

INFLUENCE OF SUBSIDIES ON TECHNICAL EQUIPMENT AND EFFICIENCY OF FAMILY FARMS

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Keywords: technical equipment of holdings, amount of subsidy, economic size, holding income, sustainable agricultural production

ABSTRACT

The aim of the study was to determine the influence of subsidies on the technical equipment of holdings. The level of technical equipment of holdings, considering the amount of subsidies, economic size and income, in the period before and after receiving subsidies, shows a growing tendency. The greatest changes were noticed in the group of holdings with subsidies within 100–150 thousand PLN (number of tractors of a power over 50 kW – an increase by 450% pcs·100 holdings⁻¹). In all the studied groups, the highest increase (by about 200%) was noted in the number of tractors with a power over 50 kW. An increase in the economic size (ESU - Economic Size Unit) and in the level of generated income has a significant influence on the level of mechanization of holdings. The efficiency of support technical equipment is considerably higher in groups of holdings with the highest values of the criteria of division than in groups with lower values of the division criteria. The evaluation of the relationship between received funds and the technical modernization of the holdings under study, in the context of sustainable development, allows us to conclude that social sustainability is present in small holdings.

INTRODUCTION

Factors of production are always connected with human labour, they are referred to as the productive forces of the production process which are present in the relations between means of production (capital) and labour power (labour). That is why labour (mh – manhours, or labour-hours) and the workplace (of a person) have to be assisted by technical equipment to achieve high efficiency of mechanization of agricultural production (Kocira and Sawa 2008). The technical condition and the structure of means of mechanization in given (organizational-economic) conditions of production shape the production process and define management efficiency in agriculture, which is a significant factor for farmers when they make decisions concerning investment purchases and sources to finance the said purchases. (Sawa 1994, Wójcicki and Pawlak 1996). As shown by numerous studies, the level of agricultural technical equipment of holdings, including the quantity, type, value and efficiency of machines and the power of tractors, varies greatly between individual holdings, even those with similar scope of production (Tabor 2004, Muzalewski 2007). Diversified holdings, with mixed directions of production, usually require diversified machines (Strategia... 2008). Differences in the number of tractors and agricultural machines are, first of all, the result of a disproportion between the development and the economic size of individual entities. In Biłgoraj County, the factor which influences the level of technical equipment of holdings is the particular form of mechanization of principal field work. There are no well-developed mechanization services and most farmers aim to achieve self-sufficiency with respect to agricultural equipment, and holdings make use of external services only when harvesting (Strategia... 2008). The possession of their own machine is a guarantee of its availability, which is especially important in unfavourable weather conditions.

The introduction of another new machine to the holding should contribute, among others, to an improvement in the organization of production, productivity and promptness of field works, quality of machine work. It should also improve work conditions and safety of operators as well as decrease the unfavourable environmental influence of agricultural machinery (Muzalewski 2008, Wasąg 2008).

THE AIM, SCOPE AND METHODOLOGY OF THE STUDY

The aim of the study was to determine the influence of subsidies on the technical equipment of holdings. 70 agricultural holdings from Biłgoraj County were studied in the period before and after receiving subsidies from EU funds (purposive sampling). The period is different for individual holdings because in the years 2004-2009 they received different forms of subsidies. The period under analysis was a minimum of two years before and two years after receiving subsidies based on business plans filed by farmers with the Agency for Restructuring and Modernization of Agriculture in the years 2004-2009 (Plan... 2004; Sektorowy... 2004; Program... 2007). In order to assess the condition of agricultural technical equipment, the sample of holdings was divided on the basis of the amount of subsidies, their economic size and their income. The study contains empirical data from completed undertakings, presenting the level of ownership of major machines and equipment in the base year (before subsidies) and in the target year (after subsidies). The indicators are grouped into: level of technical equipment per holdings ($\text{pcs} \cdot 100 \text{ holdings}^{-1}$) and technical equipment per farmland area ($\text{pcs} \cdot 100 \text{ ha}^{-1}$ AL - Agricultural Land). The level of agricultural sustainability in the holdings under study was evaluated in the social context (Sawa et al., 2006).

RESULTS OF THE STUDY

The level of means of mechanization of holdings, considering the amount of subsidies (table 1) in the period before and after subsidies, shows a growing tendency. The highest level is present in the group with subsidies up to 50 and from 50 to 100 thousand PLN in the number of tillage machines and tools, respectively: 121.4 and 180.0 $\text{pcs} \cdot 100 \text{ holdings}^{-1}$ and in total tractors: 50.0 and 72.9 $\text{pcs} \cdot 100 \text{ holdings}^{-1}$. These groups also show a significant share of, respectively: tractor trailers 34.3 and 48.6 $\text{pcs} \cdot 100 \text{ holdings}^{-1}$ and spraying machines 30.0 and 40.0 $\text{pcs} \cdot 100 \text{ holdings}^{-1}$. Holdings both of smaller sizes and receiving lower subsidies (up to 50 thousand PLN) in comparison with holdings with subsidies over 150 thousand PLN have better means of mechanization – tractors and tillers, respectively: 50.0 and 47.1 and 121.4 and 84.3 $\text{pcs} \cdot 100 \text{ holdings}^{-1}$. The highest change in the level of means of mechanization of holdings in the target year as compared with the base year was noted in the group of holdings with the amount of subsidies from 100 to 150 thousand PLN (number of tractors of a power over 50 kW – an increase by 450% $\text{pcs} \cdot 100 \text{ holdings}^{-1}$).

An evaluation of the conversion level of total tractors in holdings according to their economic size and to their income (tables 2 and 3) shows an increased level of the holdings' equipment, respectively up to 8 ESUs (16.8 $\text{pcs} \cdot 100 \text{ holdings}^{-1}$ AL) and up to 10 thousand PLN (22 $\text{pcs} \cdot 100 \text{ holdings}^{-1}$ AL). Whereas the percentage increase in the level of equipment in those holdings in the target year is the highest in the group from 16 to 40 ESUs (65) and over 50 thousand PLN (66). However, in the whole studied group, all groups have the highest increase (ca. 200%) in the number of tractors with a power over 50 kW, which can indicate the use of higher efficiency machines and tools. Whereas, holdings of smaller economic sizes (up to 8 and between 8 and 16 ESUs)

purchased currant harvesters, which supports their aim (defined in the business plan) to increase of machine efficiency (table 2). The level of mechanization of those holdings was several times higher than the bigger ones in individual groups of technical equipment. Sawa (1998) made similar findings, which can evidence the continuing tendency towards an irrational use of equipment and towards generating maintenance and operating costs. However, this increases the comfort and quality of work and reduces the number of, for example, drives of combined cultivators in fields. Due to the specificity of the county under study, in which small holdings prevail, a situation like this is a sign of social sustainability.

A multidirectional analysis of these holdings confirms that a growth in the economic size (ESU) and in the level of generated income have a considerable influence on the level of mechanization of those holdings. An exceptional situation arises when the income of holdings is taken into consideration (table 3), in which case its increase is accompanied by a clear decrease, e.g. in the total number of tractors from 22.0 pcs·100 holdings⁻¹ AL (with income up to 10 thousand PLN) to 4.8 pcs·100 holdings⁻¹ AL (with income over 50 thousand PLN).

Table 1. Changes in the equipment of farms with tractors and major agricultural machinery considering the amount of subsidies

Specification	Agricultural equipment (pcs·100 holdings ⁻¹) in holdings with respect to the amount of subsidy											
	< 50			50–100			100–150			> 150		
	by	ty	change, base year = 100	by	ty	change, base year = 100	by	ty	change, base year = 100	by	ty	change, base year = 100
Total tractors, including:	42.9	50.0	117	41.4	72.9	176	14.3	27.1	190	30.0	47.1	157
– up to 30 kW	10.0	10.0	100	18.6	21.4	115	2.9	2.9	100	4.3	4.3	100
– 30–50 kW	21.4	27.1	127	11.4	21.4	188	8.6	8.6	100	7.1	7.1	100
– over 50 kW	11.4	14.3	125	11.4	30.0	263	2.9	15.7	550	18.6	35.7	192
Tractor trailers	31.4	34.3	109	35.7	48.6	136	19	21.4	115	44	50	113
Other trailers and manure spreaders	20.0	20.0	100	27.14	37.1	137	4.3	4.3	100	14	21	150
Reloading equipment	14.3	18.6	130	5.7	21.43	375	4.3	10.0	233	19	26	138
Machines and equipment:												
– tillers	98.6	121.4	123	140.0	180.0	129	53	77.1	146	61	84.3	137
– ridgers	11.4	11.4	100	25.7	25.7	100	2.9	2.9	100	4.3	4.3	100
– fertilizer and lime distributors	21.4	24.3	113	27.1	35.7	132	13	15.7	122	17	20.0	117
– seed drills	24.3	25.7	106	28.6	34.3	120	11	15.7	138	19	27	146
– sprayers	22.9	30.0	131	28.6	40.0	140	10	14.3	143	14	22.9	160
Combine harvesters	8.6	8.6	100	12.9	12.9	100	1.4	1.4	100	11	14.3	125
Balers	17.1	20.0	117	18.6	24.3	131	5.7	5.7	100	10	15.7	157
Root crop harvesters	5.7	5.7	100	5.7	5.7	100	1.4	1.4	100	5.7	5.7	100
Currant harvesters	2.9	4.3	150	1.4	2.9	200	–	–	–	1.4	2.9	200
Feed making machines	4.3	4.3	100	7.1	15.7	220	1.4	4.3	300	15.7	15.7	100

by – base year (before subsidies), ty – target year (after subsidies)

Table 2. Equipment of farms with tractors and major agricultural machinery with respect to economic size

Specification	Agricultural equipment (pcs·100 ha ⁻¹ AL) in holdings with respect to economic size (ESU)											
	< 8			8–16			16–40			> 40		
	by	ty	change, base year = 100	by	ty	change, base year = 100	by	ty	change, base year = 100	by	ty	change, base year = 100
Total tractors, including:	10.7	16.8	157	10.8	15.2	141	3.4	5.6	165	2.9	4.1	141
– up to 30 kW	6.8	7.5	110	2.7	3.0	111	0.8	0.7	88	0.4	0.4	100
– 30–50 kW	1.7	5.2	306	6.1	7.2	118	1.3	1.3	100	1.3	1.3	100
– over 50 kW	2.2	6.2	282	2.0	5.8	290	1.3	4.2	323	1.2	3.1	258
Tractor trailers	10.8	9.2	85	7.9	10.4	132	4.1	4.8	117	4.5	4.3	96
Reloading equipment	2.1	3.9	186	4.3	6.4	149	1.6	3.0	188	1.0	1.9	190
Machines and equipment:												
– tillers	39.6	43.1	109	29.7	36.1	122	12.3	15.6	127	5.7	6.8	119
– ridgers	7.6	6.3	83	6.0	5.5	92	1.0	0.9	90	0.4	0.4	100
– fertilizer and lime distributors	7.4	8.1	109	6.0	7.5	125	3.7	3.9	105	0.6	0.9	150
– seed drills	7.7	7.5	97	6.7	6.9	103	2.8	3.7	132	0.4	1.2	300
– sprayers	6.2	10.3	166	7.1	7.8	110	2.8	3.7	132	0.7	1.7	243
Combine harvesters	2.3	1.8	78	2.9	2.5	86	1.0	1.1	110	0.9	0.7	78
Balers	2.0	1.8	90	6.0	6.5	108	2.0	3.3	165	1.0	1.2	120
Root crop harvesters	1.2	1.2	100	2.3	2.0	87	0.5	0.4	80	0.2	0.2	100
Currant harvesters	0.7	1.1	157	0.3	0.3	100	0.0	0.0	0	0.3	0.6	200
Feed making machines	2.0	2.5	125	1.5	2.6	173	0.6	0.5	83	2.1	2.3	110

by – base year (before subsidies), ty – target year (after subsidies)

Table 3. Equipment of farms with tractors and major agricultural machinery with respect to holding income

Specification	Agricultural equipment (pcs·100 ha ⁻¹ AL) in holdings with respect to income (K PLN·holdings ⁻¹)											
	<10			10–20			20–50			>50		
	by	ty	change, base year = 100	by	ty	change, base year = 100	by	ty	change, base year = 100	by	ty	change, base year = 100
Total tractors, including:	14.4	22.0	153	10.1	13.7	136	7.1	9.5	134	2.9	4.8	166
– up to 30 kW	6.9	8.1	117	3.5	3.5	100	2.0	1.9	95	0.4	0.3	75
– 30–50 kW	5.7	9.5	167	4.1	5.1	124	3.3	3.9	118	1.1	1.1	100
– over 50 kW	1.8	5.5	306	2.5	5.9	236	1.8	3.8	211	1.5	4.9	327
Tractor trailers	8.5	9.3	109	10.7	12.3	115	5.9	6.7	114	4.0	4.7	118
Reloading equipment	4.3	5.8	135	3.4	5.6	165	0.6	3.3	550	2.4	3.7	154
Machines and equipment:												
– tillers	46.6	53.5	115	28.5	36.5	128	19.1	22.9	120	12.1	11.4	94
– ridgers	10.8	10.4	96	5.1	4.4	86	0.8	0.8	100	1.7	0.8	47
– fertilizer and lime distributors	8.7	10.1	116	6.6	7.4	112	3.6	5.0	139	2.8	3.1	111
– seed drills	8.4	9.1	108	6.9	7.7	112	3.2	3.7	116	3.4	3.0	88
– sprayers	10	13.8	138	5.5	7.2	131	3.8	5.4	142	2.2	2.2	100
Combine harvesters	2.2	1.6	73	2.3	2.3	100	2.1	2.1	100	1.1	1.0	91
Balers	5.3	4.4	83	5.0	6.0	120	2.8	4.9	175	1.6	2.1	131
Root crop harvesters	2.3	1.9	83	2.2	2.2	100	0.4	0.4	100	0.6	0.5	83
Currant harvesters	0.5	0.5	100	0.0	0.0	0	1.2	1.8	150	0.1	0.1	100
Feed making machines	1.6	2.9	181	1.4	2.6	186	0.6	0.9	150	0.8	1.0	125

by – base year (before subsidies), ty – target year (after subsidies)

SUMMARY

The level of mechanization of holdings with respect to the amount of subsidy, their economic size and income in the period before and after receiving subsidies, shows a growing tendency. The highest level is in the groups, respectively: from 100 to 150 thousand PLN·holdings⁻¹, over 40 ESUs and from 20 to 50 thousand PLN·holdings⁻¹. Holdings of smaller sizes, which at the same time received lower subsidies (up to 50 thousand PLN), in comparison with the ones with subsidies over 150 thousand PLN have a higher level of mechanization – tractors and tillers: 50.0 and 47.1 and 121.4 and 84.3 pcs·100 holdings⁻¹. The greatest changes in the level of mechanization of holdings in the target year with in comparison with the base year was noted in the group of holdings with the amount of subsidies between 100 and 150 thousand PLN (number of tractors with a power over 50 kW – an increase by 450% pcs·100 holdings⁻¹). In all the studied groups the highest increase (ca. 200%) was noted in the number of tractors with a power over 50 kW, which can indicate the use of more efficient tools and machinery. In groups of holdings with the highest value of the division criteria, the efficiency of support machinery is considerably higher than in groups with smaller values of the division criteria. For example, in holdings with the amount of subsidy up to 50 and over 150 thousand PLN and with economic size of up to 8 ESUs and over 40 ESUs, the change in the percentage of spraying machines was, respectively: 31 and 66% and 60 and 143%.

A multidirectional analysis of these holdings confirms that an increase in the economic size (ESU) and in the amount of subsidies has a considerable influence on the level of mechanization of holdings. The evaluation of the relationship between received funds and the technical modernization of the holdings under study, in the context of sustainable development, allows us to conclude that social sustainability is present in small holdings. It increases the comfort and quality of work and reduces the number of, for example, drives of combined cultivators in fields. Support programs for agriculture from EU funds are an important and effective factor in the shaping of technical modernization of family holdings.

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