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WIESŁAW MUSIAŁ[*], KAMILA MUSIAŁ[**]

[*]University of Agriculture in Krakow, Poland
[**]National Research Institute of Animal Production, Poland

STRUCTURAL CHANGES IN AGRICULTURE VERSUS ADAPTATION PROCESSES IN THE WORLD OF ANIMALS – SEARCHING FOR ANALOGIES

Key words: agriculture, farms, method of analogy, parallels, nature and economy

ABSTRACT. The study deals with problem of using analogies in order to search for the adequacy of structural transformations in farms, and changes in animate nature. There has been presented the essence of the analogy method, usually defined as the similarity or correspondence of objects, phenomena, processes and states. That points out its universalism and interdisciplinary in the field of cognition, including natural and economic processes. The instrument of analogy can be helpful in searching for the truth and regularity in the world around us, as well as may be some source of inspiration for research, by providing invigorating thoughts, and creative effects. The possibility of such application of analogy is also explained by the statement that, in a sense, economics may also have had its origins in biology, as the science dealing with animate world, which components represented by different species, use various life strategies that favour survival in the constantly changing outside world. It is similar in economic reality, which agriculture and individual farms are crucial elements. Thus, it was assumed that it is possible to distinguish certain parallels in spheres seemingly as distant as the economics of agriculture, and the world of animals. The examples refer to such designates as: coexistence – evolutionarily stable strategy, cooperation – reciprocal altruism, and hostile takeover – aggressive mimicry.

INTRODUCTION

When attempting to engage in research in the field of economics, we usually realise it is a fairly young field of study. It evolved in the 17th century, mainly from a critical observation and evaluation of economy and production (especially in farming estates), managing the freshly established industry, households, and with time also individual states. At the moment, economics is a vast and complex field of social science, encompassing

a number of various disciplines. Since the observations are focused on a number of subjects and the range of scientific interest is rather broad and may include inanimate matter, factors, processes and transformations, but also a man, who create all of the above. The last one is at the same time another focus of study, and the economy has grown to be an interdisciplinary science. You could also assume it partially originates from biology. The latter focuses on the animate world, including various animal species with their diverse survival strategies in the ever-changing outside world [Dawkins 1989]. That's why when you look at living organisms, often classified as diverse and distinct groups, distant from the evolutionary perspective, you will find numerous examples, references or even behavioural patterns, which may bear a resemblance to human attitudes. In this paper, the field of reference is economics, this time represented by agriculture, where you can also observe a certain kind of survival strategy. Some similar strategies or behaviours from the two, ostensibly distant realities, may broaden our cognitive spectrum of conditions, dependencies and relations functioning in nature and economics, managed by one of the elements of nature known as *Homo sapiens* [W. Musiał, K. Musiał 2021].

To explore this perception of the issue, we can draw on a commonly known method, whose potential may not be sufficiently used in economic sciences, namely analogy [Biela 1989]. Exploring the world through analogy, which involves a search for certain parallel elements or similarities to specific phenomena, processes and notions, has been naturally used by human communities for centuries. The method may be treated as a source of inspiration, but also as a tool for verifying the evaluation of economic transformations, including structural transformations in agriculture, especially when seen from the microeconomic perspective. These transformations refer to a variety of production factors, namely: farm size, assets –especially tangible property, but also human resources, which determine the nature, direction and pace of restructuring processes, be it growth, stagnation or collapse, as well as choosing the option of giving up efforts or divestment.

The purpose of this paper is to search for common areas of reference and fields of analysis for economic and natural sciences and to explore the use of analogy. In this case, analogy was used as a method for finding and describing similarities, both simple and unambiguous ones, and those hidden, less intuitive, and referring to strategies adopted by various animal species and to structural transformations observed in agriculture. The paper is an overview, so out of the broad spectrum of possible analyses and comparisons only three examples were selected and referred to the ongoing transformations in agriculture. This is but a small selection of examples from the field of animal ecology and behavioural economics, used as an inspiration for new areas of study, asking new questions and adopting a new perspective of economic and agricultural analysis.

EXPLORING THE WORLD THROUGH ANALOGY

Exploring nature, but also human societies that are part of it, together with the indications and outcomes of economic activity and social relations, is a complex issue. However, if you look at a multitude of ways of exploring the world, analogy has a special, though often underrated role. Analogy is often defined as similarity or correspondence between certain objects, phenomena, processes and conditions. It can be used subjectively or objectively. It is commonly understood as making claims and formulating findings and judgements related to the properties of a specific object or subject with known features, concerning other analogical observed subjects. In the scientific sense, analogy also refers to a similarity of relationships between specific pairs of elements, things or conditions [Biela 1989]. One of the classifications includes a distinction of three types of analogy: analogy of inequality, analogy of attribution and analogy of proportionality. It is also a specific case of relations that prove the existence of a similarity between elements of the comparable and the comparing [Biegański 1913]. When examined from the philosophical perspective, where a parallel is a synonym of analogy, the focus is on the attributes that describe both the similarities and differences between two distinct entities [Wolak 2002].

Analogy as a method of exploring the world has long played an important role in coming up with inventions or new ideas, but also in formulating theses which encouraged and inspired advancement. The thing that makes analogy so useful is its universal nature – it can also be used to explore the mechanisms of human reasoning. It can be helpful when you need to formulate hypotheses in natural sciences, even if they could not be verified at the moment of publication. In this case, such hypotheses could be used as a source of inspiration for further observations or exploration. When debating the usefulness of analogy as a research method in economic sciences, Witold Kwaśnicki [2001] points to several areas of scientific cognition, where analogy could be used in the search for truth and pattern. He claims that a very important and inspiring source of analogy is the science of biology - for example, you can draw a parallel between the evolution of businesses and individual life cycle or the concept of natural selection. In his philosophical and economic deliberations, John Maynard Keynes [1956] also made a number of references to a product of analogy, i.e. the "animal spirit" metaphor, used to describe how businesspeople chase maximised profits in the reality of liberal economics and to illustrate the actions of various stakeholders and financial speculators on the market. Analogy has long been used in economic sciences, and more precisely, in a number of areas related to the analysis of phenomena, processes and transformations. When analysing the directions of economic growth, including global agriculture, Franciszek Tomczak [2006] used this method to describe the progress of structural changes. The study referred to the expected evolution of Polish agriculture, including a variety of aspects of the transformation, considering e.g. workforce, and changes in the condition and organisation of agricultural producers.

Analogies of the transformation were used to define a hypothetical direction expected in the progress of the Polish agricultural production and agricultural business. While explaining his vision of global development, Piotr Sztompka [2010] noted the theory of modernisation and pointed to the trajectories observed in the progress of the world. According to Witold Kwaśnicki [1996], there are many fields of economic studies, where analogies to biology, and more specifically, to evolutionism or ecology, could produce fresh insight and creative outcomes. This refers to the attempts at understanding and analysing economic processes and innovative changes, by comparing them to changes observed in animate nature. You will notice visible similarities to the studies in the ecology of organisms, where you assess the impact of the natural environment and its changes e.g. on the local flora and fauna. In economics, you observe and consider the impact of the business environment, which is naturally evolving through the ever-changing economic, legal and technological systems. As a result of such processes, various business entities are transformed. An important, large and universal field of evolutionary economics is the issue of competitive strategy, constant competitive strife, and winning and losing, which determines the collapse or survival, progress and expansion. This description could be transferred in its entirety from natural to economic sciences, once you swap 'economics' for "biology". The analogies are therefore numerous, and quite diverse.

The authors of this paper look for analogies related to economic and natural phenomena, processes and strategies. The paper includes a comparative analysis of selected strategies observed in nature and juxtaposed with structural transformations in agriculture and farmsteads. These considerations are designed to help us find cognitive symmetry and trace similarities between the strategies used in nature and those employed in economics in order to adjust to the existing external settings. To this end, the author has analysed and compared selected parameters significant both in economics and in the ecology of organisms, namely:

– coexistence – an evolutionarily stable strategy;
– cooperation – reciprocal altruism;
– hostile takeover – aggressive mimicry.

Such a comparison, made through analogy, involved the extrapolation of selected natural mechanisms to economic sciences.

EXAMPLES OF ANALOGOUS STRATEGIES

The process of structural transformations in agriculture is subject to a multifaceted examination is economic and agricultural analyses. Necessary changes and adaptations, which guarantee the secure coexistence of agriculture, but also necessary agrarian or structural reforms, may be facilitated, but also hindered by economic and political stimuli

or factors, as well as cyclical phenomena – the last situation being exemplified by crises. The above factors usually trigger changes in the law. Most of such transformations are currently caused by technological advancement, and innovations. When we refer this issue to the field of microeconomics, then we can analyse them as qualitative and quantitative, as regards the use of resources. These changes are supposed to streamline the organisation of farmsteads in variable circumstances, especially considering the economic, but also social and political reality. In the West, such changes usually involve the optimisation of production technologies and quick adaptation to external circumstances, but also the concentration of land and funds. They also entail readiness to specialise and compete. The analysis is additionally made difficult by natural factors, and by considerable variability and diversity of production pursued in the whole community of farmsteads. A strategy of an individual farmstead or a finite community of such units may be treated as analogous to a strategy pursued by a specific animal species. Such similarities are justified in that animals, either solitary or living in a group, have to adjust to the ever-changing environment. In nature, it is important to be able to adjust in a way that ensures secure access to food, water, living space and breeding. By analogy, this may be compared to economic entities, whereas we need to remember that the elements necessary for their proper functioning will change accordingly.

When performing a synthetic analysis of the farmstead size and related structural transformations concerning the production scale, such issue may be confronted – by analogy – with the animal world. The mutual coexistence of small (and potentially weaker) entities and large (stronger) ones may be explained by the concept of the evolutionarily stable strategy, known from the animal world [Krzanowska et al. 1997]. In the 1960s, John Maynard Smith was the first one to propose the explanation of animal behaviour using the theory of games, where one party (animal) is the attacker, while the other one is the defender. That theory was to discuss and clarify the evolution of behaviour patterns used in animal conflicts. There was proposed a model of the evolution of conflict behaviour in which selection acts entirely at the individual level, but in which the success of any particular strategy depends on what strategies are adopted by other members of the population [Smith 1974].

This theory also enables us to search for analogy and to explore the question of why large and strong farmsteads function alongside medium-sized and small, weak ones, and all that happens in the situation of mutual competition. One may be tempted to ask which of these farmsteads have a greater chance of survival or growth (i.e. the chance to win). According to the theory of games, the weaker party yields when faced with the attacker and even though it doesn't win, it doesn't lose much, either, because it does not even start a fight and does not have to expose itself. A single attacker may eliminate defenders provided it is in its best interest. When most animals versus business entities with different economic strengths are described as defenders, e.g. when competing for land, an attacker

(a larger, stronger, more expansive and aggressive stakeholder), who can eliminate competitors by resorting to various methods, is more likely to be successful. When two defenders meet (e.g. average farmers who want to buy land), the subsequent conflict is usually solved accidentally, but without significant losses suffered by either party, because no fierce competition ever starts. On the other hand, when considerable competition is observed among numerous aggressive individuals, who keep destroying one another, there is often space for growth which can be used by individuals that do not have to engage in the fight and risk a loss but lie in wait for a convenient opportunity. There is no single best strategy for a specific species, then. The outcome of such competition also depends on the strategies adopted by other stakeholders – members of the specific population or community. When you're weak, but live among attackers, it's better to yield, but when you're surrounded by defenders, you will gain more by being the attacker [Krzanowska et al. 1997]. In economics it's also difficult to find a clear-cut answer to whether it's better to be a large or small business, to thrive. Generally speaking, large farmsteads enjoy a number of privileges related to general technological and economic features. Such farmsteads find it easier and cheaper to intensify, optimise and commercialise their products. That's why they might be more effective when coexisting with other farmsteads, thus affecting their development and operation. However, numerous economic doubts arise as to whether a business is really easier for large stakeholders, especially if they are highly specialised. We could also name several threats and external expenses related to large-scale production, especially if it's specialist, as well as the economic and production-related risk of choosing a narrow specialisation. Stakeholders who opt for less specialised production, as well as smaller, dispersed and diversified agricultural businesses struggle with these disadvantages to a lesser extent. They might find it easier to survive a variety of crop failures, which are a great risk for highly specialised farmsteads and withstand market anomalies because of their versatility and better adaptation [W. Musiał, K. Musiał 2021].

A good example of cooperation in biology is reciprocal altruism. According to Rafał Sikora [2006], the main difference between human and animal altruism is how each of these concepts is studied and measured. Research in biological altruism related to altruism among animals is focused on the outcome of the studied behaviour, while studying human altruism is rather based on exploring the motivation behind such attitudes. Assuming that ecology is a set of various strategies and their proportions in a given population, the life processes of various organisms take place within a space defined by a specific, usually broad set of life strategies [Kozłowski 1996, Bendor, Świstak 1998]. It is important that the outcome of specific behaviour, as evaluated from the ecological perspective, will prove that the losses suffered by an altruist are still lower than the profits made by their neighbours, who benefit from the acts of altruism. In economics, you could observe a similar relationship in a collaboration of two or more businesses. An individual may partially or temporarily reduce their chance of survival for the benefit of their partner,

and obtain something in exchange, even if the reciprocal service is deferred. An example of this strategy in nature is e.g. sharing food by vampire bats. They feed on the blood of other warm-blooded animals, and a bat that was successful in finding a prey one night, may accumulate a portion of food that is simply too much for it [Cichocki et al. 2015]. However, it may share the food with another bat, which happens to be starving that night, and save its life. This type of altruism, as Robert Trivers [1985] proved, may be determined by natural selection, if the animals know one another. It is a kind of soft-core altruism, not determined by a genetic programme. It is based on the assumption that an altruist can count on a reciprocal favour [Sikora 2006]. It is therefore a prolonged exchange of resources between individuals [Wilson 2000]. The analogy to the soft-core altruism in agricultural economics may be the exchange of land between weak, recessive farmsteads and expansive ones. Such a strategy may be seen as altruism when the land price is satisfactory or even higher than expected by the seller. Sometimes it is the case that family or relatives help one another in this way, which might be seen as the analogy to reciprocal altruism. This category of analogy may also include the case of successful collaboration between farmers in a producer or marketing group, as well as the collaboration of farmsteads and consumers within the framework of the sharing economy.

Another strategy, this time related to conflict attitudes, is aggressive mimicry. It is widely represented, and observed in various groups of organisms [Zajdel et al. 2015, W. Musiał, K. Musiał 2021]. For example, such an attitude is adopted by certain parasitic bee species, also seen in Poland. They use the so-called hostile takeover with regard to other bee species, especially targeting solitary bees. Parasitic bees don't make nests for themselves, but they might stealthily lay eggs in the nests of solitary bees. To this end, an egg is hidden, so that it remains unnoticed by the rightful owner of the nest. After the changeling hatches, it kills other young bees with its strong mandibles and takes over the entire nest. In this case, the strategy involves fraud – a technique observed among animals and humans alike. Fraud means an individual consciously misleads another party – be it among animals or parties to economic transactions – to benefit from the situation and achieve one's own egoistic purposes. As a result of such actions, the other party usually suffers a loss [Lobanova 2014]. According to the dominant view expressed in the economic literature, a "hostile takeover" – especially with regard to companies, but the same can be said of farmsteads – is defined as obtaining control against the wishes or without the consent of the target company's management [Wróbel 2004, Sawicz 2011]. In economics, a variety of legal tricks are employed to this end, as well as actions that range way beyond what is culturally acceptable. An example could be granting social loans on favourable terms, even exceeding the necessary amount, but with the assumption that the borrower will not be able to repay the loan, so the lender will be able to legally seize their property, e.g. land. Such strategies are also observed when it comes to business loans. In the poultry sector, it was sometimes expected that a smaller or poorly managed poultry farm would quickly

go bankrupt and then it will sell all its equipment or the whole business to competitors at a low price. A sophisticated, if extreme, an example of aggressive mimicry could also be entering into a fake marriage to become a co-owner of a farmstead, while planning a divorce in the future in order to take over part of or the entire business.

CONCLUSIONS

Searching for analogy in economic studies, to compare certain phenomena to those observed in nature, especially in the animal world, is not a new approach. This method still seems quite fresh, because it expands the description of economic phenomena and presents them in a new, interdisciplinary dimension. Considering the transformations observed in agricultural structures and individual farmsteads, and analogous processes in the world of diverse living organisms, analogies can be made concerning various elements. These elements may include i.a. the life cycle (of an individual or company), the concept of natural selection, exploring the cost of coexistence of businesses and animals participating in various strategies, explained through the theory of games. Such analogies may become an inspiration for changes observed on all levels. In animal behaviour, we can notice certain regularities, which are also pertinent to the operation of farmsteads, including the concept of a hostile takeover, but also cooperation and altruism. The analogy method may therefore be useful in minor analyses of comparing similarities, attribution and proportionality, as well as in the search for inspiration and fields of reference in behavioural economics, including agricultural economics.

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PRZEMIANY STRUKTURALNE W ROLNICTWIE VERSUS PROCESY DOSTOSOWAWCZE W ŚWIECIE ZWIERZĄT – POSZUKIWANIE ANALOGII

Key words: rolnictwo, gospodarstwa rolne, metoda analogii, paralele, przyroda i ekonomia

ABSTRAKT

W opracowaniu podjęto problem zastosowania metody analogii do poszukiwania adekwatności przeobrażeń strukturalnych w gospodarstwach rolnych i przemian w przyrodzie ożywionej. Przedstawiono istotę tej metody, określanej zwykle jako podobieństwo lub odpowiedniość przedmiotów, zjawisk, procesów i stanów. Wskazuje to na jej uniwersalizm i interdyscyplinarność w zakresie poznania, w tym procesów przyrodniczych i gospodarczych. Instrument analogii może być pomocny przy poszukiwaniu prawdy i prawidłowości o otaczającym nas świecie, a także być źródłem inspiracji do badań oraz dostarczać ożywczych myśli i twórczych efektów. Możliwość takiego zastosowania analogii jest tłumaczona także twierdzeniem, że w pewnym sensie ekonomia może mieć swoją genezę również w biologii, jako nauce której przedmiotem badań jest świat ożywiony, którego części składowe, a zatem różne gatunki stosują rozmaite strategie życiowe, sprzyjające przetrwaniu w stale zmieniającym się świecie zewnętrznym. Podobnie jest w rzeczywistości gospodarczej, w której rolnictwo i poszczególne gospodarstwa rolne są ważnymi elementami. Dlatego też założono, że możliwe jest wyróżnienie pewnych paralel w sferach pozornie tak odległych od siebie, jak ekonomika rolnictwa i świat zwierząt. Przykłady odniesiono do następujących desygnat: koegzystencja – strategia ewolucyjnie stabilna, współpraca – altruizm odwzajemniony oraz wrogie przejęcie – mimikra agresywna.

AUTHORS

WIESŁAW MUSIAŁ PROF. DR HAB.
ORCID: 0000-0002-8213-4859
University of Agriculture in Krakow
Department of Food Economy and Economics
21 Mickiewicza Av., 31-120 Krakow, Poland
e-mail: wieslaw.musial@urk.edu.pl

KAMILA MUSIAŁ, PHD
ORCID: 0000-0002-6713-341X
National Research Institute of Animal Production
Department of Production Systems and Environment
1 Krakowska St., 32-083 Balice, Poland
e-mail: kamila.musial@iz.edu.pl

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