new tools and instruments to adopt and adapt for ensuring natural resources access for future generations [8; 20]. Sibiu County has an exceptional natural heritage with a coverage of approximately 52% of protected areas, many of which includes rural communities [1; 21]. Developing a highly performant farming depends not only on the application of intelligent agricultural practices, but heavily on the maintenance of natural resources including soil fertility [11]. Such a goal can be attended by the

appropriate access of genetic resources such as plant varieties and hybrids, animal breeds according to natural and semi-natural environmental conditions [5]. The appropriate access to genetic resources can be developed based on procedures that can be initiated at the local level through decision-making factors represented by municipalities from local up to county levels [23]. Thus, accessing genetic resources becomes part of a larger economic landscape. Moreover, to apply the principles of sustainable development in the context of the Brundtland Report (1987) as a Member State of the European Union, it is necessary to strike the balance between the three domains: environmental, socio-cultural and economic for ensuring future generations the access to the same resources for more than 30 years [3]. The ease way of passing into the current official political documents from socio-cultural to socio-economic issues make us to bring to light a forgotten connection

between culture and agriculture in Europe. To define the cultural dimension of agricultural activities, a special attention should be paid to genetic patrimony of landscapes in Sibiu County. Here we discovered a unique universe of people dedicated to saving seeds from generation to generation, lovers of old animal breeds, who also consume wild food resources or simply lovers of nature itself [1]. Ensuring the sustainable access to these genetic resources will become a milestone that should be relevant for a county public policy supporting the title of European Gastronomy Region Sibiu in 2019 [18; 19]. The local taste, specific to gastronomic tourism [4; 10; 12; 15], is mainly imprinted with food genetic resources (i.e. edible plants, animals and mushrooms), followed by the access of unpolluted soil, the care for natural health and nature itself and the support of circular economy [7]. The scope of this article is to evaluate the awareness of consumers in agri-food markets of Sibiu city in Romania, regarding the origin of some major local products specific for Sibiu county such as: vegetables, fruits and raw-materials. We consider that the results of this survey are relevant for further supporting public policy developments required for a circular economy where the agricultural management as a whole can profoundly be changed. Furthermore, the official recognition of local genetic resources will support long-term food security maintenance for rural communities that can be further replicated into the European context [1; 13].

MATERIALS AND METHODS

Survey method. 200 respondents as consumers and sellers, randomly selected into three agri-food markets have been investigated for the origin of some major food raw materials such as: cheeses (i.e. Sibiu cheese, bell cheese, curd and urda), vegetables (i.e. potato, beans, cabbage, onion, garlic, parsley, dill, tarragon, thyme and basil), fruits (i.e. apple and plum fruits) and raw materials (wheat flour). The series of agri-food items were selected based on the county ability to provide such products in close cooperation

with the county Directorate for Agriculture and Rural Development. The questionnaires were anonymous, full accepted by all respondents and applied during September 2017 and 2018.

Places of investigations. Three agri-food markets from Sibiu city were investigated such as: “Cibin”, “Transilvania” and “Huet” (Fig.1). “Cibin” market is a constant open agri-food market, “Transilvania” and “Huet” are open all year around during Saturday and it is open only to local producers and householders from rural areas of Sibiu county [22].

Data analysis All data provided during the survey have been statistically analysed.

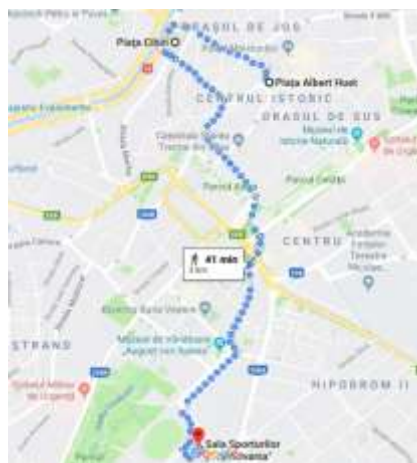


Fig. 1. The main agri-food markets investigated for consumers options regarding the origin of agri-food products in Sibiu city: Transilvania, Cibin and Huet markets.

Source: Modified map after www.google.com/maps.

RESULTS AND DISCUSSIONS

The analysis of Sibiu’s customers from agri-food markets. Based on the survey’s results, more than 66% of the consumers from Sibiu city, buy products from agri-food markets, and this can be considered as a positive attribute for future steps under Sibiu European Region of Gastronomy 2019 (Fig. 2). However, there is not evaluated the public that is highly dependent of hypermarkets, but only on the public from these three agri-food markets.

The analysis of cheese originating from Sibiu county. Cheeses of all kinds are produced in Sibiu county (i.e. Sibiu cheese,

bell cheese, curd and urda) [22]. They are purchased from the agri-food market at only 1% (i.e. from Cibin market), since most of the respondents (74%) declared that they buy it directly from Sibiu county's producers (Fig. 3). This result may be considered as a vulnerability for the agri-food market development as a monitoring system for local chees marketing is not possible yet to be implemented.

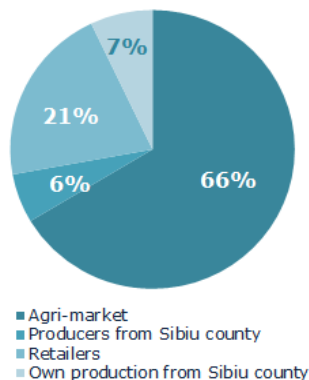


Fig. 2. 66% of customers are ensuring their products from agri-food markets of Sibiu.
 Source: Original data.

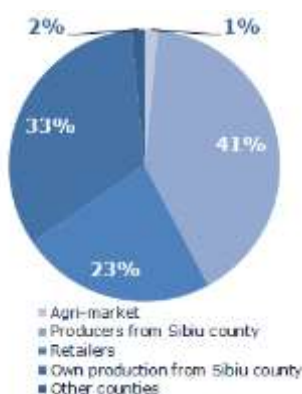


Fig. 3. The origin of cheeses in Cibin agri-market. 41% of the customers are ensuring their products directly from producers of Sibiu county.
 Source: Original data.

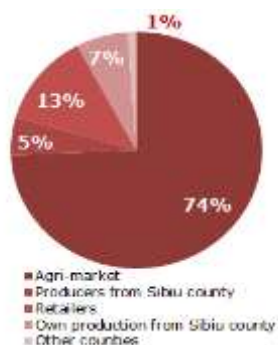


Fig. 4. The origin of potatoes for consumers. 74% of the customers are ensuring their products from agri-food markets of Sibiu county. Source: Original data.

Furthermore, there is no evidences for the closing of the economic loop at the county level [7].

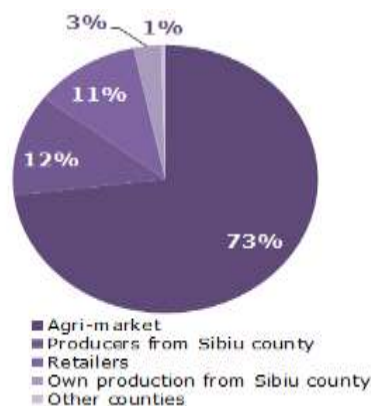


Fig. 5. The origin of beans in Cibin agri-market. 73% of customers are ensuring their products directly from agri-food markets of Sibiu county. 12% are accessing directly the producers.
 Source: Original data.

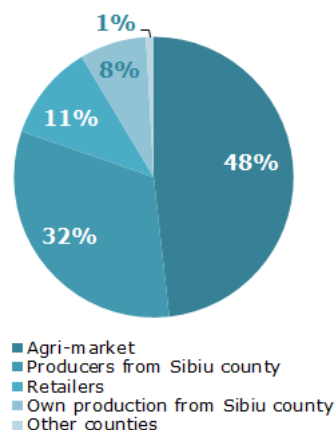


Fig. 6. The origin of cabbage for consumers. 32% of the customers are ensuring their products directly from producers of Sibiu county. Source: Original data.

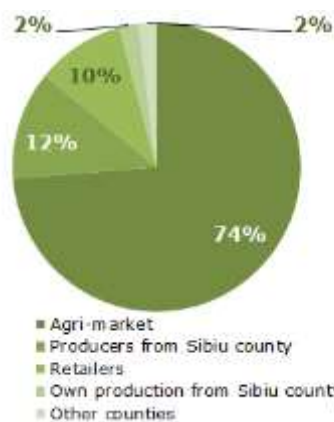


Fig. 7. The origin of green onion and garlic for consumers. 74% of the customers are ensuring their products directly from agri-food markets of Sibiu county.
 Source: Original data.

On the other hand, a careful analysis of this result may be a prerequisite for the manifestation of an economic landscape to support the Sibirian circular economy [18]. If the central scope of the Sibiu county's policy would be a sustainable economy, these results would support the recommendation that there is a need to deeply analyse the economic landscape by involving all stakeholders of the food chain (i.e. including restaurants and hospitality) [18; 19]. Also, on one hand to maintain this positive attitude of supporting the circular economy and on the other hand to increase the confidence of the Sibiu's consumers regarding quality of cheeses entering the agri-food market [22]. Gains should be geared to both poles of economic interest under this hypothesis and as a consequence it is compulsory to rethink the concept of a sustainable cheese market in Sibiu as well as in Romania.

On the other hand, the situation of sheep breeders is already known by officials [22]. Thus, the traditional Romanian breeds are used by shepherds who know how to grow and breed these valuable genetic resources that today are endangered due to the slow replacement with highly productive breeds of import. However, the local taste, so much claimed by gastronomic tourism [6] may suffer dramatically if there will be recorded losses in terms of traditional old breeds.

In this regard, there exists a traditional knowledge associated with genetic resources (represented by sheep breed, grazing systems, pastures management, connectivity to wilderness and pollinators) that needs to be updated to the today's general negative issues of agricultural development.

Among these it should be mentioned the increasing number of wild (wild boar, *Sus scrofa*) and domestic herbivores (i.e. sheep herds) that are the main vectors, for example, for the transport of potato cysts nematodes or PCNs (*Globodera pallida* and *G. rostochiensis*). "Sheep transfer to pastures" should be regulated at the county level to ban the use of arable land.

We mention that Sibiu county, as the whole country, is under phytosanitary quarantine

since 2007 for the above-mentioned problems, which is why the seed potato market was lost for export. Moreover, the PCNs resist into the Romanian soils up to 28 years compared to other EU countries where they can resist up to 8 years (i.e. the official period recognized by the EU specific regulation today).

Under these circumstances veterinary authorities apply extremely expensive but inappropriate measures from where the inefficiency of their application into the Romania pedoclimatic conditions. In order to solve out this situation it is necessary to involve all stakeholders to ensure the declaration of *free zones* of phytosanitary quarantine in Sibiu where the transfer of sheep herds should be forbidden. This concept is defined at the level of the EU and would ensure the revival of the county economy and the long-term sustainability of the cheese market on the one hand and other agri-food products dependent on the sheep management on the other hand. Sibiu may return to the market for the production of seed potato free from pathogens of phytosanitary quarantine by the proper integration of phytosanitary and sanitary veterinary measures in all agricultural activities [2].

The analysis of vegetables originating from Sibiu county

Potatoes (*Solanum tuberosum*) have been slowly entered the Sibiu market since the eighteenth century, alike all Transylvania, and have since become a basic food source [9]. Currently, potato trade outside the EU is banned for Romania due to the barriers imposed by the phytosanitary quarantine mentioned above.

Based on the survey results white potatoes varieties are the most frequent traded on the market (i.e. 95.33%), with 74% purchasing from the agri-food markets and 12% directly from the county's producers (Fig. 4).

The relatively low rate of penetration into the agri-food city-market of potatoes is due to the lack of connectivity between producers, transport, storage and city-marketing. We may add the lack of a financial mechanism for the equitable distribution of the benefits sharing

resulting from the sale of local goods for small producers and farmers.

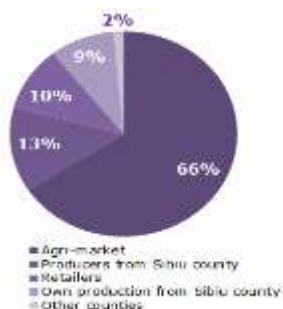


Fig. 8. The origin of dry onion for consumers. 13% of the customers are ensuring their products directly from producers of Sibiu county. Source: Original data.

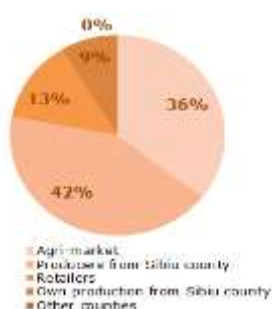


Fig. 9. The origin of dry garlic for consumers. 42% of the customers are ensuring their products directly from producers of Sibiu county. Source: Original data.

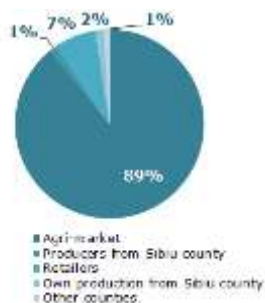


Fig. 10. The origin of green vegetables for consumers. 89% of the customers are ensuring their products directly from producers of Sibiu county. Source: Original data.

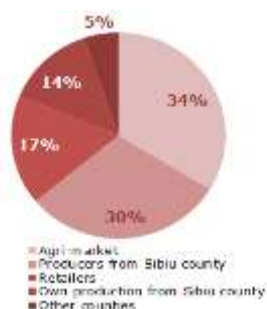


Fig.3. The origin of apple fruits for consumers. 30% of the customers are ensuring their products directly from producers of Sibiu county. Source: Original data.

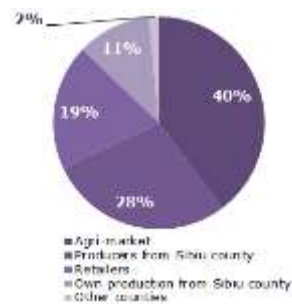


Fig. 4. The origin of plums for consumers. 28% of the customers are ensuring their products directly from producers of Sibiu county. Source: Original data.

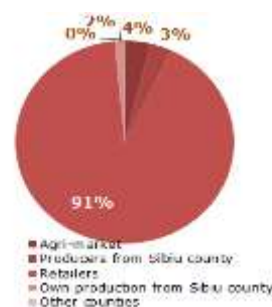


Fig. 5. The origin of wheat flour for consumers. 91% of the customers are ensuring their products from retailers of Sibiu county. Source: Original data.

We mention that in Sibiu County, are still white local potato varieties in hilly areas, preserved, for example, by householders from Rășinari. These genetic resources can become a subject of interest to the Sibian gastronomy, restaurants and hospitality due to the uniqueness of composition and taste [16; 18]. **Beans** (*Phaseolus* sp.) have a similar history with potato, being one of the most popular crops for pods and grains, being consumed almost all year round.

The analysis of the results of the interviews shows a situation comparable with that of potatoes, namely 73% of consumers buy from the agri-food markets and 15% directly from the producers (Fig. 5).

A series of missions in the rural area of Sibiu conducted by us showed that old bean varieties of an amazing diversity are currently preserved in the rural householders [1]. They represent primary genetic resources for their living for all 365 days in a year. But they also represent secondary genetic resources for accessing the economic landscape alike.

Cabbage (*Brassica oleracea* L.) is one of the oldest genetic resource in this area [9]. The

historical attachment of locals to cabbage can be found in syntagma such as: *Meşindorf's cabbage* or *Moşna's cabbage*, *Cabbage of Rothberg* or *Roşia's cabbage*, *Kastenholz's cabbage* or *Caşolţ's cabbage*. In the county of Sibiu, the favourable pedoclimatic conditions triggered during time the cultivation of the cabbage to cover both own needs and marketing [1]. Consumption in crude status, boiled, cooked or as a pickled is a *long-time* tradition, becoming an integral part of traditional gourmet culture. Generally, its high nutritional value is internationally recognized in case of organic cabbage (non-pesticide-based). In Burgberg or Vurpăr it is possible to buy bio-cabbage. At present, seeds of local varieties of cabbage seems to still exist in certain householders and family farms. However, these original seeds, should be proved for their uniqueness as genetic resources through genetic markers. The dramatic loss of local seeds may be due, on one hand, to the certified seeds promotion from the global market and on the other hand to the two years life cycle specific to the cultivation technology. This two-years life cycle, in an era of speed, generally led the locals to directly access the seeds from the large market and lose the practice of producing it by their own [1].

However, for ensuring long term food security the side effect of this unfair promotion is the erosion of traditional knowledge related to the production of a full life cycle cabbage seeds into households. Such a loss is more than dramatic as we have to deal with a cultivated resource for over 2,000 years and stimulating the maintenance and recovery of local memory should be vital in poor rural areas. Thus, the cultivation of cabbage seeds/seedlings should be encouraged, and households, small farmers or dedicated farmers/householders need promotion at the level of Sibiu and the county level in particular, under the umbrella of the concept of food security for local communities in Sibiu County. Cabbage is also a crop plant threatened by phytosanitary quarantine pathogens. Agricultural specific cultivation measures, and arable land management being

complex, will require new guidelines under the umbrella of food security. White cabbage in particular is purchased from the market at 48% shares, as 32% of respondents buy directly from producers or 8% from villages in Sibiu County from a total of 40% (Fig. 6). It is noteworthy that although there are villages with long history and traditions in the cultivation of the cabbage, however the circular economy does not work.

Onion and garlic (*Allium cepa* L. and *A. sativa* L.) Green and dry onions and green and dry garlic are indispensable in the Sibirian cuisine, with a history of their use of over 2000 years [9].

Green onions and garlic are provided in a ratio of 74% of the market and 14% from producers in the limits of Sibiu County (Fig. 7). Dry onion bulbs for consumption are also provided in a ratio of 66% of the market and 22% of the limits of Sibiu County (Fig. 8). Dry garlic is not highly sought after in the market (36%), 51% of which is covered within the limits of Sibiu County (Fig. 9).

There is a clear concern to maintain local populations of onions and/or garlic in villages of Sibiu. These genetic resources are mixed as origin between native and imported and not well established. However, in every village of the county we encountered dedicated householders for old varieties preservation [1].

Green vegetables 5 species of interest were surveyed such as the following: parsley (*Petroselinum crispum* (Mill.) A.W.Hill), dill (*Anethum graveolens* L.), tarragon (*Artemisia dracuncululus* L.), thyme (*Thymus vulgaris* L.) and basil (*Ocimum basilicum* L.). All of them are constantly present on the city food-market and are ensured for the consumers at 89% of their needs. However only 3% are supplied directly from producers in Sibiu County or hypermarkets (Fig. 10).

The analysis of fruits originating from Sibiu county. Fruit trees are traditionally cultivated for over 5,000 years (i.e. plum three, cherry three, sour-cherry three and walnut three) [9]. The apple trees and the pair trees reached the old Dacia, at the same time with the Roman Empire and since than they

were very well integrated into existing agro-ecosystems. The apple tree is traditionally cultivated in Sibiu County for over 2,000 years and in an organized system for several centuries. Basically, these genetic resources are older than 2,000 years for their presence and essential for pollinators [22]. Old varieties obtained some four of five centuries ago in their countries of origin (i.e. Germany, Austria, England, France), entered Sibiu County for more than 350 years ago. The pattern of traditional orchard in Sibiu County is of German and / or Austrian origin: cultivation in large rows (i.e. distances of 10 m between three rows) allowing the exploitation of the meadow differently for the cold and warm seasons. This type of multi-covering land use management has supported the rural communities in Săliște, Cislăchioara and Valea Târnavelor to exploit cost-efficient and sustainable agricultural resources for more than 800 years with the establishment of the first Saxons in Transylvania.

Sibiu's apple fruits are bought from the market in 34% of the Sibiu County and 44% directly from the producers (Fig. 11).

Plums are insured from the market in 40% and for sure from Sibiu County 39% directly from the producers (Fig. 12).

The lack of connectivity between the fruits producers and the food market, including the lack of storage houses are among the major problems for ensuring the functioning of circular economy.

Moreover, we need to underline that there are householders, in all villages in Sibiu that applies traditional grafting methods. This is a valuable traditional knowledge that should be exploited for the future development strategies of the county.

The analysis of food-raw materials originating from Sibiu county

Wheat flour is the most representative food resource, being ensured in the largest proportion of food chain stores, of uncertain origin, only 5% of consumers are buying directly from producers in Sibiu County (Fig. 13). There is a serious lack of interest in ensuring financial mechanisms for rewarding local producers for this asset.

CONCLUSIONS

By analysing the customer preferences related to the origin of agri-food products it is possible to envisage the real situation of rural economy in the neighbouring localities. Furthermore, it is possible to set new public policies that can support rural areas development. The major lack in the current economy is the agri-food storage chain that can further supply agri-food markets for Sibiu county or in the country. The integrated management of livestock and crops is essential for the appropriate implementation of the phytosanitary and veterinary measures of quarantine importance. This analysis provides the first evidences that local genetic resources for food and agriculture are still marketed in Sibiu agri-food markets. Moreover, there is a need for awareness among customers regarding the positive effect on the circular economy of their choice when are buying agri-food products from the markets.

ACKNOWLEDGMENTS

This paper was supported by the Research Centre for Agricultural Sciences and Environmental Protection of the University Lucian Blaga from Sibiu. Surveying activities were realized with the support of students within the contracts nr. 71065/04.09.2017 and 48124/19.06.2018.

REFERENCES

- [1]Antofie, M.M., 2011, The Red List of Crop Varieties for Romania-Lista Roșie a varietăților plantelor de cultură din România. Publishing House Lucian Blaga University from Sibiu, pp: 81.
- [2]Antofie M.M., 2016, Current political framework regarding control measures on potato cyst nematodes in Romania. *Analele Universității din Oradea, Fascicula Biologie*, 23(1): 37-42.
- [3]Brundtland, G., Khalid, M., Agnelli, S., Al-Athel, S., Chidzero, B., Fadika, L., Singh, M., 1987, Our common future ('brundtland report'). <http://www.un-documents.net/our-common-future.pdf>, Accessed on May, 2018.
- [4]Cohen, E., Avieli, N., 2004, Food in tourism: Attraction and impediment. *Annals of tourism Research*, 31(4), 755-778.

- [5]Döring, T.F., Knapp, S., Kovacs, G., Murphy, K., Wolfe, M.S., 2011, Evolutionary plant breeding in cereals—into a new era. *Sustainability*, 3(10), 1944-1971.
- [6]Dulău, A. V., Coroș, M. M., 2010, Is There a Gastronomic Tourist Offer in Romania. *Revista Economica, Universitatea "Lucian Blaga", Sibiu*, (5), 52.
- [7]Girard, L.F., Nocca, F., 2017, From linear to circular tourism. *Aestimum*, (70): 51-74.
- [8]Gössling, S., Hall, C.M., 2016, Developing regional food systems: a case study of restaurant–customer relationships in Sweden. *Food tourism and regional development* (pp. 92-104). Routledge.
- [9]Gyémánt, L., Câmpeanu, R., Dörner, A.E., Mureșan F.V., 2009. *Conscriptia fiscală a Transilvaniei din anul 1750: Descrierea localităților conscrise*. Editura Enciclopedică Cluj Napoca, pp: 980.
- [10]Green, G.P., Dougherty, M.L., 2008, Localizing linkages for food and tourism: Culinary tourism as a community development strategy. *Community Development*, 39(3): 148-158.
- [11]Grey, S., Newman, L., 2018, Beyond culinary colonialism: indigenous food sovereignty, liberal multiculturalism, and the control of gastronomic capital. *Agriculture and human values*, 35(3): 717-730.
- [12]Hall, C. M., 2015, Heirloom products in heritage places: Farmers' markets, local food and food diversity. *Heritage Cuisines* (pp. 100-115). Routledge.
- [13]Jani, S., Miho, L., Çakalli, A., Dervishej, L., 2017, Landraces in Albanian Alps area: perspectives for on farm conservation and production for quality and local markets. *Albanian Journal of Agricultural Sciences*, 139-145.
- [14]Knight, D.M., Stewart, C., 2016, Ethnographies of austerity: temporality, crisis and affect in Southern Europe. *History and Anthropology*, 27(1): 1-18.
- [15]Iorio, M., Corsale, A., 2010, Rural tourism and livelihood strategies in Romania. *Journal of Rural Studies*, 26(2): 152-162.
- [16]Liu, Y.D., 2014, Cultural events and cultural tourism development: Lessons from the European Capitals of Culture. *European Planning Studies*, 22(3): 498-514.
- [17]Obani, P.C., Gupta, J., 2016, The impact of economic recession on climate change: eight trends. *Climate and Development*, 8(3): 211-223.
- [18]Richards, G., Rotariu, I., 2015, Developing the eventful city in Sibiu, Romania. *International Journal of Tourism Cities*, 1(2): 89-102.
- [19]Rotariu, I., Matic, S.M., 2017, Addressing public economic development programs in terms of gastronomic tourism objectives of the Sibiu-European Region of Gastronomy 2019 Program. *Revista Economica*, 69(3): 102-111.
- [20]Sidali, K.L., Spiller, A., Schulze, B. (Eds.), 2011, *Food, agri-culture and tourism: Linking local gastronomy and rural tourism: Interdisciplinary perspectives*. Springer Science & Business Media, pp: 33.
- [21]Stancă-Moise, C.M., 2015, The collection Lepidoptera preserved at the "Lucian Blaga" University Sibiu (Note 2). *Oltenia. Studii și comunicări. Științele Naturii*, 101-114.
- [22]Stanciu, M.C., 2016, Research on the exploitation technology applied in sheep breeding households in Sibiu county. *Scientific Papers Series-Management, Economic Engineering in Agriculture and Rural Development*, 16(1), 87-91.
- [23]Verdery, K., 2002, Seeing like a mayor: or, how local officials obstructed Romanian land restitution. *Ethnography*, 3(1), 5-33.
- [24]Zerva, A., Tsantopoulos, G., Grigoroudis, E., Arabatzis, G., 2018, Perceived citizens' satisfaction with climate change stakeholders using a multicriteria decision analysis approach. *Environmental Science & Policy*, 82, 60-70.