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LEVEL AND STRUCTURE OF INPUTS IN SPECIALIST FARMS

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ABSTRACT

The objective of the paper is to determine the size of human and objectified labour in selected specialist vegetable farms. The paper covered studies carried out in the area of southern Poland in 50 organic vegetable farms. Based on the detailed studies, the size and structure of work, and energy inputs used in the production process were determined. The highest inputs of labour per a unit of the production area and 1 tonne of a product were incurred in production of Cucurbita vegetables – 1883.1 and 547.74 man-hour, while the lowest of Solanacea vegetables – 342.8 and 7.11 man-hour. From among all analysed groups of plants, the highest energy inputs were incurred in cultivation of root and onion vegetables and they were three times higher than in traditional farms. Contrary, the lowest inputs were incurred in cultivation of brassica and Solanaceae vegetables.

Introduction

According to Granstedt and Tuburski (2006) traditional and organic farming are presently the most popular types of farming.

Organic farming, at the foundations of its functioning, is set for production of high quality agricultural produce. Presently, development of farming in Western Europe aims at improvement of the nutritive quality and value of produce including relevant crop cultivation and animal breeding technology which limits the outflow of hazardous substances to environment and positively affects the human health (Bloksma et al., 2008, Grandstedt and Tyburski 2006, Meier et al., 2015, Willer and Kilcher 2009).

Within the last decades, a considerable increase in the number of organic farms has been reported. One of the main reasons of such a great increase is a constantly growing consumers' demand for organic products (Poradnik rolnictwa ekologicznego, on-line, 2014). According to the newest data, there are 23 375 organic producers in Poland including 22 435 farm producers. Despite the increase in the number of eco producers, the area of organic agricultural land has been the lowest for 7 years. In 2016, it was almost 536.6 thousand ha, in 2015 - 580.7 thousand ha. Vegetable production reported the highest increase (by 42.4%) and potatoes (by 20.2%) in recent years. Grain production increased by 17% and fruit production by 15.7%. However, it should be admitted that organic farms in Poland are very fragmented. A decisive majority of organic farms are farms with the area of up to

50 ha (at the average 22 ha) which results, *inter alia*, from the specificity of organic production (Raport on-line, 2017).

Development of production in the organic system is directly related to its profitability as well as to competitiveness in comparison to other agricultural production systems.

Costs in agricultural production in the organic system, similarly as in the traditional one, should be reduced and the revenues and incomes should be increased. The value of the incurred expenditures (raw materials, and human and objectified labour) and organic products prices are fundamental factors that determine profitability of the incurred inputs (Borecka and Szumiec, 2013, Walczak and Szewczyk, 2013, Ziętara et al., 2013). It is particularly important in organic production where crop yields are on average lower by 20-40% than in traditional farms and the work inputs are 2-3 times higher (Czykier-Wierzba, 2002; Klima 2003; Krasowicz and Kukuła 1998; Kwaśniewski et al., 2013). In order to improve the production inputs efficiency, organic farms should aim at lowering the production costs for which mechanization costs are a basic element (Szczeptycki and Wójcicki, 2003).

Analysis of costs and profitability of production results directly from the rational use of all production factors. Analysis of profitability provides financial information that shapes the production structure in a farm. In practice, however, it is not always easy, since the production structure is influenced by economic, social, and environmental factors (Skarżyńska, 2011).

Relatively high inputs in vegetable production are problematic not only in Poland but also in other countries (Nikkhah et al., 2017; Deming et al., 2018). As long as considerable labour consumption of production was a chance to improve the situation of the hidden unemployment on rural areas a few years ago, as much, presently a deficiency of human labour in rural areas is visible and the situation has changed diametrically. Higher mechanization of the production technology could be a solution to the problem of labour force demand in the period of accumulation of work. However, it is a serious problem due to considerable costs of specialist machines and high fragmentation of vegetable production. Efficient machines, e.g. for harvesting would not find a sufficient work front in small farms, which would result in high costs of their maintenance and affect negatively the production profitability (Kowalczyk and Grotkiewicz, 2018).

Objective and scope of the study

The objective of the study was to determine the size and structure of human and objectified labour input in the selected vegetable cultivation technologies in organic farms.

The scope of the research covered organic farms located in the region of southern Poland, precisely in Małopolska. The studies were carried out in 50 organic farms with a certificate. The results were obtained based on all-year recording of events in organic farms.

Methodology of research

The studies were performed based on 50 selected organic farms in Małopolska region. Farms were selected based on the owner's consent, organic farm certificate and production profile. Due to high fragmentation in the vegetable production structure, their division

according to Litynski was carried out (Lityński, 1955; Gruszecki, 2014). This division plays an important role in case of cultivation, since it divides vegetables into utility groups that require similar agro technical treatments. Vegetables are divided into bulb (onion, leek, garlic), brassica (white cabbage, red cabbage, Chinese cabbage, cauliflower), Solinaceae (sweet pepper, tomato), root (carrot, parsley, beetroot, celery), Cucurbita (cucumber, summer squash, zucchini), leguminous (bean, pea, broad bean, soya) vegetables. In order to determine the size and structure of expenditures, the following were calculated:

– human labour inputs (own and outside) which were expressed in man-hour·ha^{-1} and man-hour·t^{-1}.
– objectified labour inputs (own and outside) which were expressed in kWh·ha^{-1} and kWh·t^{-1}

Research results

Operation variability of factors that shape the organic farms operation should be considered for assessment of organic farms. Effective use of human labour resources and the achieved production results are factors that influence the operation of such farms (Kwaśniewski et al., 2013). Human labour inputs were expressed in man-hour·ha^{-1} and man- hour·t^{-1}, and inputs on objectified labour in kWh·ha^{-1} and kWh·t^{-1}. Figure 1 shows the value of the human labour expenditures referred to the production area and the yield size.

The average human labour inputs on the production area unit were 1058.5 man-hour·ha^{-1}. The highest inputs were incurred in case of Cucurbita vegetables cultivation 1883.1 man-hour·ha^{-1}. It resulted from the total absence of mechanization during harvesting and the necessity of frequent harvesting on various dates due to irregular maturation of vegetables. The second group of plants with regard to the size of expenditures were root vegetables. The size of expenditures was 1539.3 man-hour·ha^{-1} in this case. These inputs in comparison to traditional farms are twofold higher, where for cultivation of root vegetables inputs of 680 man-hour·ha^{-1} were incurred (Kowalczyk and Wnęk, 2007). The reason for such a great difference of inputs was a low level of mechanization in the analysed farms. In organic farms, treatments are carried out only manually, while in the traditional ones, mechanical or chemical treatments are performed. For cultivation of Solanaceae, the lowest labour inputs in the amount of 342.8 man-hour·ha^{-1} is incurred, which in comparison to cultivation in traditional farms (716 man-hour·ha^{-1}) gives twofold lower labour inputs (Kowalczyk and Wnęk, 2007). Per a tonne of a product, human labour inputs were 156.1 man-hour. The highest inputs were incurred in cultivation of Cucurbita vegetables, where they were fourfold higher than the average inputs on vegetables. While, the lowest labour inputs were incurred for cultivation of Solanaceae 7.1 man-hour·t^{-1}. In the remaining groups of vegetables a high diversity resulting from the mechanization level in particular cultivation technologies occurred. In cultivation of root vegetables, the size of these expenditures was 150.55 man-hour·t^{-1} while for cultivation of brassica vegetables sevenfold lower inputs were incurred.

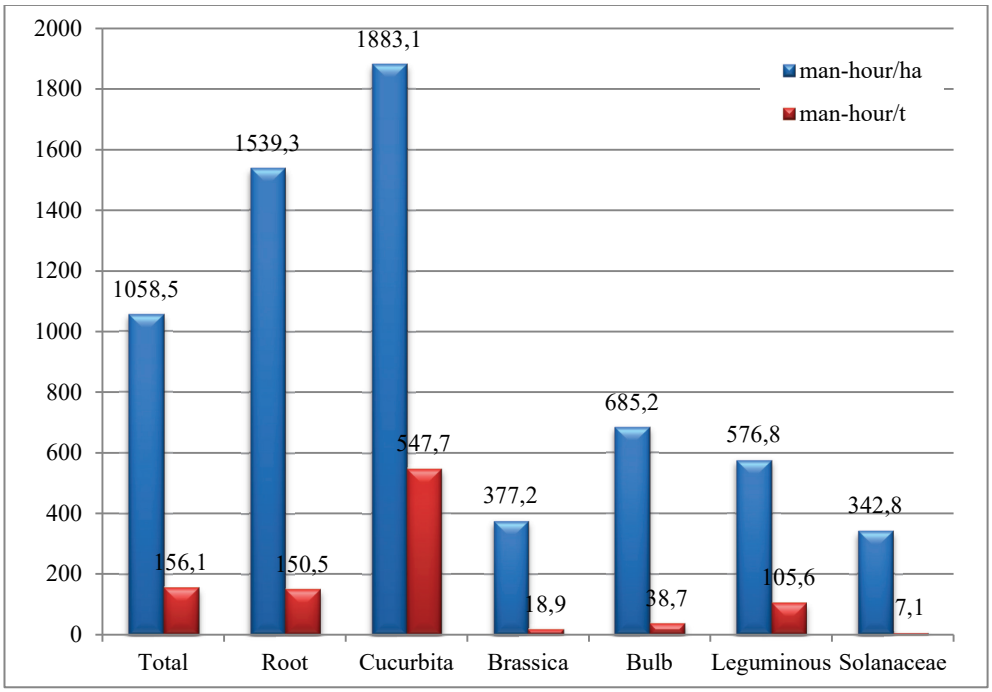

Figure 1. Human labour inputs (man-hour·ha^{-1} and man-hour·t^{-1})

The following figure (fig. 2) presents the labour inputs structure in the analysed technologies of vegetables cultivation. Based on the studies that were carried out, it was stated that from all works that were performed in vegetables cultivation, own work prevails (46.7-100%).

No outside services were used in cultivation of brassica, leguminous and Solanacea vegetables, and in the remaining groups outside services were related to treatment of a plantation and harvesting of vegetables. In cultivation of root vegetables, a low percentage (0.7%) of works was performed as a part of services while the remaining part was carried out as a part of own works. Only, cultivation of Cucurbita and bulb vegetables required the use of services in the form of help in harvesting of plants. In case of Cucurbita vegetables, outside services constituted 53.30% of the total inputs and in case of root vegetables, it was only 3.6%.

Figure 3 presents the amount of energy inputs with reference to 1 ha and 1 tonne of the product. The average energy inputs incurred in vegetable production were 6380.3 kWh·ha^{-1}. The highest occurred in bulb and root vegetables production technology. A great impact on such high energy inputs was by transport that consumes majority of inputs. On the other hand, the lowest inputs were incurred for cultivation of Solanaceae vegetables 1052.5 kWh·ha^{-1}. To compare, the size of inputs in traditional farms is within 9000 (for root vegetables) to 16 000 kWh·ha^{-1} (for root vegetables) (Kowalczyk, 2002). Such a great diversity results from both varied activities as well as multiplicity of the performed treatments.

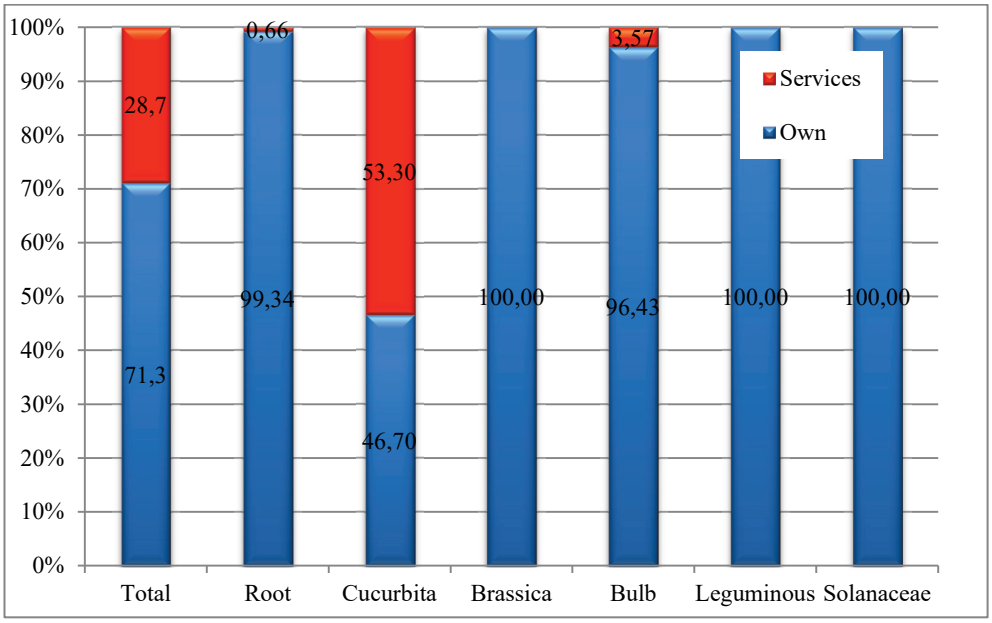

Figure 2. Labour inputs structure in vegetables cultivation technologies

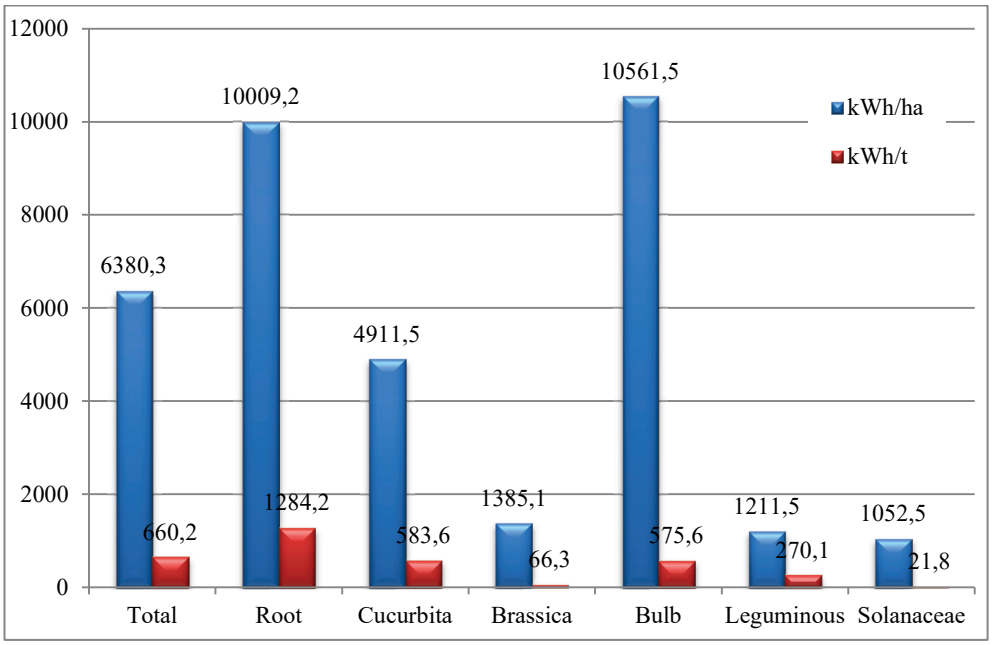

Figure 3. Objectified labour inputs ($kWh \cdot ha^{-1}$ and $kWh \cdot t^{-1}$)

The average size of inputs incurred on a tonne of vegetables was 660.2 kWh. The highest inputs incurred on produced tonnes of root vegetables – 1284.2 kWh·t^{-1} while the lowest for a tonne of Solanaceae – 21.8 kWh·t^{-1}. The size of energy inputs for cultivation of brassica vegetables was 10 times lower than the average size of input on vegetables. In the remaining groups, inputs are at a similar level and do not exceed 584 kWh·t^{-1}.

Figure 4 presents the structure of energy inputs in cultivation of vegetables with a division into field and transport works. It was concluded that on average, for all analysed production technologies, input on field works constituted 16.7% and on transport works 83.3%. It mainly results from the extended time of the transportation process during harvesting (loading of a transport mean) and multiplicity of rides (from a field to a farm, from a farm to a consignee, from a field to a consignee).

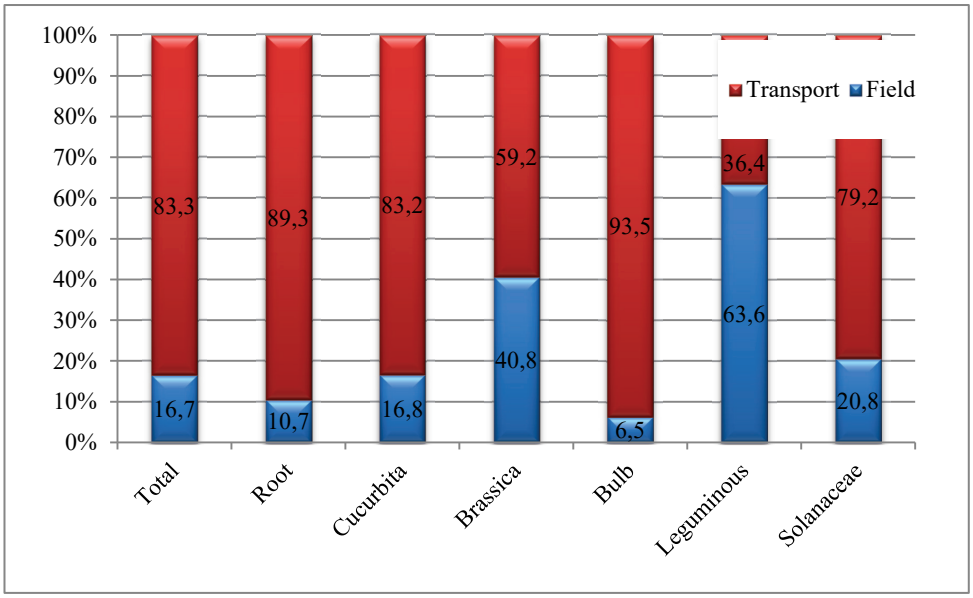

Figure 4. Energy inputs structure in technology of vegetable cultivation

The highest participation of transport works in the total works was reported in cultivation of root vegetables 89.3%. Contrary, a similar participation of those works is in case of Cucurbita and Solanacae vegetables. The lowest participation was incurred in cultivation of leguminous plants 36.4%.

Conclusions

1. The highest inputs of labour per a unit of production area and 1 tonne of a product was incurred in production of Cucurbita vegetables – 1883.1 and 547.74 man-hour, while the lowest of Solanacea vegetables – 342.8 and 7.11 man-hour.
2. From among all analysed groups of plants, the highest energy inputs were incurred in cultivation of root and onion vegetables (10009.2 and 10561.5 kWh·ha^{-1}) and they were 3 times higher than in traditional farms. Contrary, the lowest inputs were incurred in cultivation of brassica and Solanaceae vegetables (1385.1 and 1052.5 kWh·ha^{-1}).
3. In order to reduce the human and objectified labour, changes in vegetable cultivation technologies are necessary with regard to simplification of production and a higher level of field works mechanization. It is also necessary to replace a machinery park with more efficient machines, and to purchase machines, particularly for harvesting of vegetables.

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POZIOM I STRUKTURA NAKŁADÓW W GOSPODARSTWACH SPECJALISTYCZNYCH

Streszczenie. Celem pracy było określenie wielkości nakładów pracy żywej i uprzedmiotowionej w wybranych gospodarstwach specjalistycznych zajmujących się uprawą warzyw. Zakresem pracy objęto badania przeprowadzone na terenie Polski południowej w 50 gospodarstwach ekologicznych nastawionych na produkcję warzyw. Na podstawie szczegółowych badań określono wielkość i strukturę nakładów pracy oraz energii wykorzystanej w procesie produkcji. Największe nakłady pracy w przeliczeniu na jednostkę powierzchni produkcyjnej i 1 tonę produktu ponoszono przy produkcji warzyw dyniowatych – 1883,1 i 547,74 rbh, natomiast najmniejsze warzyw psiankowatych – 342,8 i 7,11 rbh. Spośród wszystkich analizowanych grup roślin największe nakłady energetyczne ponoszono w uprawie warzyw korzeniowych i cebulowych i były one 3-krotnie wyższe niż w gospodarstwach konwencjonalnych. Najniższe natomiast nakłady odnotowano w uprawie warzyw kapustnych i psiankowatych.

Słowa kluczowe: wielkość, nakłady, struktura, gospodarstwo, specjalizacja

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