Evaluating Best Practices examples of Integrated Pest Management solutions on farms

Caroline Drummond MBE
LEAF, Stoneleigh Park, Coventry CV8 2LG
caroline.drummond@leafuk.org

Introduction

With increasing pressure on the world’s natural environment and resources it is essential that we develop farming systems that are low impact on the environment but also highly productive in meeting the needs of a growing global population. The options are numerous and varied, ranging from low intensity, highly productive farming systems to balanced approaches, such as Integrated Farm Management (IFM) and even vertical farming. All have strengths and weaknesses, opportunities and disadvantages. Getting the balance right to ensure economic prosperity, environmental sensitivity and social gain are critical, to address food security and protect and enhance our valuable resources.

LEAF (Linking Environment And Farming) was set up in 1991 with a view to develop more sustainable farming systems and encourage a better public understanding and engagement in farming and countryside, through the development and promotion of IFM and a key part of this has been building on the foundations of Integrated Pest Management (IPM).

LEAF has been active in creating change, encouraging a more whole farm approach through a range of methods, including the development of technical management tools; a network of demonstration farms; markets opportunity and political influence. LEAF also runs Open Farm Sunday, the industry’s open day where over the last 6 years some ¾ million people have gone out on to farms (LEAF Open Farm Sunday, 2011).

However, the challenges that face us all are complex, systems need to be developed that are supportive of ‘tried and tested’ traditional methods and encourage the adoption and development of new technologies. It is evident that there will need to be a range of farming systems that can be adapted to specific areas and regions. Furthermore a collaborative approach will be necessary, with farmers working across landscapes and catchments. It is a case of building on some of the valuable work LEAF has put into practice with farmers in the UK and across the globe through encouraging the development and promotion of Integrated Farm Management, a system that is developed with the input and involvement of the whole food chain, including farmers, environmentalists, industry, retailers and consumers.

The Options

When the UK Government’s Chief Scientist Professor John Beddington (Beddington, 2009) warned of a "perfect storm" with food shortages, scarce water and insufficient energy resources threatening to unleash public unrest, cross-border conflicts and mass migration as people flee from the worst-affected regions, many farmers across the world listened hard as they summed up the pros and cons of increases to farm gate prices with crop failures. The challenge of the future is to ensure that we develop farming systems that are truly sustainable and engage with the public all along that journey (Foresight Report, 2010). And to follow are just some of the guiding principles that underpin crop health and productivity through the adoption of Integrated Farm Management forming a robust framework to
support sustainable production and consumption, including some examples of some personal experiences.

Sustainable farming (Fig 1) is core to LEAF’s business, through encouraging change and improvement in the field through the adoption of Integrated Farm Management, as in the diagram below.

![Figure 1 Developing the route to sustainable farming (ECPA)](image1)

Integrated Farm Management (IFM) (Fig 2) is a farming system which is environmentally and socially responsible and ensures the continuity of supply of safe, affordable food, while conserving and enhancing the wildlife of the countryside for future generations.

![Figure 2 Integrated Farm Management (LEAF 2011)](image2)

It is a balance of the best of traditional methods and modern technology. It operates on a whole farm and site specific basis, in a way that is logical, dynamic, practical, achievable and realistic. For LEAF it has been important to produce management tools to support farmers in making the right choices for their business in order to deliver a productive agriculture that is environmentally responsible.
IFM uses and encourages continual improvement in all management decisions across the whole farm, specifically in pest control measures we are looking for those that have minimal impact on the environment and human health and which promote sustainability and profitability. A well established and managed crop will be more competitive with weeds, more resilient to attack from pests and diseases and should require fewer pesticide inputs. It is a dynamic process (Fig 3) that requires a continual challenge of the system to incorporate best practice and new technologies.

**Integrated Pest Management (IPM)** is the starting point to a fully integrated crop health and protection plan, optimising productivity, minimize pesticide use and enhance biodiversity, built on the work of the International Organization for Biological Control (IOBC, 2011) in 1955 to promote environmentally safe methods for pest and disease control in plant protection.

**IPM** means the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment. IPM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms. It is a system of farming designed to be sustainable, it involves using a combination of cultural, physical, mechanical, biological and chemical measures. A well managed IPM management approach provides a cost effective, environmentally sound and socially acceptable method of managing diseases, insects, weeds and other pest in agriculture. As with IFM, IPM is a flexible approach to crop management; an approach that makes best use of all available technologies to manage pest problems effectively, safely and sustainably.

In the evaluation of best practices of IPM and IFM, LEAF has encouraged farmers to actively consider their practices through the use of management tools, such as the LEAF Audit (Fwi, 2011), and farmer-to-farmer dialogue on the network of demonstration farms. The goal of Integrated Pest Management (IPM) is to maintain pest populations at tolerable levels that will not damage the crop health or quality attributes.
The diagram above illustrates the range of options that are important in adopting an IPM approach. One of the primary missions of IPM is to help farmers and growers produce profitable crops using environmentally and economically sound approaches. These IPM tools contribute to a system that produces high-quality, safe, and affordable foods and other agriculturally related products.

IPM incorporates several pest management strategies to:

- maintain crop profitability
- minimize pest selection pressures and
- minimize environmental impact.

Once a pest exceeds the economic threshold or reaches a threatening level, it is necessary to determine the best way to prevent unacceptable yield losses. Economic thresholds integrate the crop value and management costs with biological information on the relationship between pest injury and yield. The cost, safety, benefits, and risks of employing various management strategies are weighed and evaluated. Following comments from farmers wishing to develop IFM on their farms in 1993 LEAF developed a self-assessment management tool for farmers, the LEAF Audit. It acts as a useful checklist to ensure these features are part of the management approach. Furthermore with external verification, as
with the LEAF Marque (LEAF, 2011). farmers and growers are able to demonstrate their compliance in the market place.

A recent CCRI study (Mills, 2010) showed how LEAF demonstration farms and members adopting IFM approach benefitted through reduced input use and better management (Table 1).

**Table 1 Economic benefits of IFM**

<table>
<thead>
<tr>
<th>Economic Benefits</th>
<th>Example saving per farm, per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Through the implementation of IFM principles and the use of the LEAF Audit On-farm Cost Savings</td>
<td></td>
</tr>
<tr>
<td>Reductions in fertiliser and chemical inputs</td>
<td>£2,500 - £10,000</td>
</tr>
<tr>
<td>Reductions in fuel cost</td>
<td>£5,000</td>
</tr>
<tr>
<td>Reductions in water use – horticulture</td>
<td>£14,000</td>
</tr>
<tr>
<td>Reductions in water use – livestock</td>
<td>£700</td>
</tr>
<tr>
<td>Reductions in disease treatment costs</td>
<td>10%</td>
</tr>
<tr>
<td>Reduced regulatory costs</td>
<td></td>
</tr>
<tr>
<td>– 54% of members felt LEAF membership helped them deal with environmental regulations including being prepared before regulations coming into force and reduced inspection risk.</td>
<td></td>
</tr>
<tr>
<td>Additional Income</td>
<td></td>
</tr>
<tr>
<td>Hosting of LEAF Events or Open Farm Sunday</td>
<td>£2,000 – £7,000</td>
</tr>
<tr>
<td>Increased direct sales</td>
<td>£8,000</td>
</tr>
<tr>
<td>Agri-environment Scheme income</td>
<td></td>
</tr>
<tr>
<td>– 35% of members felt LEAF membership had contributed to gaining entry to Higher Level Scheme.</td>
<td></td>
</tr>
<tr>
<td>Diversification income</td>
<td></td>
</tr>
<tr>
<td>– improved environmental credentials improving income from diversification such as on-farm tourism and training provision.</td>
<td></td>
</tr>
</tbody>
</table>

Integrated Farm Management (IFM) provides the flexibility to deliver a highly productive agriculture with reduced environmental impact. Advocated by LEAF, IFM has been developed to combine economic, environmental, social and welfare issues with management practices and decisions across the whole farm in a balanced and considered way.

**Seeing IPM in practice**

For those farmers wishing to demonstrate their commitment to IFM with independent, external verification there is the LEAF Marque. It is one of the fastest growing food standards. To date all of Waitrose’s non-organic British fruit and vegetables are grown on certified farms. Overall 20% of the UK’s fruit and vegetables are LEAF Marque accredited together with a growing number of global farmers taking part. However, only about 47% of
the products from certified LEAF Marque farms bear the logo in retail stores, and so there is further opportunity for growth and change.

The IFM and LEAF Marque approach is now also being used by farmers in 54 other countries in Europe, Middle East, South America and North Africa and there are three pilot groups in Kenya. This has been an exciting development with 150 farmer members, with as little as one-eighth of an acre each, receiving training so that they can be certified as farming to LEAF Marque standard (LEAF Annual Review, 2008 and 2009).

Trade policy is the driving force for this standard. Recognising the economic and social significance of export horticulture in Africa, the DFID challenged major UK retailers to increase the flow of African produce to Europe, especially from smaller scale producers. Working with UK retailer, Waitrose the target has been to increase sales of African fresh produce in their 241 stores by 10% of, for example, green beans and peas from Kenya and prepared fruit from Ghana, involving more small scale LEAF Marque accredited farms. This project aims to improve their prosperity and sustainability through the UK market opportunity as well as improve and enhance the Kenyan environment and provide agronomic and management skills for the farmers.

The objectives of the training were to: familiarise the delegates with LEAF and sustainable farming principles and practices; encourage them, through the adoption of Integrated Farm Management (IFM), to produce export quality crops to the LEAF Marque Standard. The project has been successful with some excellent group interaction and discussions as well as farm walks to see the training theory in action. A key part of the work has also been to develop interactive training films using Ghanaian and Kenyan farmers which are widely available to share experiences and ideas. For the farmers taking part long term sustainability is attractive, but reducing costs of production is another incentive. Blueskies Ghana Limited gained LEAF Marque certification for 40 farmer suppliers in early 2009.

"The main benefits are it really helps you produce at lower cost," explains Ernest Abloh, Head Agronomist, who works closely with the farmers. "LEAF Marque is exceptional. You have good record-keeping and attention to detail, and that helps farmers to use integrated pest and crop management practices that help reduce the use of agrochemicals and fertilisers."
The passion of the African farmers is shared by many UK farmers. IFM and the LEAF Marque enable farmers to challenge continually their processes. Good food provided with care and to high environmental standards is identified in-store by the LEAF Marque logo.

Assurance schemes have been developed in response to the significant challenges facing government, farmers and retailers to feed a growing world population and to help protect precious resources and the environment. A recent study commissioned by Defra reveals that not all schemes are based on the same criteria (Lewis et al, 2010). LEAF Marque is leading the way in the environmental labelling of food. The research evaluated a number of schemes and compared how they help to protect the environment. Results showed that LEAF Marque scored the highest marks across a range of criteria and that other, better known, schemes scored significantly less in some important areas. The report calls for a more consistent approach and highlights the need for environmental labelling to be based on a robust, scientific approach.

IFM in the UK

For many of the farmers taking part in LEAF’s work, committing to the adoption of IFM and demonstrating it through the management tools, they are seeing substantial benefits. Nick Rowsell is one such farmer. ‘We’ve been a LEAF member now for eight years. During this time, we’ve taken advantage of the many services LEAF offers and made significant changes to the farm business, starting with the LEAF Audit (LEAF Audit, 2009). It’s a really straightforward management tool to review the whole farming business. We’ve been able to step back and assess what we are getting right and where improvements can be made. Most of the changes we’ve made have helped us save money. Such as:

- Introducing GPS soil mapping to help us target our fertiliser applications, we estimate that this has reduced our fertiliser bill by some 15%
- Installing humidity sensors in the grain store leading to reduced electricity costs
- Carefully monitoring our diesel use and using minimal tillage, our fuel consumption has stayed the same, despite us acquiring new land.

Doing the LEAF Audit helps us stay ahead of legislation. Being a LEAF member is like having invisible armour.’

New approaches for linking environment and farming

It is alarming how little we know about the interactions between our use of land for food production, the environment and society as a whole. Increasing globalisation threatens to diminish the species and cultivars that are traditionally used in most agri-ecosystems. Of some 270,000 known species of higher plants about 20,000 are edible, but only about 7,000 are used in agriculture. Only 20 crops dominate global cultivation, providing an estimated 90% of the dietary energy consumed by the world’s population (UNEP, 2007). Indeed today 80% of the world’s population lives principally on four main crop species: maize; wheat; potatoes and rice.

We rely on biodiversity in our daily lives, often without realising it. The bacteria and microbes that transform waste into useful products, insects that pollinate crops and flowers, and the biologically rich landscapes that provide enjoyment, are but a few examples.

Back in 1993 the introduction of beetle banks, mid field refuges for beneficial insects, demonstrated that given the right conditions, predatory insects and spiders can overwinter in field boundaries and in spring move into the crop, reducing pest numbers significantly. By
providing places for them to spend the winter you can encourage winter boundary densities of more than 1000/m² (GWCT 2012). This stirred the imagination of many arable farmers looking to reduce insecticide use on their land concerned about the impacts of pesticides on non-target species and wanting to increase their biodiversity. Since then beetle banks are abundant, chemical companies have tested and labelled their products to provide better environmental impact assessments including providing detailed Environment Information Sheets, and government stewardship schemes have rewarded farmers to adopt better margin management. As a result of better adoption of IPM, less insecticide is used.

Building on this work and the growing recognition of developing systems that work with, and enhance nature new work is looking at selected flowering plants in field margins to recruit all forms of Functional Agro-Biodiversity, from bees to hoverflies and parasitoid wasps. Once present in numbers these beneficial insects will assist growers in producing their crops in a more sustainable and environmentally-friendly manner.

Trials of the projects multi-functional field margins are currently being undertaken at one of our LEAF Innovation Centres, Stockbridge Technology Centre by science partners on site and at both Lancaster University and FERA. Initial semi-field scale experiments are underway in carrot, pea, brassica and cereal crops, with the intention to move to commercial scale testing in 2012. It is looking to build upon previous research to combine the biodiversity and pest-control benefits of perennial field margins across a horticultural rotation, providing growers with a direct economic benefit in addition to expected subsidies from stewardship schemes. Key to the success of this 5-year project is the selection of flowering plant species for inclusion in experimental field margins that will provide multiple benefits in terms of promoting functional agro-biodiversity. For this purpose a combination of margin plant species have been selected that ensure supply of nectar, pollen, bird food and shelter and alternative prey for natural enemies. This work is vital to build our understanding of the interactions of nature and sustainable food productivity.

The future is not doing more of the same, it is about increasing sustainability at all levels. The real element of change is about growing production, whilst enhancing environmental health, and societal well-being.

This is a global issue, one where we share the problem, as well as solutions. What is critical is that engagement among farmers, environmentalists, industry, government and society when addressing agricultural and farming issues is forward looking, planned, practical and productive. Our policies and practices need to integrate environment, food, education and health more succinctly with clear engagement and communication among farmers and consumers and IFM is one such approach.
References

Idaho State University (2012) www.uihome.uidaho.edu
IOBC (2011). (http://www.uibk.ac.at/bipesco/iobc_wprs_2011/)
LEAF Audit (2009).
LEAF Open Farm Sunday (2011). Successes Shared
Mills, J, Lewis, N and Dwyer, J (2010). The Benefits of LEAF Membership: a qualitative study to understand the added value that LEAF brings to its farmer members. CCRI Report to LEAF (Linking Farming And Environment