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Experiences on different types of on-farm research in Eastern Finland

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Abstract

Three different methods of conducting on-farm research were tested during the growing season of 2013 on Finnish organic farms. The yield of clover-grass silage was measured by the farmer using his own machinery and by small plot measures of 0.25 m^2 taken by a researcher. Different pea-cereal mixtures were tested in two fields and yields were measured by farmers using a combine harvester equipped with scales. Samples for feed quality analysis were collected by an advisor from several legume-cereal-whole-crop mixtures on farms. There was no preference for different methods of conducting on-farm research based on these cases. More important was to find the best way to answer the actual question. These kind of on-farm research actions were a rapid way to answer to the needs of farmers. Observational actions were most suitable to be conducted by a researcher or an advisor in the small plots, but the overall yields of fields or larger plots were better to harvest with farm-scale machines.

Introduction

In Finland, as well as in many other countries, on-farm research is becoming more and more common. The reasons are many-fold. Agricultural research stations are closed down due to economic constraints. Instead, applied field trials have been carried out in cooperation with farmers. Advisors consider on-farm research as a new and efficient tool to show for farmers good cultivation practices. For farmers it is an attractive way of testing suitable farming practices in the environment of their own.

There can be a range of types of doing on-farm research. An important part is to involve the farmers in the research process. The involvement of farmers can vary from on-farm trials that are designed and carried out by researchers on farms, through to research in which farmers set the agenda, design the assessment methods and carry out the assessments themselves. It is important that the outcome measures are of meaning and high value both to researchers and farmers (Lockeretz & Anderson 1993).

In eastern Finland, three different ways of conducting on-farm research were used by two projects during the growing season of 2013. In SOLID project (Sustainable Organic and Low Input Dairying; EU FP7 grant agreement n^o FP7-266367; www.solidairy.eu), one work package concentrated in developing participatory research where on-farm research was an essential part of the actions. The other project was a nationally funded Skarppi project, where the aim was to develop local beef production. All on-farm research actions aimed at increasing the self-sufficiency of farms in their protein feeding of cattle by developing the cultivation practices of the protein crops.

Material and methods

The first on-farm research case was a combination of small plot measurements and use of farm scale harvester by the farmer. The aim was to increase the protein content of the first cut of a mixed red clover (*Trifolium pratense* L.) and grass (*Phleum pratense* L., *Festuca pratensis* L.) silage on the organic farm. The aim was to increase the clover content of the yield by using a pinch cut. The trial included an early spring pinch cut of grass to suppress grass growth in relation to red clover. This should give more time for red clover to develop and produce higher proportion of red clover into the first silage harvest. The pinch cut trial was carried out on two fields of an organic farm. The fields were divided into two parts, and the other part was pinch cut on May 31 while the other part was left untreated. In the previous year 20 t ha^{-1} organic slurry was directly injected into the red clover grass. The botanical composition, yield and height of clover and grasses including apex height were measured at the time of pinch cut by a researcher. The botanical composition and protein content as well as the digestibility were determined in the first silage cut on June 12.

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The yield was measured both by small plot sampling (0.25 m^2) with five replicates and by weighing machine harvested yield from around 5 000 m^2.

The second case of on-farm research was carried out totally using farm scale machines. On two organic dairy farms, five mixtures of peas (*Pisum sativum* L.) and cereals (spring wheat; *Triticum aestivum* L. or spring oats; *Avena sativa* L.) were used. The aim was to find out the most productive pea cereal mixture with a high pea yield and high quality for grain. The role of the cereals is to prevent the stand from lodging, but cereals might also shade the peas and smother them out. All the mixtures were sown on the same field in the spring by the farmer. The seeds of peas and cereals were in different boxes of the sowing machine and the amount of seeds could be adjusted electronically from the tractor. Establishment was observed in June by the advisor. The yield was measured by the farmer using a combine harvester that was able to measure the yield from the harvested seed flow. Legume and protein content of the yields were determined from the samples taken by the farmer.

The third case included collection and analysis of plant samples from whole-crop silage stands on organic farms. Altogether, nine farmers cultivated legume-cereal mixtures for whole-crop silage in 13 fields. Legumes in mixtures were vetch (*Vicia sativa* L.), fodder pea (*Pisum sativum* L.) or faba bean (*Vicia faba* L.). The cereals were spring wheat (*Triticum aestivum* L.), spring oats (*Avena sativa* L.) and/or spring barley (*Hordeum vulgare* L.). The cropping practices were done by the farmer and the samples were taken from small plots (0.25-0.75 m^2) by the advisor. Samples were weighed for yield and sorted by species for botanical composition and analyses of protein content and digestibility.

Results

Spring 2013 was warmer than in average resulting in more vigorous and rapid early growth of red clover than usually. The swards were pinch cut when height of grass averaged 40 and 47 cm in the first and the second field, respectively. In the same fields, the height of red clover averaged 26 and 30 cm, respectively. Often difference in height between grass and red clover is greater than this time. The apex height of timothy averaged 8 and 20 cm, respectively. The idea was to cut timothy apex without damaging red clover. This was not possible under these circumstances and it was decided to pinch cut at the height of 30 cm in both fields.

Time between the pinch cut and the first harvest was less than two weeks, which was too short for red clover to develop and to increase protein content of the forage. Clover content did not differ significantly between treatments and fields, but total dry matter production was decreased due to pinch cut in both fields. The decrease was greater in the field which was longer at the time of the pinch cut.

There was a difference between methods, when comparing yield data measured by small plot sampling and by weighing system of the farmer's harvest machinery. Yield of large scale harvesting averaged 63 % of that from small plot sampling, but the difference was constant between fields and treatments. Thus the conclusion from the results was the same despite the harvesting method although yield data was at the different level according to measuring method.

The total yield of different pea-cereal mixtures did not differ even though the amount of peas in the seed mixture varied from 50 to 75 %. Pea contribution in the yield varied according to its contribution in the seed mixture. Peas were the most valuable fractions for the protein content. The other aim of the trial was to study whether wheat or oats is a more suitable companion for pea. This could not be fully evaluated since the fertilization rate of manure on the fields differed. The lodging was severe in the field with higher manure application.

The information about the contribution and quality of the different species in the whole-crop silage yield was interesting. The results confirmed the earlier research results (Nykänen et al 2009). It was important for the farmers to see how these results worked in their fields. Most probably farmers will change their cultivation techniques according to these results to obtain more protein and higher digestibility of the forage.

Discussion

These kind of on-farm experiments were easy to carry out because of good machinery and high interest of the farmers. Farmers were very keen on the results as the research question came from them. So establishment of the experiments caused no major difficulties because farmers were working themselves with the aid of high-tech machinery. It was also useful to get the information about the fertilization even though it was primarily not a target. On the other hand, the performance of whole-crop silage trials was convenient for farmers since the advisor took all the samples and measurements.

The confounding effects of variable use of manure as fertilization and soil types in different fields hindered interpretation of the results. More fields under investigation could have helped in this problem, but that would have made the experiments more expensive.

The samples were analysed in a commercial feed laboratory. Results were provided fast with low cost, but their reliability was lower than that of scientific laboratories. On the other hand, those laboratories are used by farmers in their every-day farming and they have to make the decisions based on them. In some cases, the experiments could not be established due to time constraints of the participating farmers, which changed the plans and affected the results.

The most important phases in the on-farm research process were the discussions before and after the experimental work. Discussions took place together with farmers, advisors and researchers to define the questions, and to conclude from results and experiences afterwards. Successful cooperation of networking farmers, advisors and researchers was shown in these cases. Targets to get more information for the farmers themselves and to disseminate to other farmers by professional magazines, Internet and open field days by trials were met.

We need to find ways how to complement scientific work with on-farm research. A scientific debate should be initiated whether on-farm results will be valid for scientific and congress publications, and funders should be aware of different ways of conducting research.

Conclusions

Under scarcity of funds for research on organic production, on-farm research is a valuable tool to develop the sector. There was no preference for different ways of doing on-farm research based on these cases. More important was to find the best way to answer the actual needs and questions. The interest of the farmer was the key point, when there was a need to do extra actions by him. In many cases on-farm research was a rapid way to give practical answers and increase both organic production and common knowledge in the topic. This kind of work was valuable also for science. Observations and measurements in the small plots could be randomized and replicated sufficiently to decrease variation and meet scientific demands for statistical analyses. If there was a chance to introduce a number of farmers and large-scale fields to participate, validity of the study increased also with farm-scale harvesting machinery. Otherwise variation between fields was demanding to be managed.

References

Lockeretz, W., Anderson, M., 1993. Agricultural Research Alternatives. Vol 3. University of Nebraska Press, Lincoln, 239 p.

Nykänen, A., Jauhiainen, L. and Rinne, M. 2009. Biomass production and feeding value of whole-crop cereal-legume silages. Agronomy Research 7 (Special issue II): 684–690.