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WORKING CAPITAL IN FAMILY FARMS. FINDINGS FROM FADN IN 2004-2018

Key words: working capital, family farm, management efficiency, FADN, assets

ABSTRACT. The aim of this article is an analysis of the level of net working capital, calculated on: an individual farm, the length of a cycle in days, share in assets, within the framework of management efficiency in EU agricultural farms included in the FADN database in 2004-2018. Data contains basic information on the situation of approximately 8,430 production and economic types in the EU in the abovementioned period. Firstly, the analysed objects are divided into four classes on the basis of the length of the NWC cycle expressed in days (negative value, up to half a year, more than half a year but less than a year and more than a year). The centres of gravity in these categories are estimated for selected production, economic and financial information with the use of the Gretl programme. The relationship between a relation of the NWC to assets and management efficiency is also estimated. A statistically significant and positive relationship is demonstrated in the case of three of four analysed classes. Therefore, the relation of the NWC to assets has an impact on the evolution of farm management efficiency. The factor differentiating the strength of that impact is the length of the net working capital cycle on the holding. It allows to formulate the concluding remark that as negative NWC can hardly be identified and the vast majority of farms maintains it within a 1 year period, the situation of agricultural farms can be assessed as safe in the management of the NWC.

INTRODUCTION

Working capital is a liquid reserve intended to meet the demand for liabilities resulting from unforeseen needs and uncertainties that may appear in economic activity. Its size should remain in a specific relationship to the main financial categories, such as: sales revenue, total assets, current assets and their components [Sierpińska, Wędzki 2001]. If an economic unit has a permanent need for working capital, it has to search for long-term sources of financing. On the contrary, seasonal demand is satisfied within short-term financial projects such as trade commitments, loans, etc. [Bodie, Merton 2013].

A proper working capital management is one among crucial financial problems and tasks [compare: Lind et al. 2012, Motlíček, Polák 2015]. It is constrained with a time-limited decision-making process and with constant profit pressure [Bei, Wijewardana 2012].

These issues are particularly important in agriculture. The managers of enterprises and agricultural holdings should be aware of the part of the working capital at their disposal and possible to use within a certain period of time. Importance of this information stems from the fact that a farm's assets consist of the part that is a permanent technical equipment (fixed assets) and the part intended for day-to-day use (current assets). These assets are financed with equity capital and, in general, external capital. This means that part of the current assets must remain at the current disposal of the manager in order to repay short-term liabilities. Therefore, the main tasks in the planning of current assets and liabilities are the determination of an appropriate level and structure of current assets and the sources of their financing [Wasilewski 2006].

In agriculture, possibilities to create equity capital are limited. On the other hand, the high risk of production limits access to external sources of financing. Therefore, net working capital management requires a conservative approach that is aimed at maintaining a surplus of the NWC [Zawadzka, Strzelecka 2018]. The issue of determining a proper level of NWC in agricultural farms seems to be one of the most important issues. In agriculture, the level of stocks is high, resulting from the concentration of production, as agricultural production is highly seasonal [Wasilewski 2004]. A high level of stocks may protect against a rise in prices, but, on the other hand, it results in alternative costs resulting from excessive non-interest bearing cash holdings and storage costs. This may deteriorate the financial situation of a farm and limit management efficiency [Franc-Dąbrowska 2006].

Taking this into consideration, the purpose of the article is to analyse the net working capital (NWC) in relation to: an individual farm, the length of a cycle in days, the share in assets, within the framework of management efficiency in EU agricultural farms included in the FADN database in 2004-2018.

METHODOLOGICAL ASPECTS AND RESEARCH HYPOTHESES

Working capital (also called net working assets), is analysed as [Franc-Dąbrowska 2006, p. 33]:

– net – part of the current assets financed by equity, provisions for liabilities, long-term liabilities and the remainder of accruals (a part of assets that are not financed by short-term liabilities),
– gross – all sources of financing of current assets.

The choice depends on the context of the research [Brigham, Houston 2005]. Some researchers treat both terms synonymously, referring to total working capital [for ex. Czekaj, Dresler 1998, Pike, Neale 1999]. It should be emphasised that, irrespective of gross or net analysis, raising working capital always implies bearing a cost, as it is limited. That is why the question on how to manage it properly is so important.

The article analyses the following indicators describing the net working capital[1] of agricultural farms:

$$NWC = CAs - StL \quad (1)$$

$$NWCC = NWC \times 365 / S \quad (2)$$

$$CAsNWC = NWC / TAs \quad (3)$$

where: NWC – the net working capital of the family farm in euros,CAs – the value of current assets of the family farm in euros, StL – the value of short-term liabilities of the family farm in euros, NWCC – the net working capital cycle in days, S – the value of income from sales of the family farm in euros, CAsNWC – coverage of assets with net working capital,TAs – the value of total assets of a family farm in euros.

The first one, NWC, describes the current assets used in operations, reduced by short-term liabilities [Brigham, Houston 2005, p. 79]. The second one – NWCC – determines the number of days of a cycle period, within which the net working capital is sufficient [Kowalik 2015, p. 121]. The third indicator, CAsNWC, indicates to what extent the net working capital finances the company`s entire assets [Bolek 2017, p. 199].

The net working capital may be positive, close to zero or negative. A positive level is desirable because it reduces financial risk and improves liquidity. Negative working capital indicates that the liabilities required for repayment in the short term have partial coverage in fixed assets. This may cause difficulties in short-term debt settlement on time [Bereżnicka 2015]. Analysing the share of NWC in the total value of assets (CAsNWC), it can be noticed that if this relationship is negative, it means that the net working capital is negative as well[2]. The ratio of the NWC to the value of total assets is equal to 0, when the value of the current assets is equal to the value of short-term liabilities and the value

[1] NWC = CAs – (StL + StOAc) = TAs – CL, where: NWC is the net working capital, CAs are current assets, StL short-term liabilities, StOAc are other short-term accruals, and TAs are total assets, CL stands for current liabilities. The following equation can be also formulated: NWC = (E + PL + LtL + PAc) – FAs = FC – FAs; where: E is equity, PL are provisions for liabilities, LtL – long-term liabilities, PAc are passive accruals, FAs fixed assets and FC is fixed capital [Franc-Dąbrowska 2006, p. 33]. It is worth adding that net working capital, i.e. long-term net financing, represents the excess of fixed capital over fixed assets. While the part of the net working capital requirement that is not covered by the net working capital represents short-term net financing, i.e. the difference between short-term debt and short-term investments [Nita 2016].

[2] Assuming an unchanged balance sheet, the lowest NWC value is achieved when total assets only consist of fixed assets and capital only consists of short-term liabilities. The NWC increase along with the increase of the share of fixed capital in the balance sheet and/or the share of current assets in total assets. Despite this increase NWC is still negative, because a part of fixed assets is financed by short-term liabilities. A further increase in the share of fixed capital in the balance sheet along with an increase in the share of current assets in the balance sheet leads to a respective NWC increase, which reaches a positive value if the value of fixed capital exceeds the value of fixed assets [Ostaszewski 2015, p. 187].

of the fixed asset is the equivalent of fixed capital[3]. On the other hand, the highest NWC occurs when total assets only consist of current assets, 100% financed by fixed capital[4]. The relation of NWC to the value of total assets is then equal to 1.

Management efficiency is assessed with the use of ROA, ROE and ROS indicators[5] [Bieniasz, Gołaś 2012, p. 72]:

$$ROA = FR/TAs \quad (4)$$

$$ROE = FR/E \quad (5)$$

$$ROS = FR/S \quad (6)$$

where: ROA – return on assets, FR – financial result of the agricultural farm – here: family farm income, TAs – total assets of a farm, ROE – return on equity, E –farm equity, ROS – return on sales, S – sales – total output of a farm.

The following research hypotheses are formulated:
H1. The NWC cycle has an impact on the efficiency of farm management.
H2. The ratio of NWC to assets is a measurement of the efficiency of farm management.

The analysis of farmer decisions on the management of the NWC in relation to management efficiency fills the research gap. So far, researchers have only explored these relationships in the business sector [cf. Franc-Dąbrowska 2006, Sobczyk 2008, Kuś, Hodun 2011, Bieniasz, Gołaś 2012].

RESEARCH MATERIAL AND METHODS

The study is based on the Farm Accountancy Data Network (FADN). FADN data provide a detailed presentation and analysis of the main factors affecting the economic, financial and production situation of a family farm [FADN 2020]. It allows to obtain information on 8428 production and economic types in the EU in the years 2004-2018 (Table 1)[6], representative to c.a. 4.65 million agricultural holdings during the period considered.

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[3] The consequence is that the ratio equals 0 even if assets only consist of fixed assets covered in full by fixed capital or if assets only include current assets financed in full by short-term liabilities [Ostaszewski 2015, p. 187].

[4] Assuming the maintenance of a fixed asset structure, with a variable ratio of fixed capital to short-term liabilities, the highest value is achieved when all current assets are financed by fixed capital. It equals then the value of current assets [Ostaszewski 2015, p. 187].

[5] The formulas of profitability indicators are amended to reflect the characteristics of agricultural holdings. A detailed explanation may be found in publications by Lech Goraj and Stanisław Mańko [2009] as well as in Roma Ryś-Jurek [2019].

[6] The data contain aggregated average units. They represent the types in the corresponding stratificated sample [FADN 2020].

The following research procedure is adopted:

1. Stage I: the analysed sample of 8,428 farm types is divided into four classes according to the length of the NWCC period[7]:
– NWCC less than 0 days – class I (36 types),
– NWCC = 0-182 days – class II (3,235 types),
– NWCC = 183-365 days – class III (2,989 types),
– NWCC over 365 days – class IV (2,168 types).
2. Stage II: the centres of gravity in each class are presented in reference to the most important production, economic and financial information on agricultural holdings,
3. Stage III: the relationship between the ratio of NWC to assets (dependent variable) and the efficiency of farm management (independent variables) is estimated,
4. Stage: verification of hypotheses and conclusion.

RESULTS OF RESEARCH

The centres of gravity in the four farm classes according to the length of the NWCC period in reference to selected factors of production in 2004-2018 are presented in Figure 1. These factors are: total utilised area, labour input, total assets and NWC per 1 farm. Farms with a negative NWCC period (class I) have the lowest average area (approx. 44 ha over the period considered), as well as volatile high labour and total assets (on average taking 5.16 AWU and EUR 537.54 thousand, respectively). Results obtained for farms in classes II and III (with a NWCC period up to half a year and a NWCC period longer than six months and shorter than a year) are similar. Farms with a NWCC period up to half a year have an average area that equals ca. 46 ha, an average labour input of 5.54 AWU, average assets of ca. EUR 902 thousand at an average NWC of approximately EUR 109 thousand. Farms with a NWCC period up to a year but longer than half a year, have an average area of 128 hectares, a labour input of about 3.9 AWU, EUR 792 thousands of assets and an average NWC equalling EUR 132 thousand. Farms with an NWC period longer than a year (class IV) have an average

Table 1. The characteristics of the sample analysed and its representativeness

Year	Number of observation	Representativeness
2004	478	4,019,270
2005	494	4,045,300
2006	503	4,065,090
2007	553	5,295,930
2008	565	5,253,860
2009	564	4,815,530
2010	584	4,858,440
2011	578	4,857,710
2012	575	4,890,720
2013	600	4,961,850
2014	600	4,801,330
2015	572	4,639,800
2016	588	4,643,180
2017	588	4,586,140
2018	586	4,035,680

Source: own work based on [FADN 2020]

[7] In accounting, 1 year is important as a time framework to analyse economic phenomena. Therefore, farms with a cycle of up to 365 days and longer are distinguished. Negative cycles are also distinguished. 3 classes are created. It is noted that the class "0-365 days" is the most numerous. It seems reasonable to distinguish classes "0-182 days" and "182-365 days". As a result 3 classes of high similarity and 1 class characterized with a negative NWC are obtained. In European agriculture seasonality consists of four seasons, therefore the shorter the cycle, the higher the NWC management efficiency.

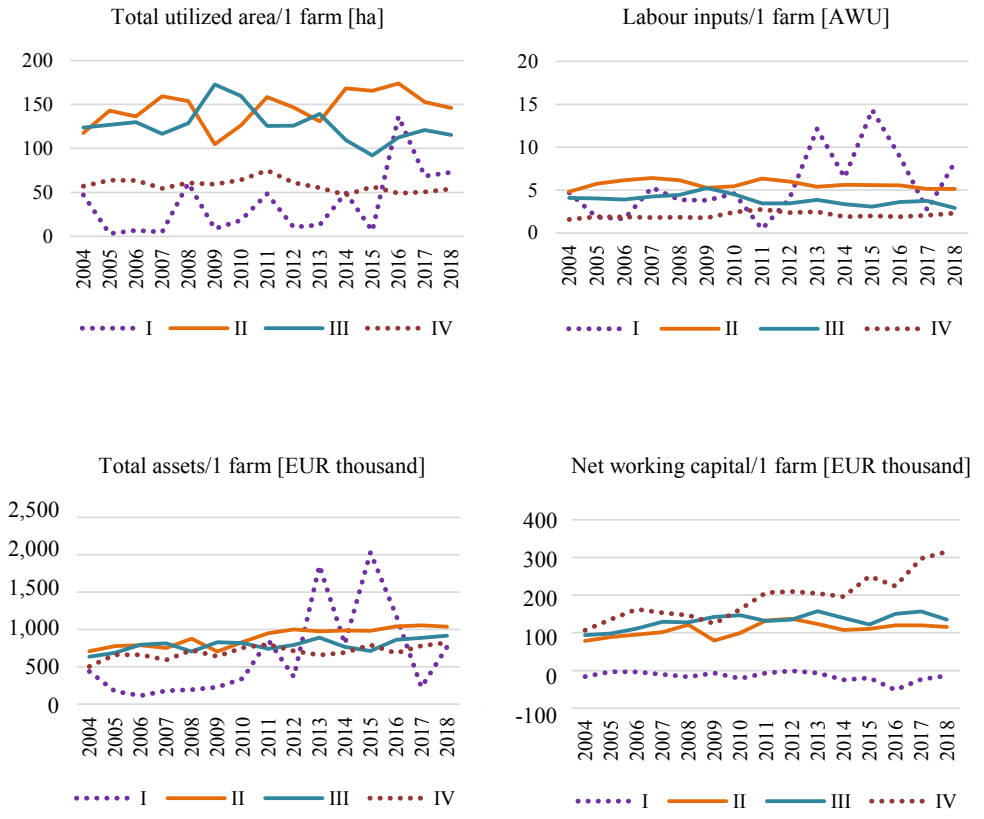
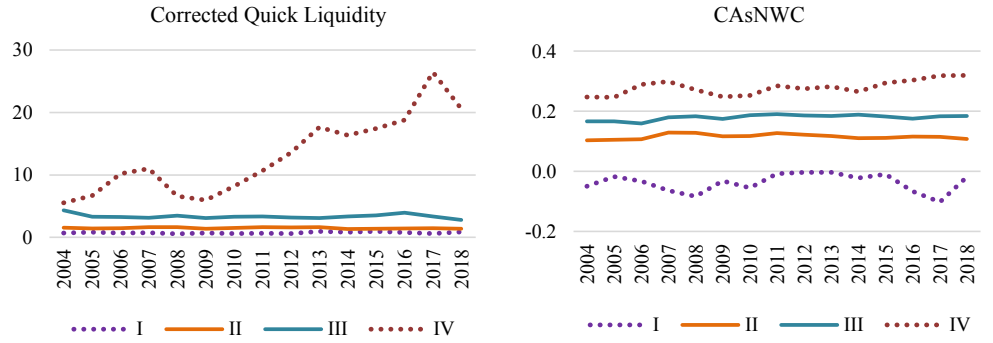


Figure 1. Centres of gravity in four NWCC period classes in reference to selective production factors in 2004-2018

Source: own work and calculations based on [FADN 2020]

area of 57.8 ha, a labour input of 2.1 AWU and assets of ca. EUR 710 thousand, whereas the NWC average equals EUR 201 thousand (Figure 1).

Quick liquidity and the ratio of NWC to assets are closely related to NWCC classes (Figure 2). Quick liquidity ratio in farms with a negative NWCC period does not exceed 0.8, and the ratio of the NWC to assets equals on average -0.05. Farms with an NWCC period no longer than half a year achieve an average quick liquidity ratio of 1.5 and an average ratio of NWC to assets equalling 0.12. Farms with an NWCC period ranging from half a year to one year differentiate themselves in an average quick liquidity ratio of 3.3 and an NWC to assets ratio of 0.18. Farms with an NWCC period longer than one year are excessively liquid (quick liquidity ratio ranging from 5.5 to even 26.5, 13.0 on average) and their coverage of assets with net working capital was on average equal to 0.28 (Figure 2).



Corrected Quick Liquidity = (Current Assets – Stocks – Non-breeding livestock) / Short-term Liabilities

CAsNWC – Coverage of Assets with Net Working Capital

Figure 2. Centres of gravity in four NWCC period classes in reference to a quick liquidity ratio and an NWC to assets ratio in 2004-2018

Source: own work and calculations based on [FADN 2020]

Over the period considered, the average ROA ratio in the analysed 4 classes is respectively: 0.06, 0.10, 0.08 and 0.07, and the highest variation (126%) of this ratio is observed in class I. In the remaining three classes, it ranges from 75 to 85%. A similar volatility may be observed in the case of the ROE ratio. Levels of this ratio in all classes equal 0.10, 0.13, 0.09 and 0.07, respectively[8]. The mean ROS in class I is 0.10, in class II – 0.28, in class III – 0.31, and in class IV – 0.38. In class I, the volatility of this ratio exceeds 300%, and in the remaining classes it remains within a range of 61-68% (Figure 3).

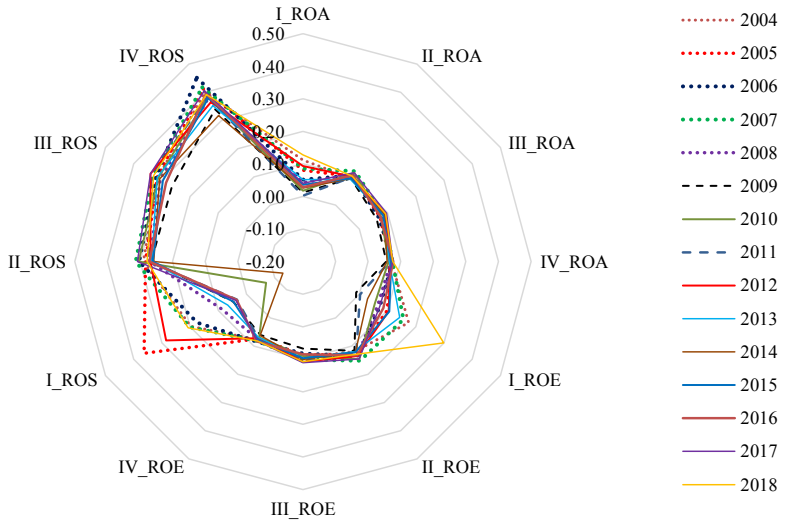
To analyse the relation between the NWC to assets ratio and management efficiency, regression models without intercept are estimated (Table 2)[9]. The programme Gretl was used for the research.

Different results are obtained in each class, along with the abovementioned remarks (Figures 1-3) confirming the H1. The net working capital cycle has an impact on the efficiency of farm management.

The model estimated in class I does not confirm a linear statistically significant relation between management efficiency ratios and the ratio of NWC to assets. This is probably due to a low number of observations. On the contrary, models estimated in classes II-IV confirm a statistically significant linear relation between NWC to assets ratio and ROA, ROE and ROS. The impact of ROA and ROE intensifies as the NWCC period increases (Table 2). This confirms H2: the ratio of NWC to assets is a measurement of the efficiency of farm management.

[8] The values of ROA and ROE are similar. This is because the numerator is the same volume, and there is only a minor difference between the denominators. Farms with FADN are characterised by low debt levels (around 15% of the balance sheet total).

[9] Regression models with 3 independent variables (ROA, ROE, ROS) were abandoned because there was a high collinear between ROA and ROE. Each model was based on 1 independent variable.



I, II, III, IV – numbers of classes according to NWCC

Figure 3. Centres of gravity in four NWCC period classes in reference to ROA, ROE and ROS ratios in 2004-2018

Source: own work and calculations based on [FADN 2020]

Table 2. Regression models for the coverage of assets with a net working capital (CAsNWC) and efficiency of management (ROA, ROE, ROS) according to the NWCC classes in 2004-2018

Efficiency of management	NWCC classes				
	I (N = 36)	II (N = 3,235)	III (N = 2,989)	IV (N = 2,168)	Total (N = 8,428)
ROA	-0.1737 (0.1800) $R^2 = 0.0508$	0.7984 (0.0000)*** $R^2 = 0.5963$	1.6197 (0.0000)*** $R^2 = 0.7291$	3.1938 (0.0000)*** $R^2 = 0.7559$	1.4087 (0.0000)*** $R^2 = 0.5374$
ROE	-0.0905 (0.2075) $R^2 = 0.0450$	0.6506 (0.0000)*** $R^2 = 0.6336$	1.4194 (0.0000)*** $R^2 = 0.7408$	2.9150 (0.0000)*** $R^2 = 0.7420$	1.1378 (0.0000)*** $R^2 = 0.5100$
ROS	0.0242 (0.5297) $R^2 = 0.0114$	0.2628 (0.0000)*** $R^2 = 0.4174$	0.4209 (0.0000)*** $R^2 = 0.5821$	0.5733 (0.0000)*** $R^2 = 0.6721$	0.4261 (0.0000)*** $R^2 = 0.5547$

The level of significance in parentheses, R^2 is non-centred

Source: own work

CONCLUSIONS

Conducted research confirms that there is a positive relationship between farm management efficiency and the ratio of NWC to assets . The factor that influences the strength of this impact is the length of the NWCC period.

The presented results also allow to assess the management of an agricultural farm in the EU as safe. A negative NWC can hardly be identified and the vast majority of farms maintains it within 1 year period. Among the most efficient are farms with an area ranging between 100 and 175 hectares, a labour input ranging between 2 and 5 AWU and assets ranging between EUR 630 thousands and 1 million.

It may be assumed that the risk resulting from maintaining high net working capital by farmers is to some extent compensated by an increasing management efficiency. Confirming this assumption requires further studies on farms with higher debt levels and lower liquidity. This allows for a broader understanding of farm decision-making processes. It is a well-known phenomenon that farmers prefer an accumulation of equity and avoiding indebtedness. Over-liquidity is an obvious consequence of this approach. As a result, they prefer a shorter liability cycle than the operational cycle.

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KAPITAŁ OBROTOWY W RODZINNYCH GOSPODARSTWACH ROLNYCH. WNIOSKI Z FADN ZA LATA 2004-2018

Słowa kluczowe: kapitał obrotowy, rodzinne gospodarstwo rolne, efektywność gospodarowania, FADN, majątek

ABSTRAKT

Celem artykułu jest analiza poziomu kapitału obrotowego netto, w przeliczeniu na gospodarstwo, dni obrotu, udział w aktywach, w aspekcie efektywności gospodarowania w gospodarstwach rolnych FADN w latach 2004-2018 w Unii Europejskiej. Dane te obejmują podstawowe informacje o sytuacji około 8430 typów produkcyjno-ekonomicznych w UE w latach 2004-2018. Obiekty najpierw podzielono na cztery klasy według długości cyklu KON w dniach (ujemny, do pół roku, od pół roku do roku, powyżej roku). Następnie oszacowano środki ciężkości badanych klas dla wybranych informacji produkcyjnych, ekonomicznych i finansowych. Do badań wykorzystano program Gretl. Oszacowano też związek między pokryciem aktywów kapitałem obrotowym netto a efektywnością gospodarowania. Wykazano statystycznie istotny i pozytywny związek w trzech z czterech ustalonych klas. Wobec tego pokrycie aktywów kapitałem obrotowym netto wywiera wpływ na kształtowanie się efektywności gospodarowania w gospodarstwach rolnych, a czynnikiem różnicującym siłę tego wpływu jest długość cyklu kapitału obrotowego netto w gospodarstwie. Sytuację gospodarstw rolnych określono jako bezpieczną w zakresie zarządzania KON, gdyż ujemny kapitał prawie nie występował, a zdecydowana większość gospodarstw utrzymywała go do 1 roku.

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