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MECHANIZATION OF SMALL FAMILY FARMS IN POLAND

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Abstract: *One of the main problems of small family farms is mechanization of farm works. However, machinery ownership is limited due to lack of funds. One of the possible solutions is to develop cooperation in machinery usage by group of farmers. Polish farming is traditionally very fragmented with the average farm area is around 10.3 ha, and 54% below 5 ha of UAA. Such small acreage affects the level of mechanization, making it very limited and inadequately low. Approximately 1.4 million farms are using almost 956,000 tractors, however their age and quality are key limitations in the introduction of new technologies. The paper presents common forms of collaboration between farmers to provide better access to machinery under Polish conditions.*

Keywords: *small farms, mechanization, farmers co-operation*

JEL Codes: *Q16*

INTRODUCTION

It is evident that the current agriculture does not allow a family farm to operate on its own without collaboration with other entities. Such statement applies not only to the marketing of the products but also to the mechanization of production processes. Examples of different types of partnership, applied not only in the European countries, where the farmers strongly cooperate within market environment as well as with each other, indicate advantages and positive aspects of collaboration. The need for collaboration covers also production mechanization, in order to limit or avoid the high investment level, to increase work efficiency and to obtain extra income.

Farmers' collaboration, in terms of planning and realization of work activities, should improve the economic results of farms as well as quality of life for farming families.

STRUCTURE OF POLISH FARMS AND LEVEL OF MECHANIZATION

Poland is a country with big diversity in terms of farms area structure (Table 1). That diversity is regional - in the west and north of Poland, the average farm area is higher than in other regions. There are regions, especially in the eastern part of Poland with highly fragmented farms (Małopolska region - average farm area - 3.99 ha) and also regions, like Zachodniopomorskie, with the average area of 28.68 ha.

The average age of the farmer is ca 47 years and, more or less, every fifth farmer is younger than 40 years. The trend noticed in the last years is the increase in the farm areas and reduction in the farmers' age.

Practically every farm with the area above 5 ha has a tractor and a set of basic machines. The average power of tractors is ca. 40 kW and their age more than 23 years. Only farms above 50 ha have full complement of machines to cover all required jobs.

Table 1. General characteristic of agriculture in Poland (2016)

No	Specification	Value
1	Number of farms above 1 ha	1,410,704
2	Average farm arable area	10.31 ha
3	Number / Percentage of farms below 5 ha	759,900 / 53.8%
4	Number / Percentage of farms above 10 ha	340,900 / 24.2%
5	Number / Percentage of farms above 50 ha	34,700 / 2.5%
6	Area distribution of farms above 50 ha	25.7%
7	Average age of farmers	~ 47 years
8	Percentage of farmers below 40 years of age	22.8%
9	Number of tractors	953,906
10	Percentage of tractors with power more than 100 kW/136 HP	6%
11	Average power of tractor	~ 40 kW/54,4 HP
12	Average age of tractors	~ 23 years

Source: Own preparation basic on (*Charakterystyka… 2017*)

THE WAY OF FARMERS COOPERATION

Proper realization of agricultural activities requires access to many machines and equipment, which in general is very expensive (Culpin 1975). It is quite normal, that in case of small farms with small areas and low income, it is not possible to keep own machinery. That is despite the support by EU funds which has a strong impact on costs reduction. One of the other possible solutions is collaboration between farmers (Kooperationen… 2005, Lorencowicz 2006). In most cases, farmers collaborate with each other both formally and informally, using a variety of methods for work organization and to settle costs and efforts. It is typical in countries with majority of small, few hectares, farms but also in case of bigger farms, even with areas of hundreds of hectares (de Toro and Hansson 2004).

The possible solutions for farmers' collaboration can be classified as follows (Landers 2000, Theunissen 2002, Weshe 2004, Witney 1988):

- neighbours' cooperation,
- machinery co-operatives,
- machinery syndicates,
- machinery rings.

Neighbours' cooperation is the traditional form of collaboration and is also very popular in Poland. It can be contract work or machinery exchange. It is recommended that the jobs are accounted for, but it happens quite rarely. In practise the settlement of cooperation depends on local conditions and customs.

Machinery cooperatives are hardly found in Poland. In that type of collaboration, the purchased machines belong to the cooperative and the jobs done are accounted according to agreed rates. One of the reasons for that form not to be popular in Poland is the negative experiences from the communist period.

Machinery syndicates or pools are appropriate solutions in case of specialised machinery. Members of syndicate are co-owners of machinery. Once again, the pools created can be formal or, more often, informal. It is strongly recommended that the syndicates would operate on the basis of agreed rules and would use proper accounting procedures.

Machinery rings are practically unknown in Poland. In 1990's there were some attempts of creating rings however they did not survive. That form of cooperation has a lot of advantages and is popular in Germany and some other European countries. In recent years the rings are evolving and currently it is not only the form of organization of machine work but a system, which allows also for collaboration in terms of purchasing of means of production as well as trading of agricultural products.

There are a lot of advantages of farmers' collaboration. These are:

- reduction in the cost of machine operation, mainly due to reduction of fixed costs,
- savings in cost of mechanization,
- reduction of investments outlays,
- improvement in access to new technologies,
- improvement in specialization hence increase in the income,
- extra income from additional activities,
- increase in work effectiveness, which can give farmer more free time.
- Also, the sole ownership has some advantages, such as:
- adding value to farm business in the form of an asset,
- timeliness and flexibility of machinery usage,
- matching implement to farmers situation in comparison to using contractors or belonging to a syndicate,
- ability to increase income via contracted work.

Although, the advantages are very beneficial and important but in case of small farms, financial limitations are in most cases the unbreakable barrier.

Collaboration of farmers - Case Study

Investigation in order to assess cooperation ties created between farmers was done in 2004 (Kowalczuk 2005, Lorencowicz 2006). Study covered all 20 farms from one village. Structured interview was used to collect the data.

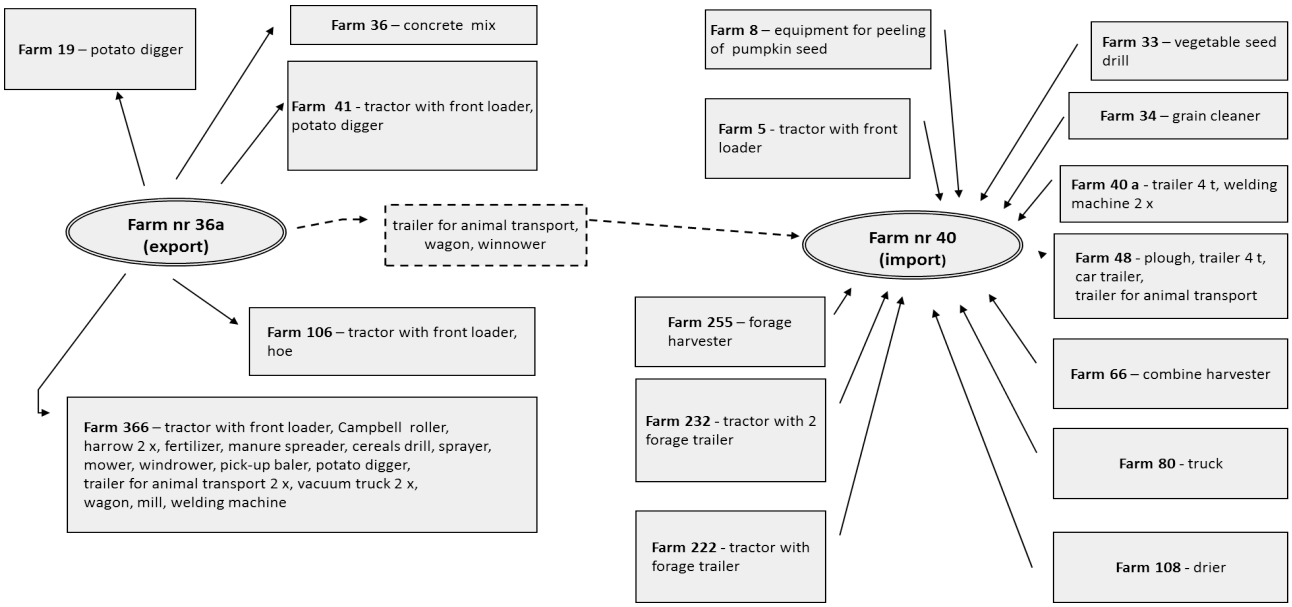
The average arable area of farms was 24.83 ha (ranging from 10 to 46 ha). They were equipped in tractors (from 1 to even 4, with average of 2.3 tractors per farm) and set of machines (from 14 to 32 items). Almost 50% of the farms had combine harvesters (9 items) and their technical equipment was better, both in terms of number as well as quality, in comparison to the region average. The above was due to the specialised production and also to the fact that their average size was more than 3 times bigger than the region average. However, despite higher income, a lot of machines were old, and the farms still used horse cart as the form of transport. The average age of tractors was 16.3 years whereas combine harvesters - 20.9 years. It is worth noting that even such old machines were used for cooperation. The actual reason for collaboration between farmers was not a single farm had all necessary and required machines.

The most popular machines to be taken from outside (import) were transportation trailers, vacuum tank spreader and combine harvesters. Those three machines together constituted 25% of all collaboration cases, whereas in total 36 types of machines took part in the cooperation. The most popular machines to be taken outside (export) were transport trailer and tractor (17% of cases) whereas the rest cases (83%), were covered by 45 different tools, machines and tractor equipment. All farmers utilized part of technical equipment within machine sets. Depending on the farm, it was from 1 to 11 machines. There were 24 types of machines used in that way, with half of the cases for machines for sowing and planting. Typically, such machine set was created by two partners, but there were five cases of 3 partners, three cases of 4 partners and even one case of 7 partners. There were also cases of cooperation in case of other machines useful in farm work as chain saw or workshop equipment.

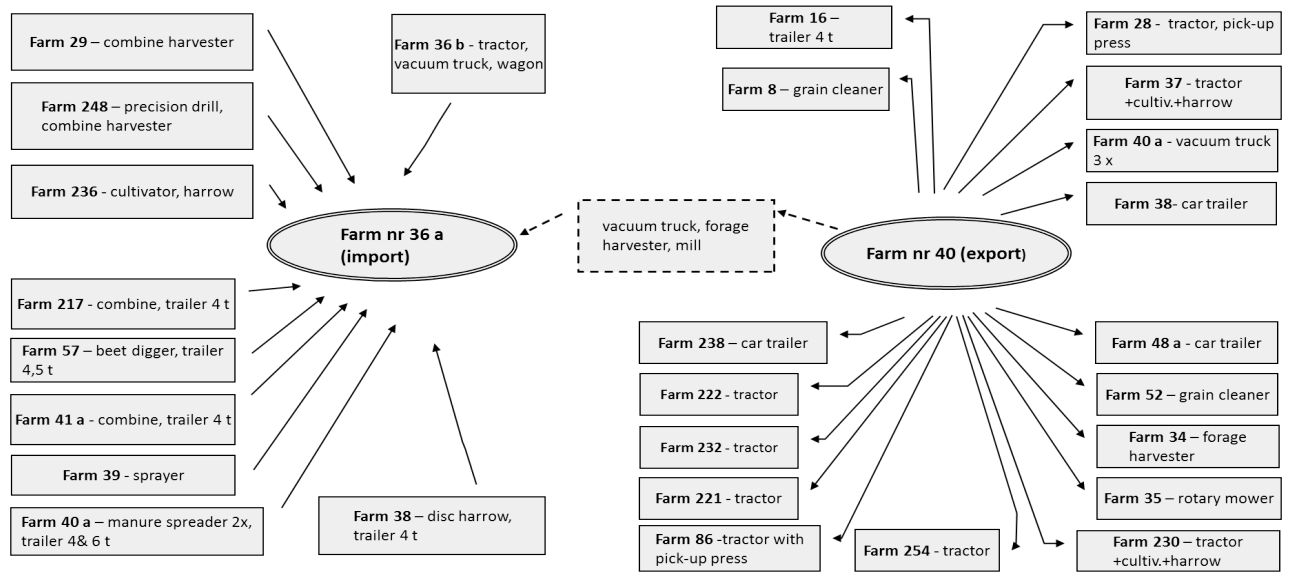
The application of own technical equipment outside of the farm increased the yearly usage from few to few dozens of hours. The most used outside machines were: manure spreaders - 315 hrs (mainly in transport), tractors - 228 hrs and transportation trailer - 196 hrs. Despite such broad range of cooperation, the main form of settling was non-monetary such as manual labour or machine work. Interestingly, the farmers more often gave information about monetary settlements for outside machines (import) than their own machines (export). Such asymmetry can be attributed to fear of the farmers to disclose extra income.

Figure 1 presents ties for two selected farms. Apart from small, mutual cooperation, there were several other connections with other farms in the system. Farm no. 36a exported machines to other five farmers and imported from ten, while farm no. 40 exported machines to seventeen

farmers and imported from twelve (excluding farm no 36a). This example indicates large and complex system of cooperation; the above example was no exception within investigated farms.



a) farm 36a - export, farm 40 - import of machinery work;



b) farm 36a - import, farm 40 - export of machinery work

Figure 1. Example of cooperation ties of 2 selected farms.

Study proved that, apart from seldom cases, there were no isolated farms and cooperation in terms of machinery was common. Such cooperation was mainly informal, and farmers did not create any rules (for instance in the form of written agreements or regulations). Relations between partners were formed by local tradition and different type of neighbour and family connections. In general, it could be estimated that access to other than own technical equipment increases the level of work mechanization. However, in the Polish conditions, it also reduces production costs from 25% to even 40%.

It is envisaged that the level of cooperation can be stimulated not only by advisory activities but also by appropriate financial schemes encouraging joint machines purchase or increase of its usage, for instance in service.

CONCLUSION

Farmers' cooperation is an important form of satisfying technological needs in case of fragmented agriculture; at the same time, it reduces the costs and outlays. It allows the farms to fulfil the requirements for sustainable agriculture improving, at the same time, the quality of life for farming families.

According to farmers under investigation, the most important factor in favour of collaboration was lack of own equipment and, in case of elderly farmers, limited possibility of own work. Despite relatively low economic gain and frequent use of non-monetary forms of settlements, the farmers' collaboration practised throughout the years, afforded proper operation of the farms and protected their owners in case of lack of technical means.

It can concluded, that farmers cooperation, also in the aspect if machinery usage and work organization, improves the sustainability in social and economic areas.

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