In stockless organic farming even 2 – 4 fold field area is needed to produce equal amount of product compared to conventional farming without fallowing. Integration between livestock farms and stockless farms is in a key role to improve organic farming.

Recycling is a must!

Critique against organic agriculture

The most important argument against organic agriculture is low yield per hectare and because of that high adverse total environmental impact per kilogram of product (table 1). Critique is justified to some extent. Roughly half of the organic farms are stockless in Finland. Stockless farms can provide nitrogen either by purchasing manure from conventional neighbour farms (or purchasing some other organic material from outside of farm) or by green manuring.

Example in practice	Green manuring (% of total area)	Yield (relative)	Arable land (relative)
Conventional production	0	100	1
Organic livestock farm	0	70	1,4
Organic stockless, "normal" yield	30	70	2,0
Organic stockless, poor yield	30	50	2,9
Organic stockless, "normal" yield	50	70	2,9
Organic stockless, poor yield	50	50	4,0

Table 1. Calculations of arable land requirements based on assumptions of different yield and green manuring. Figures are hypothetical, the yield of conventional production without any green manuring is set 100 and requirement of arable land is set 1 as comparison to equal amount of production by other combination of green manuring and yield level.

Most of the stockless organic farms are located in southern Finland and it is very difficult to find any manure to buy from reasonable distance. It is obvious that green manuring plays a key role in nitrogen management at large number of organic farms in Finland. According to statistics almost 20 % of total organic cultivated area in southern Finland is some kind of fallow – i.e. most likely used for green manuring. If the average proportion of fallow is 20 %, it is obvious that there are a number of farms fallowing 30 % or even up to 50 % of their cultivated area.

What is wrong with stockless farming?

It is easy to see that there is no recycling of nutrients at all in stockless farming. Utilization of nitrogen is not very efficient: there are always some losses of nitrogen during green manuring and specially right after it. Typically the nitrogen input with annual green manuring crop is around 100 kg/ha. The annual outflow of nitrogen in form of grain yield (2 t/ha) is 40 kg. If green manuring area is 50 % and the yield is still 2 t/ha, utilization rate is only 40 %.

All the other plant nutrients must be provided from outside the farm mainly in inorganic form. In the long run mineralisation is an insufficient source and gets exhausted. The annual outflow of nutrients in form of grain yield (2 t/ha) is roughly 7 kg phosphorus and 12 kg potassium.

Differences between stockless farms and livestock farms

Farming with livestock has several advantages compared to stockless farming. Some advantages are common for any livestock farming, but the most advantages are gained only on the cattle (=ruminants) farms.

Only a minor fraction of the nutrients taken up by annual yield is flowing out from the livestock farm, because the major fraction of nutrients is recycling in form of manure. Total nutrient outflow is roughly half compared to stockless farm.

No green fallow is needed, because legumes can be grown in large proportion (50 %) and manure is available. In addition just about any kind of crop can be utilized on cattle farm, i.e. the risk of crop failure is much lower than on stockless farm.

There are no statistics available to proof if there is any difference in grain yields between livestock farms and stockless farms. However, the yield from grasslands is higher than grain yield (Figure 1). The total yield level of organic livestock farm can be estimated 70 % compared to conventional livestock farms. Based on some nutrient balance models nutrient loading on organic dairy farms is only 50 % compared to conventional. It is very likely, that this type of organic production has less adverse environmental impacts per hectare and per kilogram than conventional production.

Integration between grain and livestock production?

Roughly 80 % of total arable land in Finland is used for fodder production. One third of arable land is cultivated grassland. It means that no stockless farming nor green manuring is necessary if livestock production was evenly distributed. It is unrealistic to set the goal that all the farms are livestock farms. However, it is realistic to set the goal that no green manuring is needed in organic production. Thus, close co-operation between the farms is necessary to minimize green manuring.

In order to manage organic production without any green manuring there should be balance between leguminous crop and livestock. The optimum seems to be around 40 % leguminous grasslands, but variation between 30 – 50 % is possible. It is very likely that even less than 30 % leguminous grassland is enough, if some other leguminous plants are included into crop rotations or intercropping methods are used.

Sustainability and stockless organic farming?

Very often organic farming, sustainability and vegetarian diet are put together. There is no doubt stockless farming is by far more sustainable compared to livestock farming. However, as far as remarkable proportion of food is based on animal products there is no reason to separate crop and animal husbandry. Just to remain, 80 % of total field area in Finland is used for feed production.

It would be interesting to hear any opinion about this issue! ■

Pentti Seuri
E-mail: pentti.seuri@mtt.fi
Tel: +358 15 321 2362

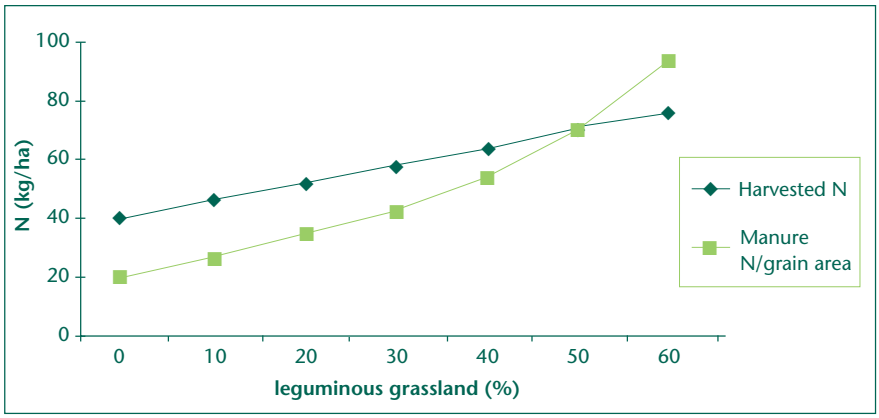

Figure 1. Assumptions: nitrogen fixation on leguminous grassland is 100 kg/ha; harvested nitrogen yield is 100 kg/ha on grass, 40 kg/ha on grain, proportion of recycling nitrogen in manure is 50 % of harvested nitrogen yield.

Pentti Seuri is research scientist at MTT Agrifood Research Finland, Ecological Production in Partala.

Litterature

Grönroos, J. and Seppälä, J. (eds.) 2000. Agricultural production systems and the environment. The Finnish Environment 431. (In Finnish with English and Swedish abstracts).

Sverige:

Föreningen Vetenskap för Hållbar Utveckling har bildats!

Den 2 februari, i samband med Edbergdagarna i Karlstad (se sid. 25), bildades Föreningen Vetenskap för Hållbar Utveckling (VHU). Föreningens syfte är att vara en nationell plattform för forskare och lärare inom högre utbildning med koppling till hållbar utveckling. Föreningen ska särskilt värna om tvärvetenskapliga ansatser.

Initiativtagare till föreningen är forskningsnätverket ” Hållbar utveckling och forskning” (HUFO) som koordinerats av ”Statens institut för ekologisk hållbarhet” (IEH).

Styrelsen består av 9 ledamöter med en bred regional fördelning och vetenskaplig kompetens. Ordförande är Docent Tuija Hilding Rydevik, naturvetare som idag främst arbetar med samhällsvetenskapliga perspektiv vid Nordregio, ett nordiskt samarbetsorgan för regional utveckling och planering.

Under 2004 planerar föreningen att bland annat ge ut ett elektroniskt nyhetsbrev, anordna sin första nationella vetenskapliga konferens samt knyta kontakter med liknande verksamheter internationellt. Man ska också utreda förutsättningarna för att ge ut någon sorts vetenskaplig publikation.

Vill du veta mer om föreningen eller bli medlem besök föreningens hemsida: www.ieh.se/forskning/vhu/. ■

Johanna Björklund