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**SUSTAINABLE DEVELOPMENT AND THE FARM
ACCOUNTANCY DATA NETWORK (FADN)***

Summary: This article aims to present the state of research on sustainable development of agriculture on the basis of studies of relevant literature. The first stage of the study involved the analysis of the idea of sustainable agriculture and its impact on agricultural policy. The next step was to analyze instruments supporting sustainable development of farms and to undertake an assessment and measure agricultural holdings as regards their degree of sustainability. Commercial records should constitute the source for this data. Accounting in the case of farming provides wealth of information useful for assessing the impact of farms on the environment because agricultural production processes involve various elements of the environment.

Key words: sustainable development, farm, agricultural holding, cost accounting, accounting.

1. Introduction

In the 90's, the world, especially Western European countries, experienced significant changes in agricultural policy. Further development of intensive agriculture was recognized as undesirable and dangerous to the environment. Therefore, measures were taken to promote the idea of lasting and sustainable development. According to this concept, the impact of agriculture on the environment became of particular interest. Environmental limitations to farm development could result in reduced income of farmers. Agricultural policy instruments (included in the Rural Development Programme or agri-environmental programmes) are designed to compensate for the reduction in the income of a farmer and stimulate the development of environmentally friendly agriculture. A need to assess the ecological and economic effectiveness of farms and pro-environmental activities carried out on them arose in relation to new goals for the agricultural policy. Several domestic and foreign studies, with varying degrees of detail, were conducted on the various methods and indicators used to perform an economic and ecological assessment of farms. A full and comprehensive economic and ecological assessment requires a significant amount of detailed

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information. In scientific studies it is usually obtained through surveys and interviews conducted among farmers, which is costly and unacceptable for more widespread use. In this paper, literature on sustainable development of farms is reviewed and the role agricultural accounting can play in the measurement and assessment of sustainability is shown. The FADN system was subject to a detailed analysis.

In this work, analysis and synthesis were the primary methods of research at the literature stage, while at the stage of preparing conclusions deduction was used as a research method.

2. The concept of sustainable development in agriculture

Sustainable agriculture is a system of farming based on sustainable crop and animal production within the agricultural holding. The system centres around setting proper priorities and the use of natural processes, which occur on a farm. The principle of preservation of organic links between areas, types and operations is respected. This ensures balance of plant and animal production on the farm simultaneously protecting the natural environment.

The purpose of sustainable agriculture is to produce food of high nutritive quality, while ensuring a fair income to a farmer and maintaining rural areas in their natural state for future generations. Mechanical methods to combat weeds are employed to a greater extent. It is extremely important to maintain the biological activity of the soil and its fertility. This relies upon the use of proper crop rotations, ensuring maximum vegetation cover of the soil in relation to time and the use of deep soil loosening and shallow plowing.

Research and studies on the relationship between a farm and the environment have been particularly intensive in the last decade. The first pieces of research, which involved an analysis of the idea of sustainable agriculture and its impact on agricultural policy, were presented, among others, by Runowski [2000], Okularczyk [2000], Ahres et al. [2000], Ziętara [2000] and Nowak [2004].

Another direction for research was the analysis of instruments to support sustainable development and the assessment of farms in terms of their degree of sustainability [Baudox 2001; Niewęłowska 2002; Popławski 2002; Prus 2002; Baum 2004].

So far, many studies have also been carried out to assess the impact of farms on the environment. These studies were based on checking the balance of nitrogen, carbon and other minerals [Kopiński 1999; Piekut, Machnacki 2002]. A detailed study was also performed regarding greenhouse gases from farms [Nalborczyk et al. 1996; Sapek 1994; Machnacki 1999].

Many researchers have dealt with the problem of economic efficiency of pro-environmental activities in agricultural holdings [Machnacki 1998; Machnacki 2002; Wierzbiński 1999; Piontek 1999; Brink 2003; Bargłowska 2003]. The studies also centred on the economic indicators regarding the degree of sustainability of farms [Wielicki et al. 2001].

Methodologies for comprehensive economic and ecological impact assessments of businesses or production processes have been demonstrated for the use of businesses [Ejdys 2001; Gollinger-Tarajko 1998]. The environment is a complex entity, therefore the impact of businesses and farms on the environment is multi-directional. Methods aimed at developing synthetic indicators of the level of sustainability of enterprises are based on the criterion of validity and the weight attributed to partial indices. These attempts to determine one single indicator to the economic and environmental assessments are hardly comparable. What is lacking is an integrated method for the assessment of farms.

3. Accounting for sustainable development

In theory and practice of accounting for companies, the need for development of ecological (environmental) accounting is increasingly stressed. Its task is to produce information on the impact of a business on the environment and the economic effects of pro-environmental actions. Accounting in the case of farming provides wealth of information useful for assessing the impact of farms on the environment, because agricultural production processes involve various elements of the environment.

Many accounting theorists propose the use of corporate accounting to analyze pro-environmental actions within economic operators [Stępień 1998; Stępień 2003; Kuśmierski 2000; Nadolna 2002]. According to Borys [2001], environmental accounting encompasses three business segments: the creation of environmental information, ecological controlling and environmental audit. Information about the environment can be recognized and made available through the diversification and supplementing of corporate accounting in order to internalize external costs, to identify assets, liabilities, environmental costs, to account for environmental costs, to prepare ecological balance sheets and to identify environmental indicators. According to Stępień [2003], a properly maintained record of events relating to the environmental impact of a company allows the following to be calculated: the environmental costs of its functioning, the costs of environmental losses and benefits, environmental liabilities.

There are no studies on the role of accounting on the economic and ecological evaluation of farms. Accounting for agricultural holdings has several features which facilitate its use in environmental assessments, such as singular character, the recognition of economic events in primary units or quantity and value [Kondraszuk 2003; Goraj et al. 2004; Wasilewski 2004]. Some authors stress the need to adapt agricultural accounting to new tasks arising from environmental protection [Kondraszuk 2003].

For the evaluation of the impact of various specializations and types of farms, it is necessary to use separate indicators and valuation methods for activities in order to reduce adverse impacts [Machnacki 2003; Andersen 2007; Majewski 2009]. Sustainability in agriculture requires not only assessing the economic and ecological

effectiveness of the farm, or the specialization of agricultural production, but also a comprehensive integrated assessment of sustainability [Piekut 2000; Jarvis et al. 2004]. A comprehensive assessment of the sustainability of a farm includes an evaluation of environmental, social and economic factors. It makes it possible not only to assess its current state, but also to identify its strengths and weaknesses in terms of sustainable development. The identification of the strengths and weaknesses of a farm and identifying the reasons, i.e. whether they stem from the management of the system – the farm, or agricultural policy instruments, and in the case of assessing the specialization of agricultural production, may serve as a basis both for the development of guidelines for necessary changes in farm management or changes in agricultural policy instruments [Wolfert 2002; Anderson 2004]. Because of this, a significant number of indicators for assessing the level of sustainability of farms have been developed, including comprehensive ones. Methods are used which seek to establish the full (including environmental effects) added value of the farm [Passel et al. 2007]. However, the sustainability of farms is not a static state, but a dynamic one, dependent on regulations, prices, wages in other sectors of the economy and the level of mechanization in the country's development. The authors of academic papers focus on the search for sustainability of farms in a given system based on multiple aspects [Runowski 2007; Majewski 2009]. Research points to the possibilities of using FADN for economic and ecological evaluations of farms [Wilk 2005]. The impact of farms on the environment and their economic performance depends on the type of farm production and the level of intensity of the said production. Despite numerous discussions, a uniform set of sustainability indicators for both the economy and agriculture has not been established. The choice of indicators depends on availability of data and degree of its aggregation.

It has become the priority of the FADN to, among others, establish the income of farms and their sensitivity to instruments of the agricultural policy, the relationships between economic performance and subsidies versus various pro-ecological activities (LFA, agri-environment and others). FADN accounting data allows the establishment of indicators for the pressure of agricultural areas on the environment. It is made possible through determining the structure of land use in farms, the share of grasslands, woodlands, forests, and wastelands. The value and role of these areas is dependent on the location of the farms. FADN reporting allows agricultural holdings to be regionally assigned and to diversify the valuation of these ecological assets from the perspective of external entities (type of region, municipality). It is also possible to determine the difference in the value added of organic farms retaining ecological assets, which stems from higher costs of mechanization caused by field shapes, reduced productivity in livestock production due to the use of feed from permanent pastures. FADN accounting also makes it possible to establish the intensity level of agricultural holdings. For example, the amount of ESU per unit area usually indicates the volume of material input per unit area. Materials used on farms and means of production coming from the outside are of different kinds and expressed in different primary units. Assigning value to material utilization per unit of area and

production presents drawbacks arising from the valuation being outside ecological framework, but there exists an advantage – the ability to synthetically approach material pressures on the environment. Other synthetic measures of environmental impact or the level of sustainability of farms also bring with them disadvantages in the form of, for example, a subjective assignment of weights to the various elements responsible for environmental impact or assessment based solely on selected material inputs. FADN accounting allows indirect consumption (costs) in relation to the area of farms or production units to be ascertained and thus to determine their material consumption. FADN accounting makes it possible to estimate eco-balance, such as nitrogen and greenhouse gases balance. This requires additional determination of inflow and outflow of energy and matter in primary units through their adjustment in relation to prices in given areas and at a given time. The exact determination of impact on the environment seems to be possible in industry. For agricultural holdings based on spatial management, however, the application of approximate methods is required. An approximate result, even if it is encumbered with errors, is better in the assessment of an entity's impact on the environment than no result. An important piece of information arising from FADN is also the contribution of operating subsidies to added value, which indicates the degree of performance of ecological goals, to which such subsidies are related. FADN accountancy data also allow synthetic measures for balancing environmental, economic and social capital to be determined [Passel et al. 2007]. The fundamental difficulty in FADN accounting is to arrive at indicators requiring data on the flow of materials, products and semi-finished products, the technical condition of farms and their farm equipment, but it does allow a fairly accurate determination of capacity for ecological activities and the social costs of such actions. The earlier system of accounting in agriculture conducted by the Institute of Agricultural and Food Economics (Agricultural Accounting Book) – Instytut Ekonomiki Rolnictwa i Gospodarki Żywnościowej (Książka Rachunkowości Rolnej), contained more quantitative data. FADN accounting is in line with current interests of policy makers and researchers. In order to fully assess environmental activities, FADN accounting should be supplemented, for example, with data regarding fertilization expressed in primary units along with the distribution, dosing and timing (an annual value does not allow full assessment of the correctness in application of fertilizers and thus the progressive degradation of arable land). Information about the equipment and the technical condition of buildings, constructions, machinery and equipment, and regarding the use of permanent pastures would be also of interest.

4. Conclusion

Measurement and evaluation of sustainable agricultural development goes beyond the traditional data set in accounting. As it has been demonstrated in this document, FADN data can be successfully used for the development of selected measures of

sustainability on the scale of individual farms, as well as for the analysis and evaluations between farms. Farming accounting provides ample information for assessing the impact of farms on the environment, because of the nature of production processes in agriculture, which involves various elements of the environment. A comprehensive assessment of the sustainability of a farm includes an evaluation of environmental, social and economic factors. Polish FADN produces a variety of data useful for such evaluations.

Literature

1. Ahrens H., Lippert Ch., *Überlegungen zu Umwelt und einkommenswegen von Agrarumweltprogrammen nach VO (EWG)*, "Landwirtschaft. Agrarwirtschaft" 2000, No. 2078/92, Bd.49, Heft 2.
2. Anderson R., *The Whole Farm Approach: A Policy to Improve Farm Management Practices*, OECD Expert Meeting On Farm Management Indicators And The Environment, Palmerston North 8-12 March 2004.
3. Bargłowska D., *Problemy wyboru metody wspomagającej podejmowanie decyzji w strategicznej ocenie oddziaływania na środowisko*, "Ekonomia i Środowisko" 2001, nr 1.
4. Baudoux P., *Beurteilung von Agrarumweltprogrammen – eine ezelnbetriebliche Analyse in Baden –Wutenbergund Nordbranderburg*, "Agrarwirtschaft" 2001, Bd 50, Heft 4.
5. Baum R., *Typ gospodarstwa a stopień zrównowazenia ekonomicznego*, Rocznik Naukowy, 2001, t. 4, z. 5.
6. Baum R., *Analiza instrumentów wspierających zrównowazony rozwój rolnictwa*, Rocznik Naukowy, 2004, t. 6, z. 4.
7. Borys G., *Tradycyjna rachunkowość przedsiębiorstwa a rachunkowość a ekologiczna*, [in:] *Ewolucja polskiej rachunkowości na tle rozwiązań światowych*, Materiały Ogólnopolskiej Konferencji Katedr Rachunkowości, Kraków 2001.
8. Ejdys J., *Metodyka zintegrowanej oceny efektywności systemu zarządzania środowiskowego*, "Ekonomia i środowisko" 2001, nr 1.
9. Gollinger-Tarajko M., *Analiza wskaźnikowa w ocenie jakości ekologicznej procesów technologicznych*, Zeszyty Naukowe AR w Krakowie, 1998, nr 508.
10. Jarvis I.E., Korolak R., Lefebvre A., *Canadian Farm Environmental Management Indicators*, OECD Expert Meeting on Farm Management Indicators and The Environment, Palmerston North 8-12 March 2004.
11. Kondraszuk T., *Nowe wyzwania dla rachunkowości rolnej*, [in:] *Historia, współczesność i perspektywy rozwoju rachunkowości w Polsce*, ed. S. Sojak, UMK w Toruniu, 2003.
12. Kondraszuk T., *Rachunkowość zarządcza w rolnictwie w warunkach globalizacji*, [in:] *Rachunkowość a controlling*, ed. E. Nowak, UE we Wrocławiu, 2008.
13. Kopiński J., *Uproszczony bilans składników nawozowych w gospodarstwach indywidualnych o różnej intensywności*, Roczniki Nauk Rolniczych, 1999, seria G, t. 88, z. 1.
14. Kuśmierski K., *Rachunkowość środowiskowa*, Zeszyty Teoretyczne. Rachunkowości, 2000, t. 1(57).
15. Machnacki M., *Produkcja końcowa netto i produkcja czysta brutto a emisja gazów szklarniowych w gospodarstwach rolniczych*, Materiały konferencyjne „Mechanizmy i uwarunkowania ekorozwoju”, Rajgród 1998.
16. Machnacki M., *Emisja gazów szklarniowych na jednostkę produkcji w gospodarstwach rolniczych*, „Ekonomia i środowisko” 1999, nr 15.
17. Machnacki M., *Efektywność stosowania azotu w gospodarstwach o różnych kierunkach produkcyjnych*, Rocznik Naukowy, 2002, t. 4, z. 4.

18. Machnacki M., *Koszty ograniczenia emisji azotu w gospodarstwach ukierunkowanych na produkcję trzody*, Rocznik Naukowy 2003, t. 5, z. 1.
19. Majewski E., *Ekonomiczna i ekologiczna trwałość gospodarstwa rolniczego*, Roczniki Nauk Rolniczych, 2009, seria G, t. 96, z. 3.
20. Nadolna B., *Rachunkowość środowiskowa a system zarządzania środowiskiem*, [in:] *Wykorzystanie lokalnych i regionalnych czynników w społeczno-gospodarczej aktywizacji obszarów wiejskich*, ed. B. Mickiewicz, AR w Szczecinie, t. 1, Szczecin 2002.
21. Niewęglowska G., *Przygotowanie polskich rolników do uczestnictwa w programie rolnośrodowiskowym*, Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu 2002, t. 4, z. 6.
22. Nowak K., *Społeczne uwarunkowania zrównoważonego rozwoju rolnictwa i terenów wiejskich w Polsce*, Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu 2004, t. 6, z. 4.
23. Ostrowski L., *Polityka ochrony środowiska w rolnictwie*, „Wieś i rolnictwo” 2000, nr 4(109).
24. Passel S., Nevens F., Mathijs E., Huylenbroek, *Measuring Farm Sustainability and Explaining Differences in Sustainable Efficiency*, “Ecological economics” 2007, no. 62.
25. Piekut K., *Strategiczne oceny oddziaływania na środowisko jako narzędzie dochodzenia do rozwoju zrównoważonego*, [in:] *Oceny oddziaływania na środowisko. Praktyka Polska i procedury w krajach Unii Europejskich*, Wyd. SGGW, Warszawa 2000.
26. Piekut K., Machnacki M., *The Balance of Nitrogen and Carbon on Polish Farms with a Different Direction and Intensity of Production*, Poznańskie Towarzystwo Przyjaciół Nauk, Wydział Nauk Rolniczych i Komisji Nauk Leśnych, 2002, t. 93.
27. Piekut K. Machnacki M., *Wpływ na środowisko gospodarstw mlecznych i opasowych na podstawie bilansu azotu i węgla*, Roczniki Nauk Rolniczych, 2003, seria G, t. 90, z. 2.
28. Piontek F., *Mechanizmy ekonomiczne stosowane w ochronie środowiska a kategoria efektywności*, „Problemy Ekologii” 1999, vol. 3, nr 6.
29. Popławski L., *Pilotażowy program rolnośrodowiskowy – pierwsze doświadczenia*, Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu, 2002, t. 6, z. 4.
30. Prus P., *Możliwości zastosowania idei zrównoważonego rozwoju w rodzinnych gospodarstwach rolnych*, Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu, 2002, t. 4, z. 5.
31. Runowski H., *Zrównoważony rozwój gospodarstw i przedsiębiorstw rolniczych*, Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu, 2000, t. 2, z. 1.
32. Runowski H., *Poszukiwanie równowagi ekologiczno-ekonomicznej i etycznej w produkcji mleka*, Roczniki Nauk Rolniczych, 2007, seria G, t. 93, z. 2.
33. Sapek A., *Oddziaływanie na środowisko gospodarstw specjalizujących się w produkcji mleka*, IMUZ, Falenty 1994.
34. Schroder J.J., Aarts H.F.M., Ten Berge H.F.M., Keulen H. van, Neeteson J.J., *An Evaluation of Whole-farm Nitrogen Balances and Related Indices for Efficient Nitrogen Use*, “European Journal of Agronomy” 2001, vol. 20, no. 1-2.
35. Stępień M., *Ekologiczne ukierunkowanie rachunkowości w krajach Europy Zachodniej*, Zeszyty Naukowe AE w Krakowie, 1998.
36. Stępień M., *Rachunkowość ekologiczna w świetle idei społecznej odpowiedzialności przedsiębiorstw*, Zeszyty Naukowe AE w Krakowie, 2003, nr 633.
37. Wasilewski M., *System informacyjny rachunkowości PL FADN w gospodarstwach rolniczych*, [in:] *Rachunkowość w zarządzaniu jednostkami gospodarczymi*, ed. T. Kiziukiewicz, Szczecin 2004.
38. Wielicki W., Baum R., Wajszczuk K., Papliński B., *Metoda oceny stopnia zrównoważenia ekonomicznego gospodarstw rolniczych*, „Problemy Inżynierii Rolniczej” 2001, nr 4.
39. Wielicki W., Wajszczuk K., *Zrównoważony rozwój rolnictwa w świetle rachunku ekonomicznego*, „Problemy Inżynierii Rolniczej” 2000, nr 3.

40. Wilk W., *Koncepcja wykorzystania danych rachunkowych FADN do ustalenia stopnia zrównoważenia gospodarstw rolnych*, [in:] *Koncepcja badań nad rolnictwem społecznie zrównoważonym*, IRGŻ PIB 2005, z. 11.
41. Wolfert J., *Sustainable Agriculture: How to Make it Work? A Modeling Approach to Support Management of a Mixed Ecological Farm*, PhD thesis, Wageningen University, Wageningen 2002.
42. Ziętara W., *Tradycyjne i współczesne podejście do równowagi w gospodarstwach i przedsiębiorstwach rolniczych*, „Pamiętniki Puławskie” 2000, z. 120/2.

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Streszczenie: Na podstawie studiów literaturowych artykuł przedstawia stan badań nad zrównoważonym rozwojem rolnictwa. Pierwszy etap badań obejmował analizę idei rolnictwa zrównoważonego oraz jego wpływu na politykę rolną. Kolejnym krokiem była analiza instrumentów wspierających rozwój zrównoważony gospodarstw oraz próba pomiaru i oceny gospodarstw pod kątem stopnia ich zrównoważenia. Źródłem danych dla tej oceny powinna być ewidencja gospodarcza. Rachunkowość rolnicza z uwagi na charakter opisywanych procesów produkcyjnych w rolnictwie, w których zaangażowane są różne elementy środowiska naturalnego, dostarcza wiele informacji służących ocenie wpływu gospodarstw na środowisko. Zintegrowana ocena zrównoważenia gospodarstwa obejmuje ocenę środowiskową, ocenę społeczną i ocenę ekonomiczną. Polski FADN jest dla nich przydatny, dostarczając różnorodne dane.