



Integrated Farming Topic Sheet no 4 / 2015

Soil Protection in Integrated Farming



Soil protection is paramount

Soils are the basis of agricultural production, and both the conservation and improvement of this valuable resource are essential elements of Integrated Farming (IF). Conserving and enhancing this resource allows produce to be grown on healthy and biologically active soils with sufficient levels of organic matter, good physical structure and high fertility.

In view of the continuously growing world population, merely conserving soils, however, is not enough. Maintaining and enhancing soil life, replacing nutrients extracted with harvested products, maintaining and enhancing levels of soil organic matter as an important carbon sink and particularly avoiding damage to the soil such as compaction and erosion are key aspects. Only soils which are fertile and undamaged can be used for the production of sufficient and high quality food, feed, fibre and energy in the long run.

Dairy farm and 'on-farm dairy' Thiry in Schouweiler, Luxembourg

The Thiry Farm in Schouweiler, Luxembourg, is located south of the capital and more than just an efficiently run dairy farm. With 62 ha pasture and 40 ha cultivated land, a herd of 60 dairy cows and 125 fattening bulls, the Thiry family has started their own 'on-farm dairy' processing and direct marketing of milk bottled with 3.5% fat in 2013.



With regard to grassland management, pasture rearing is the hobbyhorse of Claude Thiry. What is even more, the farmer succeeds to bring in line pasture rearing and automatic milking. The stable doors are kept open from spring to fall, allowing the cows to move freely from the milking robot to the pasture. For Claude Thiry, this means reducing costs for concentrated feedstuffs whilst increasing basic ration efficiency. In addition, he keeps the turf unharmed due to a low stocking density of just 1.59 livestock units per hectare and sows diverse grasses, herbs, clover and dandelions for landscaping, erosion prevention and greater biodiversity. In order to further improve the combination of automatic milking and pasture rearing, Claude Thiry participates in the European FP-7 Autograssmilk project. The national association FILL represents Luxembourg in this European project. Claude Thiry equally takes care of his cultivated land. That is particularly true with regard to the protection of soils where a cropping sequence with five different crops such as wheat, corn, oats, peas and alfalfa sets the baseline. Avoiding compaction – and particularly erosion – is also ensured through the integration of intermediate crops such as yellow mustard.



Grassland and stable: connected via livestock trail

Soil is a finite resource. A number of sectors impact soil quality and availability for agriculture: In addition to areas of soil which are used for residential, industrial and infrastructure purposes, desertification and soil degradation may also be caused by agriculture itself. Inadequate tillage practices can cause severe erosion, and working soils with too high moisture contents may lead to lasting compaction. In addition, leaving too little plant residue on the fields without adding other sources of organic matter and depleting soil nutrients without adequate fertilisation (including soil liming) may damage soil fertility and soil structure as well.

Elements of soil protection and soil conservation in Integrated Farming¹

Soil characteristics interact with the availability of soil nutrients and plant growth, and thus are important for the suitability of soils for certain crops, for timing of cultivation, for crop nutrition management and other agronomic measures. Therefore, farmers should have precise information on the soil types which are present on their farm. Soil mapping that includes and marks areas at risk on the farm are the basis of good soil management and conservation.

Cooperativa Agricola Braccianti Massari, Italy

Cooperativa Agricola Braccianti Massari is an agricultural enterprise in the Emilia Romagna region of northern Italy. With an average annual temperature of about 13°C and a precipitation of 600 mm, hot and usually dry summers and moderately cold winters, conditions for arable farming are quite favourable in the area. However,



as soils have a clay content of 40 to 60%, tillage and seedbed preparation can become quite a challenge at times. These soils must be ploughed



in order to break up surface crusts and loosen the top layers. In order to protect their soils whilst still being able to achieve timely operations even under unfavourable weather conditions, the cooperative decided to operate tracked rather than wheeled vehicles. Since 2011, Quadtracs are used for ploughing 40 to 45cm deep. Keeping the tracks outside the furrows avoids subsoil compaction. "Tracks instead of wheels offer excellent traction and – thanks to the very large contact area – superb flotation, little soil pressure and thus effective soil protection", emphasises Luciano Pula, general manager of the Cooperative.

Based on such soil maps, a Soil Management Plan including crop rotation and green cover is the next step. Organic matter improves the stability of the soil structure and prevents the risk of erosion, in addition to bringing nutritional elements to the soil. Crop residues, organic based fertilisers and cover crops must be used to provide sufficient fresh organic material to the soil.

In order to follow the evolution of the physicochemical characteristics of cultivated land in relation to the soil type and the farming system, a soil analysis programme is to be put in place. Analyses should be performed once in the crop rotation and at least every 4 years for chemical analysis and organic matter content. A field by field diagnosis should follow after harvesting to identify areas of potential structural problems and to decide on sub-soiling cultivation, liming, repair of drains, erosion prevention or any other potentially necessary measure.

Management practices

To carefully assess crops' performance and be able to improve future performance, accurate field records of all operations and applications either by crop type or field should be kept.

It is essential for soil protection that a minimum rate of 75% ground cover with trash etc. should be achieved during autumn (high risk leaching period) to reduce soil erosion and minimise emissions and nitrate leaching from bare soil. This should be achieved by surface incorporation / cover from previous crop residues, early established autumn crops or cover crops where possible.

Maintaining soil fertility through improvements in soil structure, porosity and microbial activity aids plant growth. The soil management concept should be used to define most appropriate operations: If soil type, condition and structure allow, conservation tillage should be considered.

¹ http://sustainable-agriculture.org/wp-content/uploads/2012/08/EISA_Framework_english_new_wheel_170212.pdf

Morrison Farm – Soil Case Study



Morrison Farm is a 700h LEAF (Linking Environment And Farming) Demonstration Farm in Ayrshire, UK. Integrated Farming is an integral part of the business which grows fodder crops to supply the predominantly livestock region surrounding them. The soils are a sandy loam. Due to the low value crops produced and a small workforce, much of the management decisions are made to keep costs low. Despite this, many of the techniques and practices used have

actively enhanced the sustainability, performance and workability of soils on the farm. Prior to 1999, Morrison Farm had a problem with soil erosion, in particular after heavy rainfall events. In 1999 the farm made a switch to minimum tillage and in 2012 to strip tillage. The use of minimal tillage techniques since 1999 has improved soil quality across the farm and as a result dramatically reduced erosion. In addition, the soil workability has improved allowing faster access following a heavy rainfall event. This is particularly important in this region which is experiencing a greater amount of heavy rainfall events and less predictable weather. The improved soil structure also allows the soil to recover better and more quickly from adverse weather.



In addition, lowering tyre pressure on fields automatically with technical devices, using larger or dual tyres as well as tandem and tridem axles or tracked vehicles allow for a reduction of pressure that is applied to the soil. New measures and innovative concepts such as Controlled Traffic Farming (CTF) should continually be considered and taken up stepwise where appropriate. In CTF, for example, permanent tracks are established in a field whilst the other parts of the soil surface are not affected by passing vehicles. One key aspect of an IF approach is to continually analyse how practices can be made better for the environment and the economy of the farm. Good soil management is essential to achieve both these objectives.