RPS

Developing Indigenous Farm Film Recycling in Ireland

Feasibility Study

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TABLE OF CONTENTS

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1 INTRODUCTION

1.1 BACKGROUND TO THIS STUDY

RPS was engaged by the Irish Farm Film Producers Group (IFFPG) to examine the existing recycling infrastructure for farm film plastics collected in Ireland and to examine the opportunities for entrepreneurs to consider the indigenous recycling of this material. This material is currently exported to reprocessors abroad, albeit with some intermediate processing undertaken on some of the material collected under the national compliance scheme[1] in advance of export. The scope of this study was to investigate the feasibility of a successful indigenous recycling industry for this material being developed by entrepreneurs.

With changes and intensification of farming practices, increased volumes of plastic are being used on farms in Ireland. Agricultural or farm plastics are used in both packaging and non-packaging applications. This report is focused on the non-packaging fraction, which is predominantly compromised of silage bale wrap and sheeting used to cover silage pits.

Ireland is one of the few countries in Europe with a compliance scheme for the collection and management of farm plastic; a number of countries have voluntary schemes but only Ireland, Iceland and Andalucía in Spain have specific legislation to make this mandatory.[2] In the Waste Management (Farm Plastics) Regulations, 2001 'farm plastics' is defined as 'sheeting, bale wrap, or bale bags composed mainly of polyolefins, including polyethylene, polypropylene or polyvinyl chloride, which is or are suitable for use for the conservation of fodder.'

1.2 BACKGROUND TO PLASTIC RECYCLING IN IRELAND

There is a reliance on the export market for reprocessing of all types of recyclable plastic waste generated in Ireland. In 2011, 74% of plastics collected for recycling were exported for reprocessing abroad. Reprocessing capacity exists in Ireland but the export market remains prevalent. The dominance of the export market has been due to the market prices international traders are willing to pay and a general acceptance of lower quality material.

Many traditional export countries have enforced stricter rules and inspection regimes in recent years and are demanding higher quality imports. The Chinese authorities introduced the Green Fence initiative[3] in 2013, an intense programme which aims to reduce the import of low quality recyclables or waste. With many of these export markets shrinking it is becoming increasingly important to produce higher quality recyclables to trade on the Irish or export market.

Where the quality of Irish recycled plastic can be improved, then demand for the material is further guaranteed and its potential value increases.

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[1] The national compliance scheme is operated by the IFFPG

[2] Plastics - the Facts 2011 An analysis of European plastics production, demand and recovery for 2010 http://www.plasticseurope.org/documents/document/20111107101127-final_pe_factsfigures_uk2011_lr_041111.pdf

[3] Accessed on 18/06/2013 at http://www.plasticsnews.com/article/20130519/NEWS/130519922/china-s-green-fence-makes-unprecedented-cuts-in-recycled-plastic-imports

A recent *rx3* study of plastic convertors / manufacturers in Ireland[4] showed that there is interest in using recyclate in their operations. It was stipulated that the quality of the recyclate is of primary importance to ensure the quality of their product. The value of recyclate as a resource is recognised by end users but it is important that all members of the supply chain are cognisant of the value of quality recyclable material.

The quality of recycled plastic can be impacted at any stage of the collection and handling supply chain. However it is imperative that it is addressed at source. If plastic is not collected properly at the start of the chain then it becomes increasingly difficult to produce a quality end product for use in recycling.

The Government waste management policy called 'A Resource Opportunity' published in 2012 provides a roadmap for the future of waste management in Ireland. A particular focus is to maximise the resources that can be recovered from waste. The policy highlights the progress made to date in recycling and highlights the importance of producing high quality recyclates and growing indigenous markets. Some policy measures and actions to achieve these objectives include support of recycled materials through green public procurement, and relevant Departments and Agencies will cooperate to encourage the development of indigenous processing opportunities.

The Green Public Procurement (GPP) National Action Plan for Ireland titled 'Green Tenders – An Action Plan on Green Public Procurement' was published in 2012 by DECLG and the Department of Public Expenditure and Reform.[5]

Green Tenders adopts the indicative EU political target of 50% GPP, where GPP means incorporating green criteria into the procurement contract. This target will apply in respect of both the number and the value of public procurement contracts concluded. The focus initially will be on the number, ensuring that as soon as possible, at least half of such contracts will include core GPP criteria – i.e., criteria that are suitable for use by any contracting authority, and address the key environmental impacts. Simultaneously, monitoring of these contracts will also take account of their monetary value, aspiring to meet and exceed 50% of expenditure on public procurement. In the first instance, targets will apply to eight priority product groups.

The Government Policy Statement on Growth and Employment in the Green Economy called 'Delivering our Green Potential' also references resource efficiency and green products and services as methods of job creation in Ireland.[6]

These developments could promote the use of products with recycled content, which could support the reprocessing of farm plastic in Ireland, in order to help implement the policies and achieve the targets while providing markets for recyclate derived from farm film waste.

1.3 EU GREEN PAPER ON PLASTIC WASTE

The Green Paper On a European Strategy on Plastic Waste in the Environment[7], published on 7th March 2013, stated that the "low recycling rates and exports of plastic waste for reprocessing in third

[4] http://www.rx3.ie/MDGUploadedFiles/file/rx3publications/rx3_Plastic_Manufacturers_Survey_2012.pdf

[5] http://www.environ.ie/en/PublicationsDocuments/FileDownLoad,29208,en.pdf

[6] http://www.djei.ie/publications/enterprise/2012/Delivering_Our_Green_Potential.pdf

[7] http://ec.europa.eu/environment/waste/pdf/green_paper/green_paper_en.pdf

countries are an important loss of non-renewable resources, and of jobs, for Europe. The potential for plastic recycling is still significantly under-utilized."

The Green Paper suggests that voluntary actions could 'help significantly ease the problem of plastic waste in the environment and contribute to minimising (natural) resource use.' It suggests that schemes, similar to existing schemes for PET bottles and Vinyl, 'could be set up for collection and recovery of non-packaging agricultural plastics which are easy to recycle due their uniform chemical composition.''

At present the material collected in Ireland is being exported for reprocessing, where the waste is turned into a raw material for manufacturing products such as bin liners, some of which may be imported back into Ireland and sold to Irish consumers.

In keeping with the theme of the Green Paper, there is potential to grow indigenous markets and generate jobs in Ireland by reprocessing this material into a raw material suitable for manufacturing into a variety of products. This recyclate material could either be sold to Irish manufacturing companies (further supporting jobs in Ireland and potentially exports) or exported directly at a net benefit to the Irish economy.

1.4 TRANSITION TO A CIRCULAR ECONOMY

The European Commission is promoting the need for a Circular Economy in Europe, as a driver to Resource Efficiency, which was a key Flagship Initiative as part of the EU 2020 Strategy on Sustainable Growth. In simple terms, in a 'circular economy' instead of a material being thrown away after use, it is reclaimed and reused or recycled as secondary raw materials for new products.[8]

The European Resource Efficiency Platform is calling on business, labour and civil society leaders to support resource efficiency and the transformation to a circular economy and society which offers a path out of the current crisis towards a reindustrialisation of the European economy on the basis of resource-efficient growth that will last.

There is no option but to transition to a resource-efficient and ultimately regenerative circular economy. Our future jobs and competitiveness, as a major importer of resources, are dependent on our ability to get more added material or energy value, and achieve overall decoupling, through a systemic change in the use and recovery of resources in the economy. According to the OECD, this could lead to steady economic growth with business opportunities across the whole economy. [9]

Applying the principles of a circular economy approach to the management of farm film waste in Ireland could deliver a positive outcome in terms of job creation and sustaining economic growth.

[8] http://www.esauk.org/esa_reports/Circular_Economy_Report_FINAL_High_Res_For_Release.pdf

[9] Accessed 03/09/2013 http://europa.eu/rapid/press-release_MEMO-12-989_en.htm

2 OVERVIEW OF FARM FILM PLASTIC RECYCLING IN IRELAND

2.1 INTRODUCTION

In the context of this study, farm film generally refers to agricultural bale wrap or silage sheeting. Bale wrap is a plastic material which is used to cover and wrap bales of grass crops (silage) to protect and preserve fodder material allowing it to be stored and used over the following seasons. Bale wrap is typically made from the plastic polymer LLDPE (Linear Low Density Polyethylene) which has a higher tensile strength than LDPE (Low Density Polyethylene). Silage sheeting is generally used to cover the grass which is placed in a silage pit and is made from LDPE.

These materials generally have a short lifespan and because of the way they are used, collected and stored, the levels of contamination are typically in the order of 50% of the weight recovered. The bale wrap is discarded after one use. The sheeting may be reused depending on its condition, but reuse is typically limited to one instance.

The farm film waste stream is a potentially valuable material with the advantage of being comprised of a monostream high-grade polymer. However, the reprocessing of the farm film into a high quality recyclate is a very complex, expensive and technically challenging process.

2.2 FARM FILM PLACED ON THE MARKET

Table 1 outlines the quantities of farm films placed on the market by IFFPG members in 2011 and 2012. It may be the case that farm plastics from other sources were also placed on the market and supplied to farmers in contravention of the regulations; by the nature of the activity there are no figures for the volumes of this material, however, anecdotal indications are that it could be in the region of 1,000 to 1,500 tonnes (t) per year. It should be noted that the use of farm film, particularly wrap material, varies year on year and is significantly impacted by factors such as weather and grazing conditions.

Table 1: Farm Films Placed on the Market for 2011 & 2012 by IFFPG Members

Farm Films	2011 (tonnes)	2012 (tonnes)	Polymer Type
Bale Wrap	12,592 (84%)	14,289 (83%)	LLDPE
Silage Sheeting	2,378 (16%)	2,858 (17%)	LDPE
Total	**14,970**	**17,147**	

LLDPE is the material predominantly placed on the market; this dominance is expected to continue.
The Food Harvest 2020 projections mean that the quantities of bale wrap and sheeting will continue to increase.[10] An increase in the order of 5% to 10% increase of bale wrap and sheeting on the market is feasible based on the increased agricultural output projections. This could result in more than 18,000 tonnes of farm films being placed on the Irish market by IFFPG members.

In 2012 the IFFPG collected a total of 23,556 tonnes of material (an increase from 20,897 collected in 2011); and 23,213 tonnes of material was sent for recycling in 2012. It has been stated that the

[10] Food Harvest 2020 is a strategy developed by the Dept. of Agriculture, Food and the Marine for the medium-term development of the agri food *including drinks), fisheries and forestry sector for the period to 2020*

contamination rate for material collected in Ireland reportedly ranges between 50% – 60%; so a collection of 20,000 t of farm film waste would yield approximately 10,000 t of recyclate.

Separate to the IFFPG-organised collections, another organisation collects farm plastics outside of the compliance scheme. It is estimated that this operator collects in the order of 1,000 to 2,000 t annually. In addition to the material outside the compliance scheme controlled farm plastic in Ireland, there is potentially more feedstock material available in Northern Ireland, if the potential feedstock material is considered on an all island basis.

It is estimated that approximately 50% of the figures reported as collected and recycled is comprised of non-plastic contamination.

2.3 REPROCESSING OF FARM FILMS

The majority of the farm film waste collected is LLDPE which has different handling properties as well as being much thinner than the silage sheeting typically LDPE. The bale wrap (LLDPE) has a much higher surface area per tonne than sheeting (LDPE) which also makes it more difficult to clean and process.

Due to the nature of the applications where it is used, farm film waste is typically presented with high contamination rates, including material such as soil, stones and residual organic matter, in addition to a high moisture content.

Facilities successfully reprocessing farm films into a recyclate generally contain similar elements of plant, with different configurations which are developed and refined by the operators over time in consultation with the manufacturers of the equipment (shredders, washing plant, dryers, extruders etc).

The process essentially involves a series of shredding, washing, grinding and drying cycles in advance of extrusion and cutting. The processing is very energy intensive due to the hot washing, drying and melting cycles required. Due to the nature of the material and the presence of contaminants, the wear on the processing plant is significant which necessitates regular maintenance and replacement of consumable parts (knives for shredders, motors, belts etc) which is a significant operational cost. The process may necessitate the use of bespoke equipment that can handle the abrasive nature of the material.

The process generally requires significant quantities of water for the washing cycles, which results in wastewater which requires appropriate treatment (with an associated cost). Availability of water is also potentially a constraint and an expense.

In comparing the throughputs achievable at a processing facility, the differences between LDPE and LLDPE are apparent. Plants processing LLDPE typically have a lower throughput than LDPE which makes it a more expensive material to process.

Establishing a processing line which will deliver a product of the required quality and achieving the necessary throughput of material in order to make the operation economically viable requires a significant level of technical expertise and investment.

2.4 REPROCESSING & RECOVERY IN IRELAND TO DATE

To date in Ireland a number of operators have tried to develop farm film reprocessing operations but most have been unable to sustain operations, with several companies going into liquidation or ceasing operations. At present, there is one intermediary farm film (LDPE & LLDPE) reprocessor and one company which has recently re-established that propose to produce a recycled pellet from farm film (predominantly LLDPE) and another company which has recently commenced trials on reprocessing the material.

The intermediate reprocessor has been successfully operating a pre-treatment activity for a number of years, but ultimately this material must still be exported for further reprocessing. The intermediate pre-treatment in this context, relates to undertaking a degree of contaminant removal, shredding and baling prior to export. This allows the plastic waste to be shipped as a Green List material, therefore reducing cost and administrative burden, see Section 2.5.1 for further details.

There are a variety of reasons for the difficulties that reprocessors who have been unsuccessful in producing recyclate on a commercial scale have experienced to date. The main reasons appear to be a lack of the required expertise and a full appreciation of the technical challenges (equipment and understanding of the material), and the economic factors which have impacted on their business models. For example, when the IFFPG started the export of farm film to reprocessors abroad, a gate fee was charged by these facilities to accept this material. This changed over time and the same reprocessors now pay the IFFPG for the unprocessed material. This market shift had an adverse impact on the revenue generated by Irish reprocessors handling the farm film, impacting significantly on their income stream.

Other organisations have investigated the depolymerisation of the farm plastics in different energy recovery applications. This appears technically to be a viable prospect, but the levels of contamination in the material (including moisture content) precludes the use of the material as collected at present.

2.5 CURRENT OUTLETS FOR FARM FILM COLLECTED IN IRELAND

The farm film collected in Ireland at present is sent either directly abroad for reprocessing or to an Irish intermediate facility for handling and pre-treatment processing. At this facility the material is cleaned, shredded and it is sent abroad for further processing.

There appears to be a steady demand for the waste farm film material collected in Ireland abroad (both unprocessed and material subjected to intermediate processing). Ireland is currently completely reliant on facilities abroad to recycle the material. There is no indigenous organisation producing a recyclate from farm film on an ongoing commercial basis.

The annual arrangement of exporting material is working satisfactorily and to date there has been no issues with the reprocessing facilities. However, if the demand abroad for the farm film collected in Ireland ever decreased, or if there was a shift in the market which created difficulties in exporting the material i.e. greater supply in Europe, potential temporary restrictions on export (biosecurity etc); then Ireland might find to very difficult to maintain the current recycling rate.

2.5.1 Farm Film Export / Transfrontier shipments (TFS) costs

Material being sent abroad (without pre-treatment) is exported as amber list material and must be notified to the National TransFrontier Shipments (TFS) Office before shipment. The fee payable to the National TFS Office to export farm film material as amber list waste is currently €2.50 / t. Exporting all farm film material collected by the IFFPG (circa 23,000 t) would cost in the region of €57,500. If this material isn't exported then there is a direct financial saving. There would also be other indirect savings in terms of:

- Avoiding the heavy administration burden associated with TFS paperwork plus administration fee of €500
- Reducing the financial resources tied up in bank bonds required for TFS consents

Green List material refers to material considered non-hazardous (typically source separated recyclable material); unlike Amber List waste it doesn't require pre-notification of shipments to the National TFS Office and doesn't require a bond to be in place. The fee structure is also different with a charge of €0.60 / t for Green List waste compared to €2.50 / t for Amber List waste.

3 CONSULTATION

3.1 INTRODUCTION

As part of this study, consultation was undertaken with a number of individuals and organisations who have an interest in the reprocessing of farm films or the use of virgin / recycled plastic (in various forms) as a raw material. These included:

- Companies involved in the reprocessing of waste farm film in Ireland,
- Companies who have operated farm film reprocessing facilities in Ireland but no longer do so,
- Waste companies or waste plastic reprocessors who may have considered developing reprocessing / recovery capacity for waste farm film but haven't entered the market to date,
- Reprocessors abroad who receive Irish farm film waste plastic,
- Manufacturers of plastic products in Ireland (both farm film plastic and other non-farm plastic products), and
- Manufacturers of plastic products (both farm film plastic and other non-farm plastic products) supplying the Irish market.

3.2 CONSULTATION WITH IRISH INDUSTRY PLAYERS

3.2.1 Introduction

A number of issues related to the management of waste farm films and the use of plastic raw materials were discussed with the stakeholders; some of the findings are outlined in the following sections.

3.2.2 Contamination / Presentation of Farm Film Plastics

The general consensus among the Irish stakeholders was that the presentation of farm film for collection by farmers has improved in recent years. This has been achieved by awareness campaigns targeted at farmers, the introduction of a pay-by-weight charging system and increased monitoring of material presented at the points of collection.

There was a divergence of opinion in relation to how this could be further improved. Apart from the visual contamination (soil, organic matter etc), a significant proportion of the weight of the farm film collected is made up from the moisture content of the material. The moisture content of the farm film could potentially be reduced by storing the material indoors or in weatherproof containers. There were suggestions of practices in other countries where farmers are incentivised to place the farm film directly into static on-farm balers, anecdotally this tended to reduce the levels of contamination, as the material wasn't left lying around.

Some observers noted that the levels of contamination amongst the farm film waste material presented varied significantly. Many farmers presented very clean, dry material with minimal levels of contamination, whereas others presented very heavily contaminated material. At present, all the material is bulked together which results in the cleaner material being cross-contaminated by the heavily soiled material.

Some stakeholders expressed that it would be desirable to encourage farmers to segregate the sheeting from the bale wrap at the farm level, this would assist operators who would intend to process LLDPE material separately from LDPE.

The presence of netting material made from polyproplyene (PP) is also an issue for reprocessors, it has different properties to PE and when it is present in a PE recyclate, it compromises the performance of products. It was suggested that there were some moves globally to shift from the use of PP to LLDPE, with products currently being trialled and beginning to appear on the market. It will however, take a number of years for the PP netting to be fully phased out.

3.2.3 Nature of the Material

There was consensus that farm films are amongst, if not, the most difficult plastic materials to reprocess successfully into a high quality recyclate. Even apart from the levels of contamination present, the material has properties which make it difficult and costly to reprocess. The silage sheeting and bale wrap, although visually similar, have a number of differences which also pose difficulties for the reprocessing of mixed material.

The nature of the material itself i.e. a soft film which can vary range in thickness (from 15 to 100 µm) makes it difficult to process. The material is typically presented and collected as a mixture of LLDPE (bale wrap) and LDPE (sheeting). The bale wrap material is produced from LLDPE and is usually a thinner material than the sheets produced from LDPE.

The bale wrap material has a much higher surface area per tonne of material than LDPE; bales of silage are typically wrapped a number of times which can result in 2 or more layers of film being stuck together which also makes it more difficult than LDPE to clean and process.

The bale wrap also contains an additive (such as polyisobutylene) which improves the tack (the higher the tack levels the better the layers will stick to each other) which helps the layers of wrap material to stick to each other to form an oxygen seal when a bale is wrapped. This however, makes the material more difficult to separate and clean during reprocessing.

3.2.4 Reprocessors Understanding of the Technical Challenges Involved

It was outlined previously that a number of Irish reprocessors established to reprocess farm films had experienced difficulty and were unable to sustain commercially successful operations. Many of these operators significantly underestimated the technical challenges involved in establishing and maintaining a processing operation.

It was stated by some observers that the variable nature of the film material (particularly the thickness of the material) contributed to the difficulties experienced by some operators in the Irish market; the extremely thin LLDPE bale wrap causing particular difficulties i.e. the processing plant wasn't designed to clean and process material as thin as the LLDPE farm film. As outlined previously, the thickness of the farm film collected can range from 15 µm to 100 µm; the processing plants had difficulty in coping with the material at the lower end of this range.

It was evident from speaking to many of the operators that they had not foreseen the extremely aggressive nature of the material and the impact from processing the farm film on the equipment. While a certain amount of sorting is undertaken prior to the material being fed into a shredder in most processes, it is inevitable that some particles of metal, stone etc make their way into the shredder where they cause significant damage, which can be extremely costly to repair.

It was an observation on some of the Irish reprocessors that they were unable to keep their facility running long enough at an adequate level of throughput. This led to inefficiencies impacting on businesses production and ultimately making it unsustainable.

While there are a number of companies reprocessing farm films across Europe, state-of-the-art processing facilities appear to have been developed and refined by each of the reprocessors

themselves as opposed to being purchased as off-the-shelf systems. The successful operators appear to have modular systems with individual components from different manufacturers (shredders, washing plants, dryer, extruder etc) with the systems catering to the specific requirements and technical challenges of the material to be processed.

3.2.5 End User Markets

There is an established market for the trading of LDPE recyclate. The same is not the case for LLDPE recyclate. LLDPE isn't as widely used, there is consequently less awareness of its properties, however, there is demand for this material and good quality LLDPE commands a good market price.

Manufacturers Views of Plastic Recyclate in Ireland

Fully Closed Loop Applications

The use of recyclate from farm film was discussed with a number of manufacturers of farm films who used virgin LLDPE and LDPE material, both in Ireland and abroad. The primary barrier to the potential use of recyclate was the perception of the poor quality of the recyclate available. This was an obstacle given the negative consequences to the manufacturer of processing a batch of poor quality material.

A farm film product manufacturing plant could cost in the region of €3M - €4M and certain elements of the manufacturing plant are susceptible to damage from farm film contaminants (such as fine particles of metal or stone) which could be present in a poor quality recyclate. For example, the die, a component of the manufacturing line which the molten plastic is blown through to form a film, is particularly susceptible. The maintenance costs for an element of the plant such as the die could, according to the operator, cost in the order of tens of thousands of euros, in addition to the manufacturing time lost. So the consequences of introducing a poor quality recyclate into a manufacturing process are potentially extremely expensive.

Given the cost of the virgin material, some manufacturers would have used reclaimed scrap from their own processes in the past. So there is an appetite to look at alternatives to supplement the use of virgin material, but the quality of the material has to be assured.

One manufacturer had accepted a trial of recyclate material produced from post-consumer farm film in the past, but did not feel that the material was suitable to process. In addition to the physical contamination (metal particles & stones), the moisture content of the material also proved problematic.

It was also pointed out that there would be limited market for the recyclate in closed loop applications such as farm films in the Irish market. The content of recyclate in the manufacture of farm films would most likely be limited to less than 10% of the overall plastic raw material used. Given the scale of the manufacturing of farm film taking place in Ireland, there would be a limit to the amount that could be used in Ireland in fully closed loop applications. To ensure that there is a sufficient market, it would need to be exported or used in other converting or manufacturing applications.

Other Non-Farm Film Applications

There are currently a limited number of manufacturers of plastic products in Ireland using recyclates in their manufacturing processes. At present, most of the recyclates being used are imported. One organisation that had used recyclate derived from farm films in the past were generally satisfied with the quality, once they understood how the material behaved (different melt temperatures etc). They confirmed that this is a material that they are very interested in sourcing if there was a secure, long term supply available at a competitive price. However, they also indicated that they have found it very difficult in the past to get suppliers who could guarantee a reliable supply of recyclate, both from Ireland and abroad.

The recyclate they use at present is predominantly post-industrial rather than post-consumer material. It was their experience that in general post-consumer plastics contained a mix of polymers, that it was extremely difficult for operators of material recovery facilities to separate comingled plastic successfully. This highlights the potential value of agricultural film waste stream as it has the advantage of being comprised of a monostream high-grade polymer. However, the deleterious presence in the recyclate of PP (from the bale netting material) was again highlighted as a potential problem.

Reprocessors Views / Opinions on Barriers to End User Markets

Some reprocessors found it difficult to engage with convertors or manufacturers to try and encourage them to consider recyclate as a raw material. Apart from the perception of the issues with the quality of the material, there is also a reluctance to accommodate changes to their production processes that might be required to use recyclate for varying reasons (cost of downtime etc). Virgin material generally has consistent properties and the plant can process different batches without altering the operating parameters of the processing line, this may not always be the case with recyclate, where they may be some alterations required for the parameters such as melt temperature etc.

3.2.6 Viability of Reprocessing / Recycling Operations

It should be stated that a number of organisations contacted indicated that they did not consider the development of a farm film reprocessing operation in Ireland as a viable prospect for their organisation at present. A summary of the reasons stated are outlined below:

- The level of investment required is too high.
- It is too technically challenging, particularly given the levels of contamination of the material collected in Ireland.
- Economies of scale are not present in Ireland; processing costs per tonne would be too high.
- Energy and labour costs are too high.

The gate fee for waste plastic material received by reprocessors in Ireland is indirectly linked to the outlets for the material in Europe. The situation has changed in recent years; at present, European outlets are now paying for the unprocessed material collected in Ireland compared to the past where they were charging a gate fee to accept the material. It has been suggested that the reversal in this situation i.e. reduction in the gate fee they received, had a significant impact on the viability of a number of reprocessors who had operated previously in the Irish market.

3.3 CONSULTATION WITH INTERNATIONAL REPROCESSORS & OUTLETS

3.3.1 Introduction

While in the past farm film material collected in Ireland was sent to facilities as far away as Asia, this is no longer the case. There are currently three main outlets abroad for the farm film collected in Ireland; these companies will be referred to as Company A, Company B and Company C. These companies are all located in the European Union. It is notable that while the company structures differ for these three companies, the operational and financial arrangements in place at each facility offer benefits and supports which are vital to the ongoing survival of the reprocessing business.

3.3.2 Company A

Company A is a leading European supplier of products manufactured from polyethylene such as bin liners, food & freezer bags and cling film etc. They purchase farm film waste from around Europe and reprocess the material at their facility.

They co-process LLDPE and LDPE from farm film and produce a universal grade pellet which is used in their own processing plants for the manufacture of plastic products.

The farm film reprocessing operation is undertaken in parallel with other plastic reprocessing operations at one of their facilities. From their perspective, they view this integration of the farm film operation into the overall business as critical. The reprocessing operation benefits from the efficiencies and savings of co-location with other processes, and there is a secure market for the recyclate produced.

The nature and scale of the company meant that the reprocessing operation benefits from their vast experience in the plastics industry and their capability to finance, develop and refine the complex processing in the appropriate timeframe. It would have been far more difficult to establish the successful reprocessing operation as a standalone business.

A site visit to one of their facilities was undertaken as part of this report, some of the key points and observations made by Company A during this process included:

- There are approximately 50% losses through contamination and moisture loss when processing farm film i.e. an input of 30,000 tonnes unprocessed farm film will yield an output of 15,000 tonnes of recyclate.
- Throughput is key; a certain level of output is required to ensure the plant is viable, they indicated that for farm film this was in the order of 1,000 kg/hour.
- The Green Paper on a European Strategy for Plastic waste in the Environment and the End-of-Waste-Criteria in the new Waste Framework Directive should both promote the increased recycling of plastic waste.
- For the plastic recycling industry to survive and flourish in the longer term measures need to be put in place to create a demand for the recyclate and to remove the barriers to the use of recycled plastic recyclates.
- Certain grades of recyclates produced from plastic waste have different properties to virgin materials; research may be required as to increase the understanding of these properties, this could increase the range of applications and help to dispel the negative perceptions of the quality of recyclates.
- There is a perception amongst manufacturers in the market for the recyclate that recyclate should be significantly cheaper than virgin material.

3.3.3 Company B

Company B is an organisation with a facility that exclusively processes farm film waste. Similar to Company A, they purchase farm film waste from around Europe. Company B is a partnership between two public sector organisations, one of which is a municipal authority, and private enterprise.

The facility is situated in a complex which incorporates activities such as landfilling, composting and a biogas power generation. Company B benefits from significant energy advantages due to their location, taking both water and heat from the adjacent facilities. This is critical to reducing the power demands and achieving cost savings given the intensive requirements of the processes involved.

A site visit to the facility was undertaken, in addition to consultation with Company B, as part of this study, some of the key points and observations made during this consultation are set out below:

- Company B quoted a figure of 1,000 kg/hour throughput for a processing line to ensure a plant is economically viable.
- The companies who purchase the recyclate from Company B use the material to produce a range of materials from bin liners to recycling it back into agricultural film (fully closed loop).

- Company B can vary the blends of recyclate produced; they co-process LLDPE and LDPE material and also produce exclusively LLDPE or LDPE recyclate.
- Most of the farm film placed on the market in Ireland is black in colour, apart from a small number of white stretch or green stretch wrap. This limits the end use applications of the pellets into products which are black in colour. It would be preferable to have the material white as this would potentially result in a more valuable recyclate.

3.3.4 Company C

Company C is another one of the leading European manufacturers of film products. The company has a number of divisions which control different areas of the business. The recycling division of Company C reprocesses polythene waste from industrial, agricultural and horticultural sources and recycles the recyclate into a range of products such as garden furniture, fencing and bin liners.

Consultation was undertaken with Company C regarding their reprocessing activities and the farm film material accepted from the Irish market. From their perspective the issue of contamination of the input feedstock material is still a significant issue. The problem of heavily contaminated farm film waste was universal; it wasn't limited to the material accepted from Irish collectors. There is an additional cost associated with heavily contaminated material:

- Increased transport costs per tonne of plastic received.
- Increased water demand to clean the feedstock, and consequently increased wastewater to be treated.
- Increased plant maintenance costs (replacement of parts, downtime etc).

They stated that maintenance work on their plant, replacement of knives on shredders etc, was a significant on-going operational cost.

4 ANALYSIS OF THE FARM FILM REPROCESSING MARKET

4.1 INTRODUCTION

There is currently a well-established farm film collection system operating in Ireland, which collects in excess of 20,000 tonnes of material annually. This material is owned by the compliance scheme which is responsible for managing the material in accordance with best practise and delivering the best environmental outcome. The material collected in Ireland by the scheme is exported to reprocessing facilities. The current management strategy of the material is to meet the recycling target as a minimum and exceed the target rate through the use of reprocessing destinations which are part of a closed loop treatment system. The destinations used currently are located in the UK and mainland Europe.

4.2 OBSERVATIONS ON SUCCESSFUL OPERATIONS ABROAD

The process of establishing a successful farm film reprocessing operation is complex and requires significant investment, in terms of expertise, time and finance. Reprocessing organisations which are operating successfully such as Company A and Company C (referred to in Section 3.3) are part of larger, integrated businesses which manufacture plastic products from the pellet they have produced. The reprocessing divisions of these organisations benefit from being part of a wider enterprise including receiving financial support to sustain and grow the business.

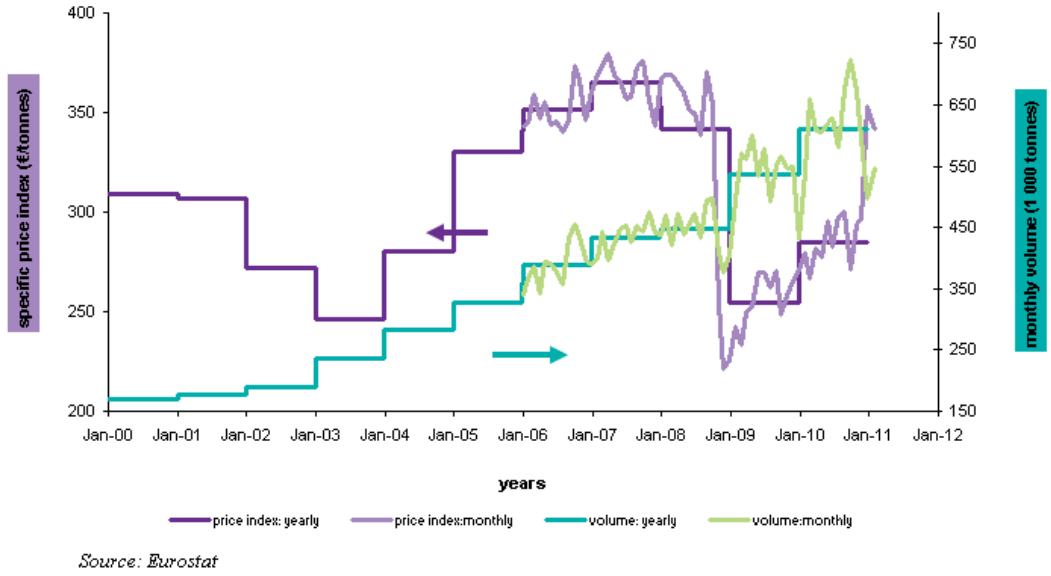
On the other hand, a reprocessing organisation like Company B (also referred to in Section 3.3), which is also operating successfully in the market, and is not part of a wider business group, was set up in partnership with municipal authority and a public body from the region who invested substantially to set up the business and continue to support the technology development on-site. The financial arrangements in place at this organisation are key to their success, supporting their set-up and their annual operations.

4.3 TRADING OF WASTE PLASTIC IN THE EU

Eurostat, the statistics office of the European commission, as part of their work for the EU Environmental Data Centre, compile data and produce indicators on the volume and prices of recyclables traded in the EU. They suggest that the price of plastic waste depends largely on two factors:

- The supply of and the demand for plastic waste material
- Crude oil prices which strongly influences the price of the virgin (primary) material.

Figure 4.1 shows the 12 month rolling averages of volume and price of waste plastic (industrial residues of high quality or separately collected waste) over the period from 2000 to 2010. The y-axis to the left of the graph is for the price (€ / tonne) and the y-axis to the right is for volume traded (1,000 tonnes).



Source: Eurostat

Figure 4.1: Annual rolling averages of the volume and price of waste plastic from 2000 to 2010

Figure 4.1 shows that the volume of waste plastic traded increased by over a factor of 3 over the period from 2000 to 2010, from approximately 170,000 t / month to nearly 600,000 t / month. The monthly data (green line) shows a steady increase until late 2008 when the monthly volume sees a short-term drop from 490,000 t / month to 380,000 t / month by the end of the year 2008, which reflects the crash in the recyclables market.[11]

The prices range from approximately €375 / t in October 2008 to a price of approximately €230 / tonnes in January 2009 following a sharp decrease. The price recovered steadily to €300 / t by the end of 2010.

While these indicators relate to the full range of post-industrial and separately collected waste plastics, the fluctuations demonstrate the volatility of the global commodity market, particularly in respect of the price. The graph also demonstrates that the trade volumes of secondary materials, while subject to some fluctuations, increased steadily over the period from 2000 up until 2011. It also demonstrated that the prices which crashed during the financial crisis on 2008/2009 were much slower to recover.

4.4 USE OF LDPE / LLDPE

Polyethylene (PE) is the largest volume polymer produced globally. LLDPE is a plastic product most commonly used for the production of plastic bags and sheets, though it is found in a wide range of other products including toys, pipes, cable coverings, lids etc. In 2009, global production of PE reached 17.24 million tons with a market value of US$ 24 billion. China's share of the production that year was 3.1 million metric tons (MT), and total consumption was 5.3 million MT.[12] In 2012 global production of LLDPE was 23.21 million tonnes and LDPE was 18.99 million tonnes, 11% and 9% of total production respectively.

[11] http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Recycling_%E2%80%93_secondary_material_price_indicator

[12] http://www.dce.com.cn/portal/info?cid=1272429421100&iid=1292572854100&type=CMS.STD

Global demand for LLDPE has been strong and growing ahead of GDP in most industrial regions of the world. Much of the growth in LLDPE has been as a replacement for LDPE, or used in blends with LDPE, but its penetration into LDPE markets is slowing in mature markets. Future global growth is expected to average at 6%/year.[13]

It is estimated, based on recent CSO data, that approximately 52,000 t of LDPE and 15,000 t of LLDPE in primary forms are used in Ireland, which indicates that LDPE is the polymer predominantly used in Ireland. This indicates that there is currently scope for the replacement of virgin materials by recyclate. It is also considered that there is a possibility that the availability of recyclate as a cheaper raw material relative to virgin material may stimulate some manufacturing activity. LLDPE has different properties to LDPE which give it a better tensile strength, puncture resistance and elongation.

The price of virgin LDPE & LLDPE has generally been increasing in recent years; the price of LDPE recyclate has followed this trend with a sharper increase in price relative to the virgin material. The high market prices for virgin material provide an incentive for manufacturers to look for alternatives, which may promote the use of recyclate.

Table 2: Market Value of LDPE & LLDPE Plastic

Polymer Type	Price €/Tonne (Platts, August 2013)	Price €/Tonne (Anecdotal information)
	Virgin material	**Recyclate**
LDPE	1,475	500 to 700
LLDPE	1,430	600 to 800

4.5 ECONOMIC VIABILITY OF A REPROCESSING FACILITY IN IRELAND

The lack of indigenous reprocessing facilities in Ireland is driving the export of farm film material abroad. The development of a reprocessing facility is a possibility but a number of factors need to be considered.

A number of the reprocessors abroad suggested that in their experience, an output of 1,000 kg/hour for a processing line is required to ensure a plant is economically viable. Dependent on running times, this hourly output equates to an annual output of between 8,000 and 8,500 tonnes of recyclate pellet each year. If we assume a 50% contamination rate is present in the material accepted for reprocessing, then the total input farm film waste feedstock would amount to 16,000 tonnes per year.

If it is assumed that an output of between 8,000 t and 8,500 t is required to have a viable reprocessing plant then there is most likely only space for one major reprocessor in the Irish market based on the quantities of material collected in Ireland. There is however, potential to improve the economies of scale by the importation of material from Northern Ireland or other parts of the UK.

Security of supply will be a critical factor in determining the long term viability of the plant. The export market for the unprocessed Irish-collected material will most likely set the value for the gate fee (positive

[13] http://www.icis.com/v2/chemicals/9076159/polyethylene+linear+low+density.html

or negative) for the material. Direction of waste is a critical issue for Irish plastic reprocessors, and has been cited as one of the most significant issues they face.

At present, reprocessors abroad are paying to obtain the farm film material collected in Ireland, it has a value to them i.e. selling this material is a source of revenue for the compliance scheme operator. The extent to which the compliance scheme operator is influenced by the prices offered by reprocessors abroad will have a significant impact on the viability of any reprocessing facilities in Ireland. Any reprocessing facility will most likely have to be receiving sufficient material to be in a position to run at close to full capacity to be economically viable. It would appear that anyone planning to develop a facility of this scale would need to get assurances from the compliance scheme operator that they would receive the quantities of material necessary.

At present, the pre-treatment facility operator in Ireland is receiving a gate fee to accept the farm film collected. This is on the basis that the facility accepts the material loose and therefore there are no baling costs incurred by the recycling scheme. Reprocessors in Ireland who have operated previously also received a gate fee to accept the material. If this changes, then it could have a negative impact for any new facility in Ireland where the operator had an expectation of getting a certain revenue to accept the material.

From consultations with stakeholders, it was suggested that it could cost in the region of €3M - €4M to design, procure and install a farm film processing line with the capacity of delivering an output of 1,000 kg of pelletised material per hour. This doesn't include the costs of the building, water treatment, wastewater treatment, electrical or power generation infrastructure or other development works required. It is difficult to estimate the extent of these additional costs as they would vary by location and the availability of water, electrical and wastewater infrastructure etc. These ancillary costs could be of the order of millions of Euros depending on the site. This could potentially bring the overall cost of developing a processing facility to between €6M - €8M.

It should be noted that these costs and throughput rates are more typical of the reprocessing facilities operating abroad. The scale of these facilities means that the processing cost per tonne could be lower than a facility which cost less to develop but has a significantly lower throughout.

There are high operational costs associated with reprocessing farm film as it is an energy intensive and wearing process. Operations typically high energy consumption comes from the washing, drying, grinding and heating cycles of the processing line. The power requirements are a significant proportion of the ongoing operational costs. Consequently, any efficiencies or alternative sources of energy that could result in savings to the external energy sources and costs will increase the viability and competitiveness of the operation.

Maintenance costs are also high and include the replacement of shredder knives, motors and other mechanical components, in addition to the cost of water, waste disposal, wastewater treatment etc.

Any reprocessing facility would need environmental authorisation (a Waste Facility Permit or a Waste Licence from the Environmental Protection Agency) to operate as a waste facility, as well as planning permissions. There is cost associated to obtaining these authorisations as well as ongoing costs of environmental reporting and compliance.

At present, it appears that any potential Irish reprocessors currently planning to enter or re-enter the market, are unlikely to operate at the scale necessary to get their processing costs per tonne in line with the facilities abroad. They will most likely be reliant on certain other savings to make them more competitive relative to the facilities abroad, including:

- Avoidance of TFS costs (see Section 2.5.1 for further details)
- Lower transport costs
- Potential savings on collection / transfer costs between collection points in Ireland

At present, it doesn't appear that any of the reprocessors based abroad are planning to develop a facility in Ireland. During the course of consultations, security of supply and quantity of material was stated by one operator as potential barriers to development of a facility. There was also a perception that it would be difficult to import farm film material into Ireland if they required additional material to process. From their perspective, it would only make sense to invest in a plant if they had buy-in / assurances from the compliance scheme operator to ensure they would secure the amount of material necessary to make the plant viable. However, the Irish market is attractive in the sense that the compliance scheme is supported by a statutory instrument.

4.6 FEASIBILITY FOR FARM FILM RECYCLING IN IRELAND

It is difficult to assess the feasibility of an indigenous farm film recycling industry developing and operating successfully in Ireland. The previous efforts of Irish operators to establish and maintain reprocessing operations have all been commercially unsuccessful to date which is testament to the technical difficulty of reprocessing this material. It also reflects the lack of technical expertise and appreciation of the material and the processing required. The approach and decisions taken with respect to scale of operations, design and configurations of the plant, methods of financing and company structures etc were not well enough informed.

It appears that there is a market for this recyclate in Ireland at present and if an operator could successfully establish a plant of the necessary scale there would be most likely be a readymade market for the material. The economic feasibility would be determined by the price available for the recyclate, the gate fee (if any) and the operational / processing costs (including repayment of capital investments and interest or investors etc).

There are factors which could have an impact on the feasibility of managing this waste stream within Ireland, including:

- Impact of legislation, regulatory changes (any changes in approach to application of the Waste Management (Shipments of Waste) Regulations 2007etc)
- Any potential restrictions on the exported of soiled / contaminated material
- Volatility of global commodity market
- Impact of oil prices, availability and price of virgin material

At present, it is not anticipated that there will be any changes in the application of the waste shipment regulations that could restrict the export of the unprocessed farm film material as amber list material. While there is no precedent for restrictions on the export of the farm film due to any perceived biosecurity risk or other issues, an event such as the foot and mouth outbreak in 2001, may result in restrictions in the collection of farm film and the export of this material. However, it is unlikely these would ever result in any long term restrictions.

Figure 4.1 demonstrates the volatility of the global commodity market; it demonstrates that the price for secondary materials including plastic can be subject to significant fluctuations. If the market price available for the reprocessors product dropped significantly below the price expectation that was included in the business model then the reprocessing operation would be more difficult to sustain.

4.7 END OF WASTE CRITERIA AND EuCertPlast

Further legislative developments that may impact on end markets for plastic recyclables are the End of Waste Criteria for waste plastic conversion being prepared by the European Commission and the Europe-wide recycled plastic certification scheme EuCertPlast.

Plastic waste which has undergone mechanical treatment such as flaking or pelletising is considered green list waste and must be managed in line with the TFS (TransFrontier Shipments) Regulations and

procedures. The European Commission is currently preparing End of Waste Criteria for waste plastic conversion (which will include farm film plastic waste).

High quality plastics that meet End of Waste Criteria will no longer be required to be managed under the waste legislation regime. This means that any compliant plastic will be treated as a product; in this case Waste Management (Shipments of Waste) Regulations would no longer apply which will result in reduced administration and cost.

EuCertPlast Certification is a Europe-wide certification programme for recyclers of post-consumer plastic waste.[14] The aim of the EuCertPlast certification programme is to recognise plastic recyclers operating to high standards, to give confidence to suppliers that any waste plastic they deliver to recyclers certified under the scheme will be recycled as per best practise, with respect for the environment and in accordance with national legislation. Similarly for buyers the scheme will give confidence that the outputs produced comply with all relevant legal and environmental legislation.

If plastic recyclables either meet End of Waste Criteria or are certified to the EuCertPlast programme buyers may preferentially chose these plastics over which are not compliant as they may be considered inferior by buyers.

[14] http://www.eucertplast.eu/uploads/downloads/audit-scheme-3-5-english.pdf

5 FINDINGS & RECOMMENDATIONS

In this section of the report a summary of the findings from the stakeholder consultations and analysis of the reprocessing market are presented along with recommendations.

The recycling of the farm film waste materials collected by the IFFPG is being undertaken at facilities overseas due to an absence of treatment capacity in Ireland for this material. The system in place is delivering high performance in terms of the recycling rate being achieved. However the system is over-reliant on overseas treatment facilities which introduces a degree of risk and vulnerability. If access to the facilities abroad was to be restricted in the future, then Ireland may find it difficult to secure appropriate reprocessing facilities and maintain this high environmental performance.

At present, the quantity of farm film waste managed in Ireland annually (in excess of 20,000 tonnes), represents feedstock sufficient to entirely allow the development of a single reprocessing facility (assuming the plant has a capacity similar to those facilities successfully operating abroad i.e. with throughput in excess of 1,000 kg/hour, producing approximately 10,000 t of recyclate annually). Any organisation that is proposing to enter the farm film reprocessing market should undertake extensive research and consider the findings of this report as part of their research.

5.1 CONSIDERATIONS FOR INDIGENOUS REPROCESSORS

1. **Understanding the Material –** A comprehensive understanding of the farm film waste stream is required to inform any decisions to be made on the reprocessing line and equipment installed. The nature of the material is outlined in detail in Section 3.2.3, but the main difficulties arise from:
    - The large variations in thickness between the bale wrap (LLDPE) and silage sheeting (LDPE) may cause difficulties for equipment configured to process film of a certain thickness.
    - Levels of contamination present, difficult to clean and causes significant wear to processing equipment necessitating regular maintenance.
    - Sticky nature of the bale wrap, which can make it difficult to clean.

2. **Technical Challenges in Establishing a Processing Line** – The difficulty in processing this waste stream into a high quality product should not be under-estimated. This point was raised repeatedly during the consultation process. Irish reprocessors interested in processing this material are advised to undertake extensive research to understand the technical challenges involved. There is much to be learned from those organisations who tried but were unable to commercially sustain reprocessing lines in Ireland and from reprocessors abroad who are managing to operate successfully.

3. **Ancillary Infrastructure and Operational Costs** – Apart from the key equipment and infrastructure required for the processing line, there are other infrastructural and operational requirements that need to be considered. These include the provision of the appropriate electrical infrastructure, water supply and usage (approximately 10 m^3 of water required per tonne of output material), wastewater treatment etc. It was notable from the consultation that many operators commented on the significant energy demands and the on-going maintenance works required which represent significant operational costs. All of these factors need to identified and costed in order to put in place realistic and viable financial management for the likely processing costs.

4. **Development of a Realistic Business Model (Revenue Sources)** – A comprehensive understanding of the markets for recyclates is needed to ensure realistic expectations in relation to revenue generated by sale of recyclate materials. As outlined in previous sections, the international recyclables market is subject to regular fluctuations influenced by factors such as the price of oil and virgin material. It has also been outlined previously that the market value of

the farm film waste presented by the farmers and delivered to reprocessors has fluctuated in the past, largely based on demand from outlets abroad. While at present, accepting the material (unbaled) may represent a source of income for potential reprocessors; this may not always be the case.

5. **End Markets for Recyclate** – Manufacturers of high end plastic products containing plastic can be reluctant to use recyclate due to perceptions that it may be of poor quality and be problematic for their processing line. Any potential reprocessor must understand that this perception may be held by existing and potential customers. Reprocessors may have to be innovative in communicating and demonstrating the quality and performance of the material as part of a strategy of building a solid relationship and overcome these views. This process may be key to opening higher end and thus higher value end markets. One of the key issues that manufacturers of plastic products indicated was the unreliability of supply of recyclate, both from suppliers from Europe and in particular from suppliers Ireland in the past.

6. **Scale of Operations** – During the consultation, there was consensus that a specific throughput of material is necessary to have an economically viable operation. Operators should be satisfied that any proposed plant can achieve an adequate throughput and that there is sufficient material available and accessible to them on the Irish market.

5.2 WORKING WITH THE COMPLIANCE SCHEME

The IFFPG, which is a not for profit company, is the sole approved body appointed by the Department of Environment, Community and Local Government to operate a compliance scheme for the collection and recovery of waste farm films under the regulations[15]. The compliance scheme takes ownership of films brought to designated collection points and oversees the subsequent collection and transportation of the material to selected end destinations for processing. Contractors appointed by the compliance scheme collect and handle the material on their behalf. The compliance scheme brings competition to the sector through an open national contractor tendering process which is held every 4 years.

The compliance scheme's aim is to recycle the maximum amount of material collected and to select and supply facilities which are part of a closed loop system and deliver best value. The compliance scheme also has a "policy of supplying material to Irish facilities where it is feasible to do so"[16].

IFFPG is a not for profit company, limited by guarantee and incorporated in Ireland under the Irish Companies Acts.

With regard to the indigenous capacity, the compliance scheme is keen to support reprocessing facilities that comply with IFFPG policy objectives and provide real and sustainable alternatives to overseas facilities. The compliance scheme is keen to liaise with reprocessors but wants to ensure any potential reprocessors learn from the difficulties experienced by previous developers. The legacy of unsuccessful reprocessing ventures in Ireland and the lessons learned from these experiences need to considered by the potential investors. Working with scheme will be central to the success of any facility and a professional and insightful approach is required. The compliance scheme will be central to the success of a future reprocessing facility in Ireland who will be dependent, to a large degree, on receiving feedstock from the compliance scheme. The compliance scheme needs to be satisfied that material to be provided to an operator will be treated and managed appropriately and safely

[15] Waste Management (Farm Plastics) Regulations 2001

[16] Irish Farm Film Producers Group, Environmental Report 2012 to Department of Environment, Community and Local Government.

7. Any potential developers of a farm film reprocessing facility need to develop a professional and open working relationship with the IFFPG. Any strategy presented to the compliance scheme needs to be supported by a sound business plan, and developers need to show their awareness of the difficulties that previous operators encountered.

Reprocessors abroad have demonstrated that, while difficult, it is technically possible to reprocess farm film material collected in Ireland into a high quality, valuable recyclate on a commercial basis. The future success of an indigenous processing facility will require a reliable and secure feedstock of material from the compliance scheme. If a limited quantity of material is supplied the viability of a development may be hindered and ultimately the project may not be commercially sustainable.

Ownership and direction of plastic waste is a major challenge for reprocessors of non-farm film plastic waste streams in Ireland. This is due to the fact that generally recyclable plastic materials arise from a variety of different sources, are collected by a large number of organisations and may not be segregated or collected separately. Thus reprocessors must compete with the highly competitive open (spot) market to get sufficient quantities of the material they require for their business purposes; and often import recyclables to meet their needs as they are unable to secure plastic waste generated in Ireland. Farm film waste is one of the few materials under the control of one organisation which can direct the material to whatever reprocessor they wish, so it represents a good opportunity to develop indigenous reprocessing capacity.

8. In this context, it is recommended the compliance scheme maintains its continued support of indigenous reprocessing facilities by engaging with reprocessing developers, at an early stage, to gain an understanding of the proposed development capacity and to offer advice based on market knowledge and previous experiences. The compliance scheme should consider putting in place a strategy outlining the supports available to future reprocessing facilities, such as guidance on regulatory, technical, or market issues, as well as including details on the schemes approach to supplying material to facilities.

From the consultations undertaken, and the review of the market, it is clear that market prices for recyclate are subject to fluctuations and the reprocessing market in Europe is evolving. The increased positive development of the market is expected to continue supported by pending European policy and legislation which will ensure the recycling of plastics and the use of plastic recyclates becomes more commonplace. It is important the compliance scheme keeps up to date with the development of the international market, price changes, the reliability and availability of existing and new destinations. It is important the scheme protects itself from market shocks, which can occur in the recyclables market especially if it expects overseas markets to be part of their short to medium term management plan. It is recommended the compliance scheme:

9. Continues to undertake a monthly review of international market prices and the reprocessing destinations to ensure the environmental and value for money objectives of its policy are being met.

10. Puts into place a contingency plan in the event that the dynamics of the market change, such as material supply exceeding demand limiting or closing off reprocessing destinations, and alternative destinations, treatments or storage solutions need to be found.

5.3 PRESENTATION AND COLLECTION OF FARM FILM

The collection system appears to be working well, with a marked improvement in recent years in the presentation of the material and reduction in the levels of contamination noted by many observers. The operation of the collection system has a significant impact on the quality of the material presented to the market for reprocessing. While the presentation has improved, there is still scope for further improvements, which could maintain and improve the quality of material collected, these include:

11. Segregation of bale wrap and sheeting at the point of collection (only required by some reprocessors who process LDPE and LLDPE separately).

12. Limit the cross-contamination of relatively clean farm films by avoiding bulking them with heavily contaminated material at the point of collection on farms or at bring centres.
13. Continue the awareness campaigns to encourage farmers to store the farm film waste indoors or in weatherproof containers to keep the material dry and reduce the potential for further contamination.
14. Consider undertaking a review of the use of on-farm balers in countries such as Sweden. These allow farmers to bale the farm film waste as it arises, which may reduce the levels of contamination. Consider undertaking a small scale trial to determine if any reductions in contamination levels or improvement in collection efficiencies are achieved in an Irish context.

5.4 MARKETS FOR RECYCLATE

It appears that there is already a market for recyclate derived from waste farm film in Ireland, albeit not in fully closed loop applications. The recent CSO figures show that approximately 77,000 tonnes of virgin LDPE & LLDPE material are used in Ireland annually. There is undoubtedly scope to displace a portion of the virgin material with recyclate and to promote the use of recyclable material in the manufacture of film and other plastic products. If it can be demonstrated that the material can be used successfully over a sustained period of time in applications which are perceived as lower risk (i.e. manufacture of bin liners), then perhaps the manufacturers of farm film products may gain more confidence in the quality of the recyclate.

15. It is suggested that the IFFPG should facilitate reprocessors in engaging with the manufacturers of film products in Ireland. This could lead to trials of recyclate used in the manufacture of film products; the outcomes of any such trials should be documented where possible. In the event that a film reprocessing facility is developed in Ireland, the use of the output recyclates in Irish film products should be promoted where feasible.

5.5 RESEARCH

The LDPE and LLDPE recyclates have some different properties to virgin materials, which may initially discourage manufacturers or convertors. Research should be carried out to provide a greater understanding of their properties; this could provide greater assurances to manufacturers and potentially identify new applications for the recyclate. A recyclate which contains a blend of LDPE and LLDPE will take on some of the properties of both polymers and may have increased tensile strength, puncture resistance properties which may be advantageous in certain applications.

16. It is considered that research into the properties of the recyclates, particularly the mixed grade of LLDPE and LDPE from co-processing of bale wrap and silage sheeting material, should be undertaken. It is suggested that the research in this area could be implemented as a partnership project between third level institutions and any reprocessors who may be producing recyclate on a commercial basis. This type of research activity will greatly increase the expertise and knowledge of farm film plastics in Ireland and push Ireland to the fore as a market leader in this area. Funding may be available for such research from the EPA or Enterprise Ireland.