

VALUE-ADDED CHAINS OF THE MOUNTAIN AGRIBUSINESS REGIONS: STATISTICAL EXAMPLE OF THE ROMANIAN CEREALS SECTOR

Brîndușa COVACI^{1#}, Radu BREJEA², Mihai COVACI³

¹Centre for Mountain Economy, Bucharest & Vatra Dornei

²Oradea University, Oradea

³Hyperion University, Bucharest

RESEARCH ARTICLE

Abstract

The added value chain is an important dimension of the current agricultural development, but especially of the mountain one. Understanding the functionality of the added value chain in the context of agribusiness is defining for the world mountain area. In the middle of the 20th century, the links between the refinement of consumer preferences and agriculture intensified, especially against the background of technological development. The technological change intermediated production with consumption, the effects being felt also at the level of the primary sector of the economy - agriculture.

Keywords: value-added chain, mountain agriculture, mountain agribusiness

#Corresponding author: Brîndușa Covaci

INTRODUCTION

The development of agribusiness is carried out taking into account multiple aspects related to the risk of biological processes, the role of buffer stocks, the structures of the markets at the farm gate and those dedicated in public spaces, etc. The complexity of the agribusiness paradigm requires the integrated approach through the prism of the added value chain, competitiveness, performance and smart sustainable development. Like any paradigm of modern society, agribusiness has evolved conceptually in the course of economic-agrarian history.

Consequences of globalization are converging and leading to the development of modern agriculture. The interdependence between the producer and the final consumer, as well as between all the links between the two components, is the main characteristic of the value-added chain. In the framework created by the added value chain, all the operations / links in the supply-production-sale chain must be taken into account. The classical approach centered on production is no longer functional in the modern economy, in this case in its primary sector agriculture. The idea of having a certain product at the consumer's table, depending on the initial demand, by leveraging

the entire supply chain has its origins in the agribusiness paradigm.

MATERIAL AND METHOD

The paper developed qualitative and exploratory research, focusing on theoretical model of mountain agribusiness. The value chain concept is constantly dynamic. Developed at the end of the 60s, the original model being of French-speaking origin (in the classic approach the supply chain was used - "filière"), the added value chain focused on the links between the production and distribution companies of agricultural products, especially on goods within the borders national. In the context of globalization, the value chain concept has become global through worldwide imposition by Anglophones. Within this terminological and conceptual structural change, the analysis focuses on globally fragmented but interconnected production systems. (Baker, 2006; Hernandez et al., 2017)

Constantly dynamic, the added value chain will permanently center on the idea of a certain number of actors carrying out activities in an inter-correlational context. The taxonomy of the added value chain involves the identification of common parameters transposed through a set of indicators. The absence of a theoretical framework functions as a limit for generalizations, which can be made

through different analyzes and comparisons between value chains. It is the reason why the value chain has not yet reached the paradigm level, and the dynamics of theoretical-applicative development will determine whether or not it remains in the concept stage. (Baumann, 2019; Humphrey & Memedovic, 2006)

Currently, the value chain analysis can be done at the product level, "measuring the input-output flows based on the goods functional unit, without taking into account the specificity of the place or the level of spatial development" Mac Clay & Feeny (2018). In dynamic, multidimensional analysis, the measurement of input-output flows within the value-added chain must take into account other dimensions besides the functional unit goods. The multidimensional foundation of the added value chain in the new context implies the praxeological approach to the intelligent, sustainable and inclusive growth of all component links.

In a research by the authors Mac Clay & Feeny (2018), the concept of the added value chain is connected to agribusiness, the latter being a paradigm developed through the prism of the emergence of modern agriculture (technological and organized efficiently and effectively). Both the conceptualization of the value-added chain and of agribusiness have undergone important metamorphoses in the current socio-economic and technological dynamics.

Governance models influence the development of value chains. Value chain models adjacent to governance can be market, relational, modular and hierarchically oriented. In this context, it is necessary to distinguish between supply value chains and demand value chains. The agribusiness value chains subscribe to the general ones. Supply and demand oriented governance and value chains set the new development direction of the agribusiness paradigm. The definitions given to the value added chain are multiple, each taking into account certain relevant aspects.

In a study on value chain management in agribusiness, Keshelashvili (2018) argues for the importance of successful cooperatives in

leading agricultural countries that provide interesting insights for the practical generalization of their experience in emerging agribusiness countries. Numerous international studies on agribusiness represent decisive international experiences for the improvement of agriculture and the effectiveness of cooperative management. The efficiency of cooperatives' activity is based on administrative, group considerations, appropriate legislation, etc. In EU countries, cooperation activities are legally regulated. These are legal entities with special legal status that entail certain exemptions for agricultural associations. Support activities from the state are provided by cooperative development programs. In Japan, there are different legal regulations for agricultural cooperatives and consumer cooperatives. Japanese agricultural cooperatives involve production, marketing and procurement of factors of production, consulting, credit cooperatives and insurance. 90% of Japanese farmers are members of agricultural cooperatives. Italy represents an effective model of agricultural cooperative. In Italy, the social function of rural cooperation is explicitly recognized. The purposes of cooperation are formulated in the Italian Civil Code specifying that the purpose of cooperation is to ensure for its members' better services and working conditions than those of the free market. (Keshelashvili, 2018)

RESULTS AND DISCUSSIONS

Mountain Agribusiness Model

The mountain development structure is supported in performance conditions through personalized intervention on the entire added value chain, but especially on its key links in agribusiness, respectively Supply - Production - Sales. All components of the added value chain are an integral part of mountain agribusiness, the key links being decisive for the minimum proper functionality of the mountain agribusiness system (Figure 1).

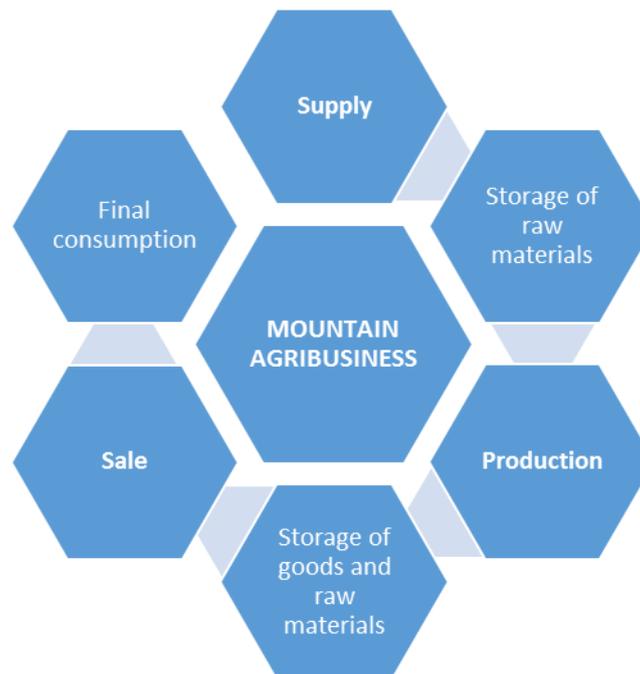


Figure 1 **Proposal for a mountain agribusiness system**

The approach to the added value chain can be achieved in the vision of Mac Clay & Feeny (2018) through a multitude of dimensions.

1. Through the lens of the strategic approach, which assumes the way the value chain works and competes, integrative structuring is pursued. The defining coordinates of this approach are focused on:

2. Through the prism of efficiency - the way in which resources are used throughout the value added chain is taken into account

3. Through the lens of sustainability - involves addressing the sources and beneficiaries of the value derived from activities that are more sustainable from a social and ecological point of view.

4. Through the lens of value assessment - involves the use of different methods and ways to verify if a value-added chain from a qualitative and quantitative complex measure value.

5. Through the lens of development - this approach is based on development of the business sustainability of value-added chains in low-income regions, by strengthening value chain actors and relationships.

6. Through the lens of governance - the authors who apply this line of modelling view on the power relations between the members of a value-added chain.

A main characteristic of agri-food chains is the difference between selling products on the agricultural market and at the farm gate. The primary stages in this approach present

relevant aspects of the competitive system, as long as economic sectors and distribution will develop multiple degrees of market sustainability, which cause different conflicts between market actors. Governance is the very core of the value chain concept and it should clearly focus on the governance mechanism.

From the point of view of the economic sector they belong to, there are important agricultural production or service cooperatives. In production cooperatives, members jointly produce/use goods. The economic activities of production cooperatives are based on the factors of production listed by David Ricardo (1817) - land, labor and capital - which are consolidated together with the factor supporting production: technology.

According to some scientists, the cooperative offers certain advantages compared to small individual farms. However, research from countries with a developed market economy shows that at the macroeconomic level there is no economy of scale at the level of initial agricultural production. The unequal distribution of the factors of production highlights the importance of a less relevant dimension at the time of formulating the Ricardian theory, namely the human dimension of the system of factors of production. And, it is not referring here to human capital - part of the capital production factor - but to the totality of the human dimension of production cooperatives. This is also confirmed by the low share of production cooperatives globally - the cooperative system is no more than 5%. Unlike

production cooperatives, in service cooperatives – the most widespread form of cooperatives worldwide – factors of production and ownership change functionality. (Keshelashvili, 2018)

The research identified the following factors that affect the management of cooperatives: the level of education of farmers, the scope of assets owned by cooperative members, the stability of the legislative environment, the specific nature of activities and business, administrative qualities.

Value-added chain of cereal production in Romania

In agriculture, compared to other sectors of the economy, financial management is strongly determined by factors unique to agricultural production, which are described in the agricultural economics/finance and farm management literature.

The existing values at the level of cereal production in Romania show that the numerical evolution related to the area cultivated/harvested/produced per 1000 ha, for the period 2000-2020, were continuously dynamic. The evolution of production values changed positively for the regions/Macro-regions Center (+7.02%), South-East (+1.41%), Macro-region three (+2.97%), South-Mountain (+5.11 %), Macro-region four (+1.59%) and South-West Oltenia (+9.54%). At the level of Romania, the evolution was negative (-7.06%), as well as at the level of some regions/Macro-regions, thus Macro-region one (-3.05%), North-West (-9.65%), Macro-region two (-4.05%), Northeast (-11.36%), West (-9.18%). The statistical values for Romania, as well as for the regions/Macro-regions with the most important developments, show the positive dynamics of the cereal agricultural subsector. At the level of Romania, respectively Macro-region one and the North-West + Center regions (the values will be presented for these territories and in this order), cereal production is sustainable for a value chain that develops agribusiness in these territories, as follows: production averages for 1000 ha they are 19467.89, 3059.80, 1844.61, 1215.19; mean standard errors 1355.04, 175.27, 110.07, 68.97; medians 19339.14, 2875.87, 1702.71, 1162.54; standard deviations 6355.73, 803.22, 504.43, 316.07; variances 40395310.46, 645168.69, 254450.29, 99904.41; Skewness .316, .503, .447, .861; standard errors for Skewness .491,

.501, .501, .501; Kurtosis -.341, -.548, -.393, .699; standard errors for Kurtosis .953, .972, .972, .972; distances (chains) 23738, 2724, 1847, 1285; minimums 7815, 1892, 1048, 733; maximums 31553, 4616, 2895, 2018; values on the 25th percentile – 14743.84, 2555.39, 1563.33, 992.52; values on the 50th percentile – 19339.14, 2875.87, 1702.71, 1162.54; values on the 75th percentile - 22653.81, 3590.42, 2222.07, 1407.73.

For the predicted values, the types of models related to the analysis were for Romania - Model_1: Holt; Macro-region one - Model_2: Simple; Northwest - Model_3: Simple; Center - Model_4: Brown; Macro-region two - Model_5: Holt; North East - Model_6: Holt; Southeast - Model_7: Holt; Macro-region three - Model_8: Holt; South-Muntenia - Model_9: Holt; Macro-region four - Model_11: Holt; South-West Oltenia - Model_12: Holt; Vest - Model_13: Simple. The fit statistic shows the following mean, standard error, minimum, maximum, 5th percentile, and 10th percentile values (presented in this order): Static R-squared .550, .309, 9.992E-16, .797, 9.992E-16, .044; R-square .289, .103, 9.992E-16, .418, 9.992E-16, .094; RMSE 1229.38, 1240.78, 59.23, 4967.23, 59.23, 137.65; MAP 25.73, 6.15, 18.09, 38.02, 18.09, 18.12; MaxAPE 137.54, 69.45, 38.69, 225.51, 38.69, 40.89; MAE 912.23, 932.82, 43.91, 3762.28, 43.91, 110.184; MaxAE 2621.62, 2690.72, 163.06, 10701.58, 163.06, 274.92; Normalized BIC 13.60, 2.19, 8.30, 17.30, 8.30, 9.47.

The statistics of the prediction numbers show different values for the regions/Macro-regions of Romania, the measurement being made by static R-square, R-square, RMSE and MAPE (presentation in this order), as follows: Romania-Model_1: 0, .787, .418, 4967.23, 23.15; Macro-region one-Model_2: 0, .120, .338, 653.31, 18.17; Northwest-Model_3: 0, .110, .295, 423,534, 19,652; Center-Model_4: 0, .707, .348, 255,302, 18,096; Macro-region two-Model_5: 0, .687, .253, 1846,709, 26,975; Northeast-Model_6: 0, .731, .241, 612,380, 22,580; Southeast-Model_7: 0, .653, .236, 1298,281, 33,420; Macro-region three-Model_8: 0, .797, .347, 1347,878, 28,123; South - Muntenia-Model_9: 0, .797, .370, 1296,328, 28,006; Macro-region four -Model_11: 0, .742, .348, 1541,470, 25,009; South-West Oltenia-Model_12: 0, .792, .272, 935,487, 32,183; West-Model_13: 0, .226, .288, 744,806, 21,144.

The presented analysis confirms the importance of cereals in the general value added chain of Romanian agriculture.

The forecast analysis for the period 2021-2028 shows that the future evolution of grain production will have a positive trend, this

agricultural subsector being one of the most sustainable for Romanian agribusiness (table 1). The forecast values do not differ significantly from the lower limit (LCL) and upper limit (UCL).

Table 1

Forecast analysis for cereal production for the period 2021-2028 (numerical values)

Model		2021	2022	2023	2024	2025	2026	2027	2028
Romania-Model_1	Forecast	.	27386	28050	28715	29379	30044	30709	31373
	UCL	.	37747	38462	39177	39891	40605	41319	42033
	LCL	.	17024	17638	18253	18868	19483	20098	20713
Macro-region one - Model_2	Forecast	4355	4355	4355	4355	4355	4355	4355	4355
	UCL	5718	5937	6130	6304	6463	6611	6750	6882
	LCL	2992	2773	2580	2406	2247	2099	1960	1829
North-West-Model_3	Forecast	2520	2520	2520	2520	2520	2520	2520	2520
	UCL	3404	3546	3671	3783	3886	3982	4072	4158
	LCL	1637	1495	1370	1258	1154	1058	968	883
Centre-Model_4	Forecast	1934	2029	2123	2218	2313	2407	2502	2597
	UCL	2467	2643	2831	3028	3234	3448	3668	3895
	LCL	1401	1414	1416	1408	1391	1367	1336	1298
Macro-region two - Model_5	Forecast	8114	8306	8498	8689	8881	9073	9265	9456
	UCL	11979	12190	12401	12612	12823	13034	13244	13455
	LCL	4249	4421	4594	4767	4939	5112	5285	5458
North-East-Model_6	Forecast	3104	3165	3226	3287	3347	3408	3469	3530
	UCL	4386	4453	4519	4586	4652	4719	4785	4852
	LCL	1823	1878	1932	1987	2042	2097	2152	2207
South-East-Model_7	Forecast	5012	5143	5274	5405	5536	5667	5798	5929
	UCL	7729	7875	8021	8166	8312	8457	8603	8748
	LCL	2295	2411	2527	2644	2760	2877	2993	3110
Macro-region three - Model_8	Forecast	6391	6559	6726	6894	7061	7229	7396	7564
	UCL	9212	9393	9573	9753	9934	10114	10294	10474
	LCL	3570	3725	3879	4034	4189	4344	4498	4653
South - Muntenia-Model_9	Forecast	6249	6418	6586	6754	6922	7090	7258	7426
	UCL	8963	9143	9324	9504	9685	9865	10046	10226
	LCL	3536	3692	3848	4003	4159	4315	4471	4627
Bucharest - Ilfov-Model_10	Forecast	147	147	147	147	147	147	147	147
	UCL	270	270	270	270	270	270	270	270
	LCL	23	23	23	23	23	23	23	23
Macro-region four - Model_11	Forecast	7477	7665	7852	8040	8228	8415	8603	8790
	UCL	10704	10907	11110	11314	11517	11720	11923	12126
	LCL	4251	4423	4594	4766	4938	5111	5283	5455
South-West Oltenia-Model_12	Forecast	3526	3624	3723	3821	3919	4018	4116	4215
	UCL	5484	5582	5681	5779	5877	5976	6074	6173
	LCL	1568	1666	1765	1863	1961	2060	2158	2257

West-Model_13	Forecast	3685	3685	3685	3685	3685	3685	3685	3685
	UCL	5238	5389	5528	5657	5778	5893	6002	6106
	LCL	2131	1980	1841	1712	1591	1477	1368	1264

Source: Authors according to Eurostat (2022)

CONCLUSIONS AND PROPOSALS

In the rural area, but especially the mountain area, the presence of advanced technologies, information, capital could help the people to use innovative and sustainable techniques and effective marketing management. Cooperatives could reduce stress in the value added chain on all three segments of the chain (supply – production – distribution).

Problems viewed on the Romanian value-added chain in mountain agribusiness regions:

- Farmers still use traditional methods in production, without innovations, their profits are very low, especially at the stage of primary production;

- Farmers do not have a long-term vision and are mostly oriented only to annual business plans, without relying on material documents;

- Farmers lack professional knowledge and experience in marketing, which prevents their integration into the value chain;

- The formation of cooperatives would allow farmers to reduce costs at different stages of the value chain and take more advantage of market opportunities, through better involvement in the sales process;

- The establishment of second and third level cooperatives together with those of the first level would further tighten the value chain, reduce costs and improve the benefits of primary producers, thus contributing to the further development of their activities.

In order to improve the management of the value chain in agribusiness, we believe that the implementation of the following measures would be significant:

- Improving the qualification of farmers, through their professional retraining, for their significant integration in the cooperative value chain;

- Support for the formation of cooperatives oriented towards long-term goals and strategies, so that their members are oriented towards the sustainable development of agricultural economies and start the organized management of their activities;

- Long-term strategic planning of state support programs based on specific indicators

taking into account the strategic objectives of the development of agricultural cooperatives;

- Stimulating the availability of credit and insurance systems, offering better opportunities for the introduction of new technologies and the efficient management of agrarian conditions;

- Stimulating the creation of large cooperatives instead of small ones, large cooperatives with extended functionalities;

- In the implementation of relevant regulations for the implementation of EU legislation in the field of food safety, stimulating the unification of farmers is an effective way of cooperation and support for a better visibility of cooperative products.

REFERENCES

- Baker, D., 2006. Agriculture value chains: overview of concepts and value chain approach, presentation prepared for the FAO LDED Regional Workshop for Asia, Bangkok.
- Bammann, H. (2019). Participatory value chain analysis for improved farmer incomes, employment opportunities and food security. *Pacific Economic Bulletin*. 22(3), October 2007 © Asia Pacific Press
- Eurostat. 2022. Animal populations by NUTS 2 regions [agr_r_animal].
- Hernandez, J. E., Kacprzyk, J., Panetto, H., Fernandez, A., Liu, S., Ortiz, A., & De-Angelis, M. (2017, September). Challenges and solutions for enhancing agriculture value chain decision-making. A short review. In *Working Conference on Virtual Enterprises* (pp. 761-774). Springer, Cham.
- Humphrey, J., & Memedovic, O. 2006. Global value chains in the agrifood sector. United Nations [UN] Industrial Development Organization
- Keshelashvili, G. 2018. Value chain management in agribusiness. *International journal of business & management*, International Institute of Social and Economic Sciences, Prague & ZBW – Leibniz-Informationszentrum Wirtschaft
- Mac Clay, P., & Feeny, R. 2018. Analyzing agribusiness value chains: A literature review. *International Food and Agribusiness Management Review*, 22(1030-2019-616), 31-46.
- Ricardo, D. 1817. *The works and correspondence of David Ricardo*, Vol. 1: Principles of political economy and taxation. Online Library of Liberty.
- Sterpu B. 2022, Reports of doctoral research. Oradea University