

Container plants and mechanised planting — The way forward?

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INTRODUCTION

The purpose of this presentation is to:

- Provide some of the background information on mechanical planting
- Outline the current equipment available and their capabilities;
- Show some of the results of mechanical planting so far;
- Indicate future developments in the area.

It must be emphasised that the presentation concentrates on mechanised planting on restock sites, using container stock only.

BACKGROUND

Coillte's current restock programme is about 8,500 ha/year, costing between €10 and €15 million. This figure is for direct costs only and does not include staff costs for example. There is constant pressure to reduce this figure and to 'benchmark' our costs/ha with international figures in Europe and beyond. One of the methods examined to reduce costs was to look at alternatives to manual planting. This has already happened in the harvesting area in this country, where, currently, over 95% of Operations are carried out mechanically.

CURRENT EQUIPMENT AVAILABILITY

In the same way as Scandinavian manufacturers have been at the forefront of harvesting technology, most of the mechanical planting systems that are capable of planting restock sites have also been designed and manufactured in Sweden and Finland. There are currently three main restock planters available:

- The Lumen FP-160;
- The EcoPlanter;
- The Bracke Planter.

Lannen FP-160

This equipment is designed and manufactured in Finland by Lannen, a company with strong links to the container nursery trade. It is a relatively simple design, with the capability of being attached to many different types of prime mover, e.g. farm tractor, excavator or timber harvester. It is somewhat limited by the fact that it does not cultivate the soil as it plants and a separate piece of equipment would be required to be brought on site if cultivation were required. The current cost of this planting head is approximately €20,000.



▲ *Lannen FP-160 planter.*

EcoPlanter

Designed and built in northern Sweden, the EcoPlanter is now partly owned by Komatsu. This planting head is unique in that it plants two plants simultaneously from a carousel which holds over 200 plants. The planting mechanism is also unusual in that rotors on the planting heads spin at high speed and create two loose cultivated mounds, into which the trees are inserted. An EcoPlanter has been working in this country for approximately three years, with an annual planting programme of over 200 ha. The equipment uses a harvester as its prime mover and the cost of the planting head is €70,000.



Ecoplanter

Bracke Planter

The Bracke is the best seller of the three, with over fifty units working in Europe alone. The head is excavator-based and plants one plant at a time. The cultivation system used is simply to turn over a sod and plant into the top of the raised mound created. The annual planting programme for the Bracke is approximately 120 ha and, over the past six years, there have been four Brackes working in Ireland at different times. The Bracke head costs €45,000. Both the Bracke planter and the EcoPlanter can spray the plant with insecticide as it is planted.

CONTAINER STOCK

All of the planting systems outlined above use only cell or container grown planting stock. This type of planting stock has played only a minor role in Irish forestry to date, as the preferred option has been for bare-root stock. Container stock has been tested in research trials since the

1970s and some very positive results were found with lodgepole pine in the early 1980s.

A report of a survey of operational planting, published in 1990, suggested that container stock had potential for afforestation sites only. In the mid 1990s, establishment foresters reported some very poor experiences with container stock at that time. Looking back, the small size and a lack of hardening off of the plant were probably responsible for the poor establishment success with this stock.

The recent Coillte order for container stock has been in the region of 3-4 million plants. This is grown either in the Coillte nursery in Clone, Co Wicklow, in other private nurseries in Ireland or in the UK. The cost of container stock in comparison with transplant stock is also a problem. Currently, containerised Sitka spruce costs 80% more than bare-root stock, up from 28% greater in 1989.

MECHANICAL PLANTING IN COILLTE

Most of the interest in mechanical planting has come from contractors who are already involved in site cultivation. Some contractors wish to plant almost year round while others plant as part of an annual cycle of work. These latter contractors plant for part of the year only and spend the rest of the year on cultivation of afforestation or restock sites.

Because drainage cannot be carried out as part of the planting operation, most of the mechanical planting undertaken to date has concentrated on drier sites in cast Cork/Waterford, Tipperary, Kilkenny and Wicklow. Although both the EcoPlanter and the Bracke Planter have been used on afforestation sites, the vast majority of sites planted have been restock sites.

In an effort to encourage investment in planting machines, Coillte has offered a three year planting programme to interested contractors. In the past, this has been quite successful and within the last year, three Bracke Planters and one EcoPlanter were working on restock sites in the company. This has changed in



^ Bracke planter.

recent months and, as of now, there is only one Bracke working. Suitable sites have become scarce and this has implications for plant supply. Container stock needs to be ordered twelve to eighteen months in advance of being used for most species. If plant supplies are not used for mechanical planting, then they have to be diverted to manual planting or destroyed.

MECHANICAL PLANTER PERFORMANCE

Valuable experience has been gained by all parties involved (nurseries, establishment teams and contractors) since mechanical planting was started over six years ago. In that time, over 2,500 ha have been planted mechanically in Coillle. Actual performance of the complete process has been evaluated using a number of surveys over the last number of years. These surveys included:

1. Satisfaction with plant quality (survey of contractors)

Two aspects of plant morphology are crucial for contractors – evenness of plant size and quality of the actual cell. An operator can adjust the machine settings on a daily basis for small or large plants but cannot cope with variability during the clay. Initially contractors were not happy with the variability in height both within and between boxes of plants. This problem was overcome, however, by greater care in the sort/despatch from the nursery. The compactness of the cell (peat and roots) is also very important as plants will not slip down the planting tube of the planter if the root ball has fallen apart. Once correct sort/despatch procedures are in place in the nursery, this is not a problem.

2. Satisfaction with planter performance (survey of Establishment Team members)

The users of mechanical planting, when surveyed, were generally very happy with the operation. The main reason for this was that they had one point of contact (the contractor) for almost all of the establishment operations. It is the contractor who organises the delivery and on-site distribution of the plants, in addition to

the cultivation, planting and spraying operations. All Establishment Team members said that they would use mechanical planting again.

3. Early performance of mechanically planted sites

Survival and early growth of mechanically planted areas were monitored using site surveys. Ten sites were assessed, six of which were planted by the EcoPlanter and three by a Bracke Planter. One site (Clondonnel) had both planters working on it. Results are presented in Figure 1.

Results were generally very good, with an average survival rate of over 90 percent after one year. After two years, survival dropped to below 80 percent on three of the ten sites. Two of these latter sites (Crust and Rossmore) were unsuitable for mechanical planting as they were too wet and had not received any drainage at planting. On the third site, survival was poor because of weevil damage.

Early height growth and stocking levels were also assessed in the surveys. On average across all sites, trees put on height increment during the first growing season of 75% of their initial height. This is very encouraging and compares very favourably with the early height growth of transplants. Overall stocking rates at planting were excellent and averaged 2543 trees/ha for all sites. There were slight differences between the two machines with the average stocking for the Bracke (2607 trees/ha) slightly greater than that for the EcoPlanter (2479 trees/ha). The range of planting densities across all sites was similar for both machines (2356 to 2745 trees/ha) and plant spacing was generally excellent and usually in lines.

ADVANTAGES AND DISADVANTAGES OF MECHANISED PLANTING WITH CONTAINER STOCK

Advantages

Based on our experiences so far, some of the advantages of using container stock and mechanical planting are:

Planting season, The use of container stock means that the planting season is extended

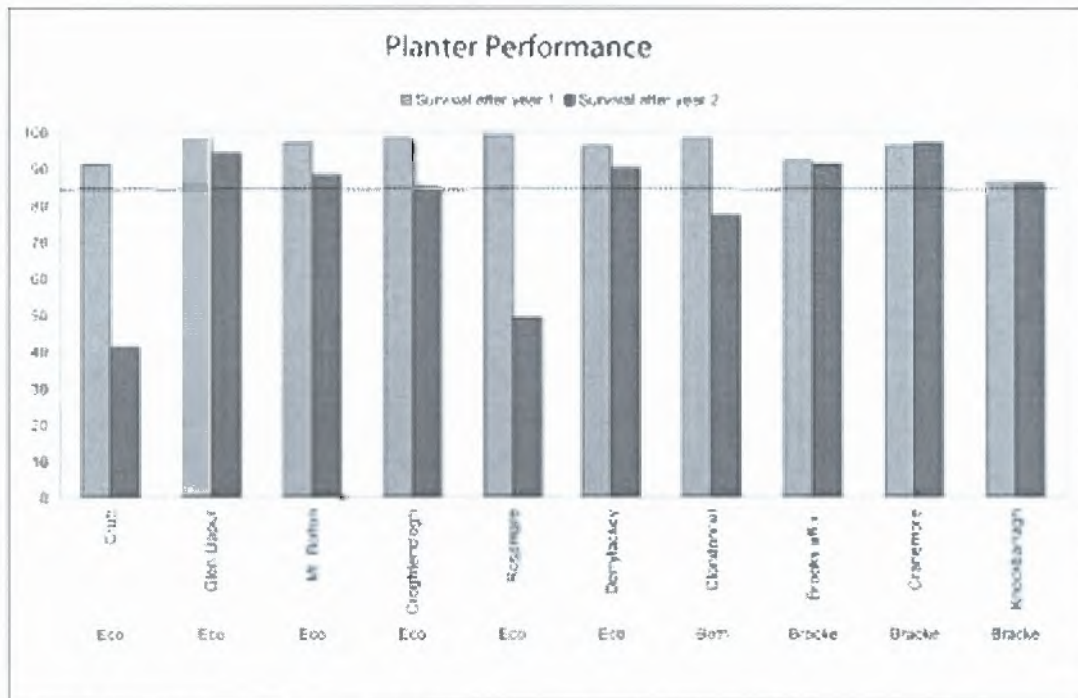


Figure 1. Survival of mechanically planted trees on ten sites after one and two growing seasons.

compared to bare-root stock. This has huge advantages for autumn and summer planting times when no bare-root planting can be carried out. We have had good experiences with Braeke planting even over a twelve month period.

Management. As mentioned earlier, using either planter makes the job of managing the establishment process much easier. One contractor dealing with most of the site operations reduces workloads on the site supervisor.

Plantation performance. Plantations established using mechanised planting of container stock have performed very well in surveys of establishment success.

Weevil control. Using the Braeke or EcoPlanter to carry out weevil control at the time of planting is very effective and concentrates the insecticide where it is required. It also reduces the operator's contact with treated plants.

Species change. The shorter growing cycle used for container stock means that this growing method is more adaptable to changes in species requirements than that used for transplant stock.

Cultivation area. With either of the existing planting machines, the total area cultivated

is less than that cultivated under more usual systems. This has major advantages in, for example, planting riparian or native woodland,

Disadvantages

Plant size and cost. Container plants used in mechanical planting are smaller (height and root collar diameter) than transplant stock. As such, they can be very vulnerable to weevil or mammal attack unless protected well. The cost of container stock is high relative to transplant stock and this is a deterrent to their being used more.

Novelty. Mechanical planters are relatively new to Coillte and it sometimes can be difficult to persuade some establishment foresters to use them. Some remain loyal to existing cultivation and planting contractors and do not wish to change.

Site suitability. Both the EcoPlanter and the Braeke Planter are limited to certain site types. This can prove to be a difficulty in terms of putting a programme of work together for a particular machine.

Availability. Most of the existing fleet of mechanised planters are in the south and east. There is little scope for their being used

in other parts of the country, as contractors are often not willing to travel and large programmes are not available in other areas.

Training. Most of the contractors that are interested in mechanical planting come from a site cultivation background. As such, they are used to dealing with machines and not with plants. They need to be trained in the handling and care of plants.

FUTURE DEVELOPMENTS

Research is quite active in the area of mechanical planting and in other related areas that impact on it. On the equipment side, Bracke Forest have recently developed a larger carousel for the Bracke Planter. It is designed to triple the existing carousel capacity to over 200 plants. This will result in the operator having to leave the cab a lot less to load the carousel with plants. It is hoped to test the new carousel in Ireland in the spring of 2006.

Another machine development that could affect the role of planting machines is that of brash bundling. This equipment gathers brash after clearfelling, bundles it and the bundle is later chipped for fuel. This equipment would leave the site relatively free of brash, thus making the planting operation much easier. A brash bundler has already been demonstrated in this country and further evaluation will take place this year.

Two recent developments in the area of pine weevil control have already been tested using mechanical planters. Some Bracke Planters in Scotland have been fitted with applicators which apply a granular insecticide to the planting hole at the time of planting. This systemic insecticide is taken up by the growing plant. The system has not been tested in this country yet.

Another development in the area of protecting plants against weevil is the WeeNet. This plastic sleeve, developed by Alba Trees in Scotland, is slipped over the container plant in the nursery just prior to despatch. It protects the tree by preventing access by the weevil to the main stem. It has been tested with mixed success in this country in the last year and can be used for manual and mechanical planting.

CONCLUSIONS

Mechanical planters are now an accepted tool in forest establishment in Coillte, with over 2,500 ha planted in this way already.

Within Coillte, we must ensure that planting programmes are in place to ensure work for contractors who have invested in mechanical planters.

Although the operation reduces overhead costs, we need to strive to reduce the actual cost of producing container plants and look for further efficiencies in the machine side of the operation.

We need to continuously monitor plantations, established using mechanically planted container stock, to assess survival and early growth.

ACKNOWLEDGEMENTS

Thanks to COFORD for the opportunity to speak at the conference. Joe Kilbride has taken a special interest in mechanical planters and undertook all the early plantation surveys. The staff at the Coillte Clone Nursery have been particularly helpful since the project began, especially John and Eamon Bardon.

A special thanks to all the Coillte Establishment Team members who had the courage to use mechanical planting when it was a little known technique. Lastly, to the contractors who have invested their own money in this project — the Nevilles, the Walshes, the Ryans, the Gregans and Denis Shannon.