Camelia GAVRILESCU[1], Ioan-Sebastian BRUMĂ[2], Krisztina-Melinda DOBAY[2], Daniela MATEI[2], Lucian TĂNASĂ[2], Codrin DINU-VASILIU[2]

[1]*Institute of Agricultural Economics, Bucharest*
[2] *"Gh. Zane" Social and Economic Institute, Iaşi Branch of the Romanian Academy*
cami_gavrilescu@yahoo.com

A SUBJECTIVE PERCEPTION OF THE RESILIENCE OF SMALL MIXED FARMS – A CASE STUDY IN NORD-EST REGION OF ROMANIA

ABSTRACT

In this paper, we define the resilience of agricultural systems and farms as their ability to ensure the fulfilment of their essential functions while facing increasingly complex and volatile economic, social, environmental and institutional challenges. Measuring resilience can be done by objective and subjective methods, each with varying degrees of accuracy and comprehension, and combining them can provide a complex insight into the resilience of a system or farm, with the benefit of complementing each other and eliminating many shortcomings and limitations of both categories of methods. The paper presents an assessment of the resilience of the agricultural system of small mixed farms by subjective methods, more precisely by an empirical research using qualitative tools, in this case a survey based on a questionnaire, conducted in 122 farms in the Nord-Est region of Romania. Farmers' opinions on the farm functions in providing private and public goods are being investigated, as well as how farmers perceive the resilience of their farms to the main challenges that today's agriculture is facing.

1. INTRODUCTION

In the latest years, European agriculture has had to face many challenges. These come in various types: economic (such as high product price volatility, changes of power and competition on international markets, changes of market power among actors in value chains, high dependence on financial institutions); environmental (increased frequency of extreme weather events, increasing pressure regarding diminution of synthetic chemicals for agriculture and food industry use), social (demographic changes, changes in consumer preferences, animal welfare issues) and institutional (such as continuous changes in policies and regulations) (Maggio *et al.*, 2014).

These uncertainties and their complex interconnections are likely to affect the viability and sustainability of agri-food production and the sustainable development of rural areas. However, the response of the agricultural systems and of farms in particular greatly vary in relation to the region analysed, the type of agricultural

production, the size and profile of farms. As such, their response can go in two directions: either it tends to reduce or limit the effects of stressing factors, or it tends to increase the system's ability to adapt to changes.

2. STATE OF KNOWLEDGE

Resilience theory provides an integrated framework for investigating the ability of complex social, economic, and ecological systems to cope with changing environments (Holling *et al.*, 2002; Folke *et al.*, 2010; Bullock *et al.*, 2017), and highlights how these changes take place: through various measures of managerial and technological improvement, through reorganization or even reorientation.

There is a number of "objective" indicators for measuring resilience; they represent statistically measurable economic and social variables.

Objective methods of measuring resilience are based on the observation of key socio-economic variables and other types of capital that support people's livelihoods (Bahadur and Pichon, 2017). These approaches use characterizations of resilience that are externally defined (by the evaluator), and the measurement takes place by external observation or is often based on statistical relationships on an aggregate scale (Clare *et al.*, 2017). A weakness of this approach is that it is extremely difficult to identify all relevant features and indicators – from economic factors to socio-cultural and political factors – that influence the resilience of a household or community (Cutter *et al.*, 2008).

The literature shows that the objective indicators used to measure resilience are selected according to the methodological approach used. In its conceptual framework of resilience, FAO identifies several pillars of resilience, such as: access to basic services, assets, social protection systems, adaptability (FAO, 2013, 2016).

More recently, subjective approaches to measuring social systems have been considered and used, given their benefits (Jones and Tanner, 2015; Jones and Tanner, 2017; Lockwood *et al.*, 2015; Maxwell *et al.*, 2015; Béné *et al.*, 2016). These methods can provide an opportunity to address the weaknesses of traditional objective approaches, such as difficulties in selecting indicators, lack of context specificity, and assessing people's knowledge of their own resilience (Jones *et al.*, 2018). Béné *et al.* (2016) show that resilience is significantly influenced by a wide range of subjective psycho-social factors that are not directly measurable by statistical indicators (e.g. risk propensity, openness to novelty and innovation, ability and desire to learn, etc.). The influence of these factors can be assessed through empirical research using qualitative tools, such as questionnaire surveys, which investigate farmers' opinions on subjective factors influencing farm resilience.

Subjective household resilience is defined by the perceived level of the household resilience to specific external shocks and stresses and refers to a person's cognitive and affective assessment of their own ability to anticipate, buffer, and adapt their livelihoods to disruption and change (Jones and Tanner, 2017).

In the present paper, we define the resilience of agricultural and farm systems as their ability to ensure that their essential functions are fulfilled, while facing increasingly complex and volatile economic, social, environmental and institutional challenges; their ability to withstand shock, to adapt and transform as a result of their robustness, adaptability and transformability.

Although subjective methods may provide an alternative and complementary approach to objective resilience assessments, it is important to note that subjective resilience assessments are not an alternative to more objective definitions of resilience indicators, but rather they can provide an indication of causal relationships with a wide range of socio-economic, psychological and institutional factors that contribute to resilience (Jones and Tanner, 2017).

By analysing farm resilience in the framework proposed by Meuwissen *et al.* (2018), one can distinguish three resilience capacities: robustness, adaptability and transformability.

We define *robustness* as the ability of the farm to withstand challenges, stressors, and to absorb shocks, without affecting its normal activity and without significantly diminishing its efficiency and viability.

We define *adaptability* as the ability of the farm to cope with challenges, stressors or shocks by introducing technological and / or managerial changes (in production, marketing mix and / or risk management) so that it can continue business as usual.

We define *transformability* as the ability of the farm to cope with stressors and severe shocks through profound, radical changes in the structure and profile of the activity, in the internal functioning mechanisms and in the relations with external agents and with the market. Practically, without this transformation of the activity, the farm would become economically unviable.

3. MATERIAL AND METHOD

This paper examines respondents' perceptions of the resilience of their own farms. The study was done by analysing the data obtained from a questionnaire-based survey, applied in January 2019 in the Nord-Est region of Romania in small farms with a mixed profile (crops and livestock).

The procedure for selecting counties and communes and establishing the sample consisted of a complex process that took place in 4 stages (Dobay *et al.*, 2018).

Thus, Iași and Suceava counties were selected for the survey, which have the largest population among the counties in the Nord-Est region (Iași 22.5%, Suceava 19.7%) (TEMPO-Online, 2016). Both the geographical position and the climate regime are of high relevance for the distribution and intensity of agricultural and / or entrepreneurial activities in the two selected counties. Another important criterion in this selection was diversity: information can be collected on areas specialized in growing cereals, vegetables, winegrowing and orchards or in animal husbandry in the remote countryside and on areas with more accelerated development and diversified agriculture, with a dynamic entrepreneurship respectively.

The two counties were selected for field research also due to their representative character for the Nord-Est development region of Romania. Thus, Iaşi county is located in the plain and hilly area on the right bank of the Prut River in the east of the Nord-Est development region. The relief, the natural resources, the agricultural profile and its rural socio-economic characteristics make it comparable to Botoşani and Vaslui counties, located north and south of Iaşi county. According to the same considerations, Suceava county is representative for the mountainous, submountainous, hilly and lowland areas on the right side of the Siret river, having a specific agricultural potential similar to Neamţ and Bacău counties.

The communes selected for field research in both counties are representative in terms of agricultural potential for about 75% of the total number of rural territorial administrative units.

The sample established for the research is represented by small, mixed agricultural holdings, which have maximum 5 ha of total agricultural area and a maximum herd size of 5 LSU, consisting of herbivores (cows or sheep and combinations thereof). The 2011 Population and Housing Census and the 2010 General Agricultural Census were used to select respondents.

4. RESULTS AND DISCUSSIONS

4.1. DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS IN THE SAMPLE

The sample consisted of 122 respondents, 62 from Iaşi county and 60 from Suceava county. The sample of farmers was predominantly male (80%), with an even higher share in Iasi county (92%). With very few exceptions, the farms were established in the early 1990s, after the restitution of land by Land Law (Law 18/1991) enforcement. These are family farms, in which the owners' property has been reconstituted or they have taken over the farm (or part of the farm) from their parents, to which they added leased or bought land.

The average age of respondents is 51 years, slightly lower in the case of women heads of farms in Iaşi county (45 years). Half of the respondents are between 46 and 65 years old, and only one fifth of respondents are under 40 years old (which would allow them to access the setting up of young farmers measure from NRDP).

As regards the type of education, 23% of respondents only graduated a primary or lower secondary school and 66% graduated an upper secondary education form – vocational school, high school or post-high school). Only 11% of respondents have a university degree.

4.2. PERCEPTION OF THE IMPORTANCE OF FARM FUNCTIONS – A WAY TO ASSESS FARM RESILIENCE

In the resilience framework analysis proposed by Meuwissen *et al.* (2018), it is shown that the essential functions of the system, of farm respectively, are to provide

private goods and public goods. 4 functions were formulated, defining the provision of private goods and other 4 functions defining the provision of public goods.

Respondents were asked to divide a total of 100 points between 8 defined functions of the farm, in proportion to the importance they attach to each function (the more important the function is perceived, the more points it receives; the sum of the points distributed between the 8 functions should be 100).

In the questionnaire applied, the functions of the farm were formulated as follows:
   - Provision of private goods:
1.   Deliver high quality food products
2.   Deliver bio-based resources (e.g. hemp, wood) to produce biomass and biofuels
3.   Ensure a sufficient farm income
4.   Provide employment and good working conditions for the farm labour force
   - Provision of public goods:
5.   Maintain natural resources (e.g. water, air, soil) in good condition
6.   Protect biodiversity
7.   Ensure the attractiveness of rural areas in terms of agro-tourism and residence
8.   Ensure animal welfare
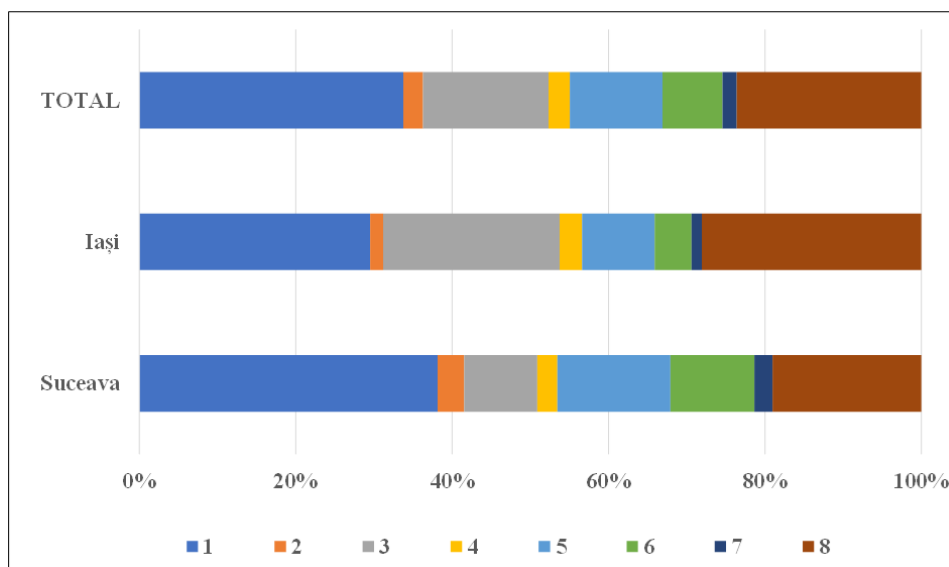
Notes: 1 – provides high quality food products; 2 – provides bioresources (e.g. hemp, wood) for the production of biomass and biofuels; 3 - ensures a sufficient agricultural income; 4 – provides jobs and good working conditions for the farm labour force; 5 – maintains natural resources (e.g. water, air, soil) in good condition; 6 – protects biodiversity; 7 – ensures the attractiveness of the rural space for agro-tourism and housing; 8 – ensures animal welfare.

Source: processing of survey data

Figure 1. Ranking the perceived importance of farm functions as a measure of resilience.

Respondents considered that the most important functions of the farm are: providing high quality food (33.8%), followed by ensuring animal welfare (23.6%). These two functions, which perfectly illustrate the mixed profile of farms in the sample (crops and livestock) add up to more than half of the total score. The main economic function of the farm, namely ensuring sufficient income, ranked only third in the perceived hierarchy of functions (16.1%). One explanation could be the economic and physical size of farms included in the sample (small farms), which rely on the financial contribution of a family member who has an additional income (usually non-agricultural) – pension or salary.

Farmers' awareness of the importance of protecting the environment quality is reflected in the cumulative average score assigned to this function and the function related to biodiversity protection (19.5%). The least relevant function was "ensuring the attractiveness of the rural area for tourism and housing" (1.8%), which is not surprising if one considers the fact that the rural area is perceived as relatively devoid of significant economic opportunities, which leads to internal and external labour migration. The relatively balanced distribution of the share of functions that reflects the provision of private goods (55%), compared to public ones (45%), indicates a good resilience in the short and medium term.

In the sample from Suceava county, the respondents assigned a higher importance to the production function than those from Iași county (38.1% compared to 29.5%), as well as to the two functions that refer to the protection of the environment and biodiversity (25.1% compared to 12.2%), to the detriment of the economic function (9.3% compared to 22.6%).

4.3. PERCEPTION OF FARM RESILIENCE CAPACITIES

We have defined above the three resilience capacities: robustness, adaptability and transformability. They were not included per se as direct questions in the survey, although the concepts were presented to the respondents. An attempt was made to evaluate the three resilience capacities by averaging the answers to each 4 relevant statements. In order not to induce overly positive responses to this assessment, statements were also formulated indicating a negative contribution to that resilience capacity (Table 1). Respondents were presented with 12 statements and asked to rate the relevance of each one on a 7-point Likert-type scale (1 – strongly disagree; .....; 7 – strongly agree). When processing the answers, in the case of statements associated with negative connotations, the respective scores were transformed by inversion (so that an original score 1 became a transformed score 7, an original score 2 became a transformed score 6, and so on). Then, for each respondent, the scores obtained for each form of resilience were averaged.

Table 1

Statements included in the investigation to assess the resilience capacities

Resilience capacity	Statement	Associated connotation
Robustness	Q6a.1. After something challenging has happened, it is easy for my farm to bounce back to its current profitability	positive
	Q6a.2. As a farmer, it is hard to manage my farm in such a way that it recovers quickly from shocks	negative
	Q6a.3. Personally, I find it easy to get back to normal after a set back	positive
	Q6a.4. A big shock will **NOT** heavily affect me, as I have enough options to deal with this shock on my farm	positive
Adaptability	Q6b.1. If needed, my farm can adopt new activities, varieties, or technologies in response to challenging situations	positive
	Q6b.2. As a farmer, I can easily adapt myself to challenging situations	positive
	Q6b.3. In times of change, I am good at adapting myself and facing up to agricultural challenges	positive
	Q6b.4. My farm **IS NOT** flexible and can hardly be adjusted to deal with a changing environment	negative
Transformability	Q6c.1. For me, it is easy to make decisions that result in a transformation	positive
	Q6c.2. I am in trouble if external circumstances would drastically change, as it is hard to re-organise my farm	negative
	Q6c.3. After facing a challenging period on my farm, I still have the ability to radically re-organise my farm	positive
	Q6c.4. If needed, I can easily make major changes that would transform my farm	positive

Source: processing of survey data

Table 2 shows that the respondents perceive that their farms have quite a low degree of robustness (2.98 average of the sample on a scale from 1 to 7), which indicates that they have exceeded the subsistence level (the least influenceable – therefore the most robust to external pressures), and there is a certain dependence on market signals and the environment of the agricultural system (Figure 2).

Table 2

Descriptive statistics of perception of the three resilience capacities

	Number of respondents	Indicators	Robustness	Adaptability	Transformability
			(1=I completely disagree ....7=I totally agree)		
Total	122	Average	2.98	3.52	3.70
		St. dev	1.29	1.51	1.45
Iași	62	Average	2.90	3.65	3.92
		St. dev	1.19	1.58	1.45
Suceava	60	Average	3.07	3.38	3.47
		St. dev	1.38	1.43	1.42

Note: St. dev = standard deviation

Source: processing of survey data

Robustness (Q6a)

no. of respondents
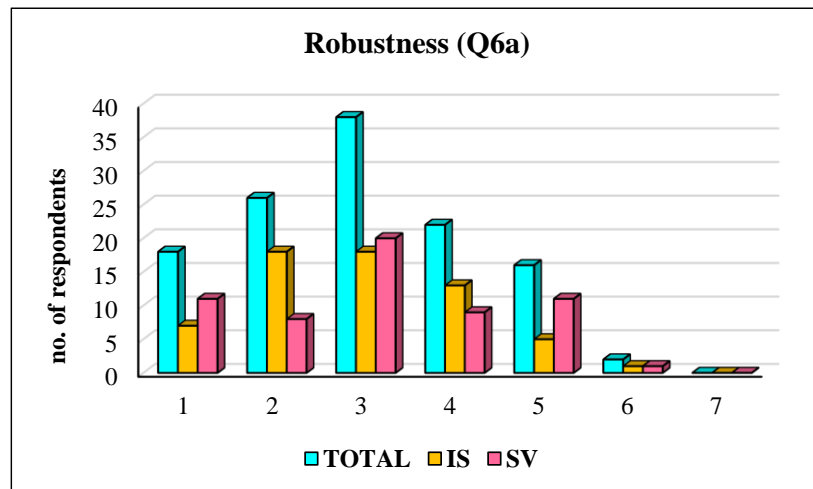
Source: processing of survey data

Figure 2. Farmers' assessment of farm resilience capacities: robustness.

Adaptability (Q6b)
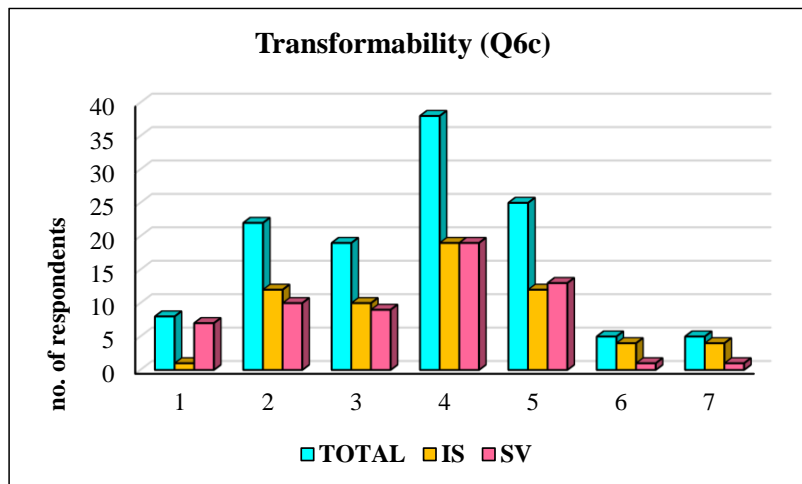
no. of respondents
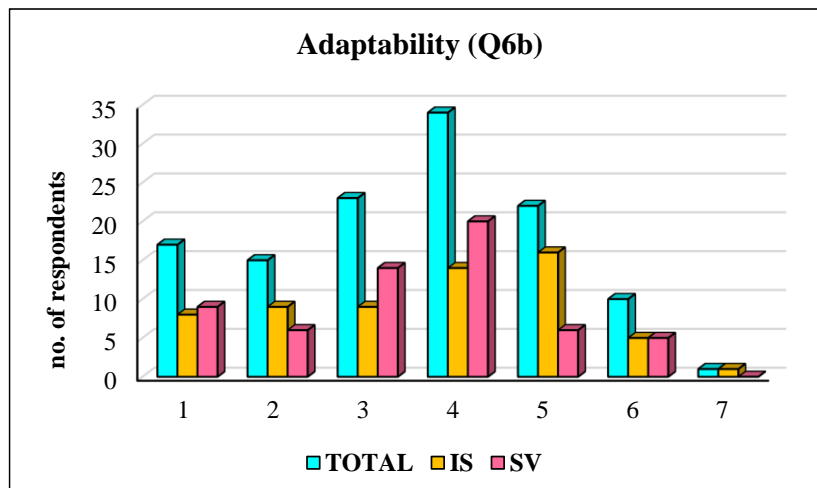
Source: processing of survey data

Figure 3. Farmers' assessment of farm resilience capacities: adaptability.

The sample average for adaptability is higher (3.52), which indicates that farmers are aware that their farm response to current and future challenges must be a good adaptability, through technological and managerial improvements, thus confirming the results of the challenge analysis in Gavrilescu's study (2019). The capacity of farms in Iași county to be more adaptable may be explained by the higher degree of urbanization of the county, which can be translated into a higher and more varied demand for agri-food products, coupled with a higher degree of

professionalism of farm heads (Gavrilescu, 2019). These two elements contribute to this type of farm response to system disturbances (Figure 3).

A similar explanation can be associated with the sample average for transformability (3.70), which is above the median (3.50). In the case of this form of resilience, the sample from Iași county also shows a higher average (3.92). To the factors listed above, we can add the greater willingness to take risks (production and / or investment risks) and the partial or total change of production profile through a greater openness to innovation and novelty (Figure 4).

Transformability (Q6c)

Source: processing of survey data

Figure 4. Farmers' assessment of farm resilience capacities: adaptability.

5. CONCLUSIONS

In conclusion, it can be appreciated that small mixed farms in the Nord-Est region of Romania have a good average resilience, mainly characterized by adaptability and transformability.

Adaptability is typical for the current stage, in which many small farms make development efforts through technological and managerial improvements, by improving productivity and economic efficiency, by increasing the degree of integration in agri-food value chains, attempting to evolve into medium-sized family farms with a commercial vocation.

Transformability is also present in the current stage, in which small farms strive to diversify production activities, by adopting new crops, breeds and animal species, by shifting to organic farming, and by various forms of vertical integration, mainly by primary on-farm processing, in order to be able to enter the market with value-added products, which are sold through new sales channels.

The development of farms through land acquisition / lease, investments in animals with higher genetics and in their own storage and processing facilities, by accessing the support measures under Pillar II of the CAP, contributes to these evolutionary trends.

It is very important to know the perceptions and attitudes of farmers, because they can have a major impact on the decision-making process, with long-term personal and economic consequences.

6. ACKNOWLEDGEMENTS

REFERENCES

1.   Bahadur A., Pichon F., (2017), *Analysis of resilience measurement frameworks and approaches*, Overseas Development Institute, London, UK. Available at: http://www.preventionweb.net/publications/view/52589

2.   Béné, C., Frankenberger T., Langworthy M., Mueller M., Martin S., (2016), *The influence of subjective and psycho-social factors on people's resilience: conceptual framework and empirical evidence*, Report prepared by the Technical Consortium, a project of the CGIAR. Technical Report Series No. 2: Strengthening the Evidence Base for Resilience in the Horn of Africa. International Livestock Research Institute (ILRI) and TANGO International publication, Nairobi, Kenya.

3.   Bullock. J.M.; Dhanjal-Adams, K.L.; Milne, A.; Oliver. T. H.; Todman, L.C.; Whitmore, A.P.; Pywell, R.F., (2017), *Resilience and food security: rethinking an ecological concept*, Journal of Ecology, 105(4). 880-884.

4.   Clare A., Graber R., Jones L., Conway D., (2017), Subjective measures of climate resilience: What is the added value for policy and programming? Global Environmental Change 46:17–22.

5.   Cutter S. L., Barnes L., Berry M., Burton C., Evans E., Tate E., Webb J., (2008), *A place-based model for understanding community resilience to natural disasters,* Global Environmental Change 18(4):598–606. Available at: http://dx.doi.org/10.1016/j.gloenvcha.2008.07.013

6.   Dobay, K.M.; Brumă, I.S.; Matei, D.; Tănasă, L.; Bohatereț, V.M; Dinu-Vasiliu, C., (2018), *Metodologia de aplicare a chestionarelor din ancheta privitoare la percepția fermierilor asupra riscurilor și rezilienței fermelor,* Iasi.

7.   FAO (2013), *SAFA guidelines*, Sustainability Assessment of Food and Agriculture systems, version 3.0; http://www.fao.org/fileadmin/templates/nr/sustainability pathways/docs/SAFA Guidelines Final 12.2013.pdf

8.   Folke, C.; Carpenter, S.R.; Walker. B; Scheffer, M.; Chapin, T.; Rockström, J. (2010), *Resilience thinking: integrating resilience, adaptability and transformability*, Ecology and Society, 15(4), 20.

9.   FAO (2016), *RIMA 2: resilience index measurement and analysis – II. FAO*, Rome, Italy. Available at: http://www.fao.org/3/a-i5665e.pdf

10.   Gavrilescu, Camelia, (2019), *O analiză a riscurilor economice și de mediu în exploatațiile agricole mici din regiunea de Nord-Est a României,* IEA, Bucuresti.

11. Holling, C.S.; Gunderson, L.H.; Peterson, G.D., (2002), In: Gunderson L.H. & Holling CS. (eds.): *Panarchy: understanding transformations in human and natural systems,* Island Press, 63–102.

12. Jones L., Tanner, T., (2015), *Measuring 'subjective resilience': using peoples' perceptions to quantify household resilience,* Overseas Development Institute, London, UK. Available at: http://dx.doi.org/10.2139/ssrn.2643420

13. Jones, L., Tanner, T., (2017), *Subjective resilience: using perceptions to quantify household resilience to climate extremes and disasters*, Regional Environmental Change, pp.1–15. Available at: http://dx.doi.org/10.1007/s10113-016-0995-2.

14. Jones L., Samman E., Vinck P., (2018), *Subjective measures of household resilience to climate variability and change: insights from a nationally representative survey of Tanzania,* Ecology and Society 23(1):9. Available at: https://doi.org/10.5751/ES-09840-230109

15. Lockwood M., Raymond C. M., Oczkowski E., Morrison M., (2015), *Measuring the dimensions of adaptive capacity: a psychometric approach,* Ecology and Society 20(1):37. Available at: http://dx.doi.org/10.5751/ES-07203-200137

16. Maggio, A.; Van Criekinge. T.; Malingreau, J.P., (2014), *Global food security 2030. Assessing trends with a view to guiding future EUpolicies,* EU Joint Reseach Centre - Foresight and Behavioural Insights Unit.

17. Maxwell D., Constas M., Frankenberger T., Klaus D., Mock M., (2015), *Qualitative data and subjective indicators for resilience measurement*, Resilience Measurement Technical Working Group. Technical Series No. 4. Food Security Information Network, Rome, Italy. Available at: http://www.fsincop.net/fileadmin/user_upload/fsin/docs/resources/1_FSIN_TechnicalSeries_4.pdf

18. Meuwissen, M.; Paas; W.; Slijper, T.; Coopmans, I.; Ciechomska, A.; Lievens, E.; Deckers, J.; Vroege, W.; Matthijs, E.; Kopainsky, B.; Herrera, H.; Nitzko, S.; Finger, R.; De Mey, Y.; Poortvliet, P.M.; Nicholas-Davies, P.; Midmore, P.; Vigani, M.; Maye, D.; Urquhart, J.; Balmann, A.; Appel, F.; Termeer, K.; Feindt, P.; Candel, J.; Tichit, M.; Accatino, F.; Severini, S.; Senni, S.; Wauters, E.; Bardaji, I.; Soriano, B.; Zawalinska, K.; Lagerkvist, C.J.; Manevska-Tasevska, G.; Hansson, H.; Peneva, M.; Gavrilescu, C.; Reidsma, P., (2018), *Report on resilience framework for EU agriculture*. https://surefarmproiect.eu/wordpress/wp-content/uploads/2018/02/SURE-Farm Deliverable-Dl.l-Resilience-Framework.pdf

19. National Institute of Statistics – TEMPO-Online.

20. National Institute of Statistics (2012) – General Agricultural Census of 2010.

21. National Institute of Statistics (2014) – Population and Housing Census of 2011.

22. National Institute of Statistics (2018) – Farm Structure Survey of 2016.