

## **Carbon Footprint Report**

**To be viewed with Carbon Data Spreadsheet**

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## **1.0 Introduction**

North West Turf Ltd (NWT) decided to implement a research programme in order to gain a better understanding of the carbon impact on the environment it was having. In these modern times when global warming is one of the key issues facing humanity, businesses must consider the effect they are having and what can be done to reduce emissions. These factors meant that North West Turf wanted to know the carbon levels which were released into the atmosphere, thus then being able to make more informed decisions about their future environmental actions.

In NWT's favour however, through the turfs process of photosynthesis carbon is absorbed from the atmosphere, meaning that potentially not only could the company be carbon neutral but rather absorbing more than they emit. This would mean that the company is assisting in reducing the global environmental crisis. Before the carbon impact of North West Turf can be calculated the numerous different items involved must be taken into consideration. These include the amount absorbed by the turf grown as well as the offset created through the companies solar panels. The emitters on the other side of the equation are the fuel used in production, emissions created through transport and the impact of fertiliser.

## **2.0 Absorbers**

### **2.1 Turf**

The first major component in this calculation is the amount of carbon which is absorbed by the turf grown across the 250 acres of farm. Dr Ranajit Sahu in his report regarding the carbon sequestration potential of managed turf grass, (2010) suggests that for each acre of turf, on average, 0.42 tonnes of carbon would be absorbed. His research was carried out in order to estimate whether the turf gardens of the United States were acting as a carbon sink, or if the management of them by home owners was removing any positive impact which they were having.

Processing this across the 250 acres of production area which North West Turf owns, results in a total absorption of 105 tonnes according to Dr Sahu's estimated figures of intake each acre. This figure on its own is a substantial amount of carbon intake which can only be of benefit to the overall environment. Despite the relatively small amount of carbon absorbed each acre, because of the vast quantities of turf produced by North West Turf with its fields totalling 250 acres, extensive amounts of carbon are being processed and turned into something better for the environment.

Absorbing such a large figure of carbon means that the organisation could emit 105 tonnes of carbon back into the environment and still be having no harmful impact, thus being carbon neutral. Minimizing a company's environmental impact is something that not only businesses want to do themselves but also something that customers are now bringing into consideration when making a purchase. Buying from a company which pays little thought into their overall impact of climate change is something that is becoming less and less common as consumers demand that organisation consider the influence they are having.

The carbon absorbed by turf is significantly less than other types of organic matter such as trees for example in their processes and photosynthesis. However turf has a major advantage of reaching maturity much quicker than trees, these can often take up to 30 years in order to reach their most efficient age. In comparison to this long duration, turf can take just nine months to reach majority and reach a level where it can be cut and sold to a different location, where it can carry on absorbing carbon from the atmosphere.

## **2.2 Solar Panels**

The next tool which North West Turf has in order to offset carbon emissions is the solar panels which are situated on the roof of one of the barns at the farm. These panels not only reduce electricity costs and provide any spare energy back into the national grid, but also offset emissions with a fuel powered station no longer needing to produce as much electricity. These power stations are no longer required to develop electricity for North West Turf meaning that less non-renewable fuels have to be used in order for the organisation to operate. Instead the green power of solar energy is being used with a much more eco-friendly impact.

The solar panels located on the roof on one of North West Turf's barns will provide power for all of the various electrical needs of the organisation, from the office in which staff organise the day to day activities, down to the lights of the barns in which goods sold by the company are packaged and stored. This means that the North West Turf is no longer dependent on the fossil fuelled power stations and the catastrophic affects their over consumption is having on global temperatures.

Each panel according to their manufacturer Eco Environments Ltd creates a carbon offset of 0.03 tonnes, with NWT installing 140 of them, creating a total offset of 4.2 tonnes. This is a significant level of carbon intake for something that isn't the primary aim of installing the panels, with the principle goal of them being to reduce the energy costs of the organisation. This carbon offset is an added bonus to NWT who originally was simply looking for a way to reduce their electricity payments. After research and consultations it soon became clear that not only could payments be reduced but also North West could, in their actions, have a

positive influence on the environment, with solar panels being the clear choice moving forward.

The 4.2 tonnes of carbon offset created through solar energy can be added to the intake by the turf of 105 tonnes, resulting in a total carbon offset of 109.2 tonnes. This substantial amount of carbon intake could have a drastic effect not only for them but also on the global environment. Absorbing this level of harmful substances is only going to be of benefit for the surrounding area, improving living conditions and the quality of the air for the population in the local area.

### **3.0 Emitters**

#### **3.1 Fuel**

In the operations of North West Turf and carrying out various different processes in order to grow high quality turf for resale carbon is emitted into the atmosphere. The first of these processes is the fuel used in the various different types of machinery that is currently in service in the organisation. North West Turf currently owns and operates four tractors for example as well as multiple fork lift trucks, all requiring diesel fuel in order to function. In the use of these machines diesel is used in the engine which as a result releases carbon into the atmosphere.

In order to gain an estimate of the total carbon released into the atmosphere by North West Turf the first task was to find out the total amount of fuel used each year. As the diesel is purchased in bulk loads this was easy to acquire simply needing to contact the suppliers for them to provide NWT with the information on total gallons purchased. From their numerous different suppliers a total of 12,542 gallons was purchased from June 2011 – June 12, as a result all of the subsequent calculations will be based on this figure.

The next stage in order to calculate the emissions was to find the amount of Carbon released into the atmosphere for each gallon. This figure is understood to be 0.00275 tonnes of carbon for each gallon of diesel consumed (US Department of Energy, 2009). Thus meaning the total amount of carbon produced by North West Turf in their use of diesel is 34.49 tonnes (0.00275 \* 12,542.) This is a significant amount of carbon released that will be released into the atmosphere and cause damage to the environment. However it is still lower than what North West Turf are absorbing and further calculations are needed to get to the final stage to determine if they are carbon neutral or not (United States Environmental Protection Agency, 2011).

In the long term North West Turf could look to reduce these emissions in order to improve their environmental impact. Assessing if the amount of diesel could be reduced for example

by using machines more efficiently, lowering their total distance travelled or improving the way they are driven could all result in less diesel consumed. One alternate method may be to see if hybrid vehicles are an option for the company. These battery powered vehicles could be charged through the electricity produced by the solar panels which are installed, reducing carbon released to zero.

### **3.2 Transport**

The next factor taken into account by North West Turf is the transport of purchased turf and other products from the farm in which they are grown and packaged. From this location they are then sent to the customers who have ordered them. NWT currently uses a third party haulage firm which collects goods from the farm, transfers them to a depot where they are then put onto an alternate vehicle and delivered to the customer. For the purpose of this test the average journey is based upon a standard trip to customers in the zone one region.

The average pallet travels from the NWT farm (L39 6SR) to the Lichfield Depot (WS13 8NE), where it gets transferred at the depot to a different vehicle. This is a distance of 99.8 miles which must then be added to the other miles travelled at the other parts of the journey. The next step in this average journey for a pallet is travelling from this Lichfield Depot to the Oxford site (OX14 4SD), a total mileage of 96.9 which can then be added to the distance from above. The final step in the chain is transferring the pallets from the Oxford depot to the customers. According to the third party haulage firm this on average is a distance of 11.18 miles, resulting in a total mileage of 207.88.

The problem with using these artic trucks is that they produce significant amounts of carbon in their emissions because of the high amount of diesel which they use. The standard truck that the haulage company uses currently is the Volvo Globetrotter FM 440. According to the Motor Transport Awards (2011) this truck averages at an MPG of 8.65, meaning that every gallon of diesel used, 8.65 miles of road were covered. Using this data the total emissions created for the average trip could be calculated at 0.066 tonnes of carbon each journey.

The next step is to calculate the number of trips that these vehicles make on behalf of North West Turf each year. 22792 pallets are sold each year by NWT and go through the third party haulage firm's organisation travelling this average journey. 30 pallets are placed on each lorry in order to maximise their efficiency by not sending out empty loads. As a result in total 760 trips are made each year with total carbon emissions estimated to be 50.21 tonnes. Thus a substantial amount of carbon is being released into the atmosphere in the transportation of the turf and other products to the customers who are purchasing them, in the long run this might be something which NWT looks to reduce.

Although the transportation is handled by a third party company and North West Turf have little influence over their operations, applying pressure regarding turning more eco friendly and looking into reducing their Lorries emissions for example would only be on benefit to the environment. Having this amount of carbon released into the atmosphere by the arctic trucks travelling around the country each day is going to cause damage to the local area reducing air quality and potentially damaging wildlife. One optimistic note is that despite this carbon produced North West Turf is still offsetting more than the emissions produced meaning that there is still a positive impact on the environment.

### **3.3 Fertiliser**

North West Turf uses fertiliser on the turf it produces in order to insert minerals into the soil to provide customers with the best quality product available. These fertilisers also help to remove any unwanted items in the turf including weeds and harmful bacteria. Without the use of fertilisers the turf would not grow to such a high standard demanded from customers and thus would not be able to offer the weed free guarantee (Bilgili, Acikgoz. 2011).

One drawback with using fertiliser for the turf is that some level of carbon will be emitted into the atmosphere. Having this carbon emitted will have an impact on the overall footprint of the organisation and the bottom line on whether or not North West Turf is carbon neutral. Only by knowing all the figures can the overall impact of the organisation on the environment be calculated and decisions made accordingly, either on how to further improve the carbon intake, or decisions on how to reduce the emissions.

North West Turf from June 2011 to June 2012 used 50 tonnes of urea 46N fertiliser on the product in order to achieve the best possible quality. The urea fertiliser dissolves in water meaning that the products created from the chemical reaction are ammonia and carbon dioxide. Using the equation  $\text{moles} = \text{mass} / \text{Mr}$  we can conclude that there are 833.3 moles of urea in the 50 tonnes. There is a 1-1 ratio between the urea and CO<sub>2</sub> thus meaning that we can infer that there are also 833.3 moles of carbon dioxide.  $\text{Mass} = \text{Moles} \times \text{Mr}$  which results in 36,666.67 kg of carbon dioxide. Converting this to carbon individually results in 10,000 kg of carbon being released or 10 tonnes.

### **4.0 Net Carbon Absorbed / Emitted**

Now all of the various sections of the calculations are concluded, it can be determined that North West Turf has a total carbon offset of 109.20 tonnes and creates emissions through its operations of 94.70, a net intake of 14.50 tonnes. Thus despite the large amounts of carbon produced, because of the solar panels and turf absorbing harmful gases it results in a positive result for North West Turf. Having a beneficial impact on the environment not only

allows the organisation to know they are improving their surroundings, but also meeting the demands of customers who want to see organisations thinking about their actions.

Absorbing 14.50 tonnes of carbon each year means that NWT are having a positive effect on the global climate change crisis, in comparison to other companies who are simply making the situation worse. This highlights North West Turf's commitment to this issue of climate change and how they understand that action needs to take place in order to improving the situation. If companies continue not to alter their ways and decide not to adapt to assist in the reduction of global warming then the situation will only get worse. Following similar actions to NWT, installing solar panels for example to help carbon offset would assist dramatically in improving environmental conditions.

One important consideration is that the turf produced by North West Turf is then sold and delivered to customers, who then lay this in their garden or other areas where it continues to photosynthesise and process carbon. As a result the actual carbon absorbed through NWT turf isn't just the product grown on their fields each year, but rather also the amount of turf which is currently in place in customers gardens. Thus meaning that in order to know the full extent of the turfs effect on global warming, the product sold to customers during certain duration of time must also be taken into account.

## **5.0 Customer Turf**

### **5.1 Carbon Intake**

For the purpose of these calculations North West Turf will look at the turf it grows itself in a year, as well as customers having the turf for a time of three years. Taking this into consideration the total square footage of turf being assessed is 250 square foot grown on the farm, as well as an additional 750 which is located in customer's gardens reaching a total of 1000 square metres. The figures will be based upon a three year period as some consumers keep the turf for longer, whilst others may replace it with an alternate set up after just a year, meaning that three years is a general average.

Taking this into consideration the same assessment as before still remains the same, that one acre of turf equates to a carbon offset of 0.42 tonnes. As a result the total amount of carbon absorbed by the turf both in the NWT fields, as well as the customer's gardens is 420 tonnes. Having such a large amount of carbon taken out of the atmosphere will be of benefit to people and wildlife living both around the NWT farms in addition to the houses in which customers turf is now located.

The number of acres sold to customers is derived by knowing that the organisation sells 250 acres of turf each year, over the three year duration this reaches a total of 750 acres of

goods, all of them absorbing harmful gases from the atmosphere. By customers having significant amounts of turf in their gardens rather than concrete or block paving for example they are helping to reduce their carbon footprint, offsetting to some extent the emissions that they are creating through their daily actions. As a result not only is North West Turf lowering their carbon footprint but also helping the customers who are buying their products to lower theirs.

## **5.2 Carbon Emissions**

One important consideration in assessing the carbon emissions created through customers having turf in their gardens is that some level of maintenance will take place in the three year period. The main task that the turf customers will need to complete for their lawns is mowing. As it is the primary task that must be done to the lawn with other items' not being as important, this is the only duty that will be included in this evaluation. In order to be able to calculate the net carbon value for the customer's turf, the amount of emissions produced by domestic lawn mowers will have to be taken into account in the calculations.

To be able to calculate the total emissions created by the domestic lawnmowers, the average amount of carbon produced per acre is required which could then be multiplied by the total number sold. According to Milesi et al (2010) each acre of domestic mowers releases 0.073 tonnes of emissions, producing in total across the 750 acres 54.75 tonnes of carbon gases. These gases are released into the atmosphere contributing towards global warming and climate change. Despite their small size domestic mower engines are typically inefficient requiring substantial amounts of fuel for little amounts of work (Priest et al, 1999).

This lawn care as a result is contributing more to carbon emissions each year than any of the other factors in the calculations. In the long term greater legislations and efforts should be put forward from certain institutions such as government in order to try to lower the emissions from these inefficient machines. If legislation were to be introduced it would stop manufactures from producing this type of engine, forcing them into researching new methods and encourage them to change their current actions.

In addition to this, thousands of gallons of fuel are spilt each year with people refilling their mowers (Priest et al, 1999). This fuel is not only a waste of resources but also causes harm to the environment causing damage to wildlife around it and can often contaminate water supplies. Although no emissions are being created with this wastage directly, this fuel has still had to go through various refineries and acquired in the first place, meaning any emissions created through this have been a waste with the fuel not even being used.

## 6.0 Conclusion

However despite this negative impact from domestic lawnmowers there is still a net positive impact on the environment with the carbon offset from turf being far greater than the emissions created in its maintenance. The overall positive impact for the environment including the customer's lawn is 361.50 tonnes absorbed, having a hugely beneficial effect on the global climate change issue. North West Turf would still have a valuable impact on the environment if the turf of customers was not included in the calculations absorbing 14.50 tonnes of carbon, contributing to lowering global warming. This means that overall as an organisation North West Turf is helping to improve climate change and preserve the planet for future generations.

However only by other organisations changing their operations and practices can the issue be fully rectified. Companies polluting the atmosphere with substantial levels of carbon emissions will result in a gradual reduction of air quality and increasing problems of climate change. It must be a unified effort from all sectors of the economy, government must provide legislation to encourage businesses to alter their ways, organisation must see that a change is needed and want to adapt their ways of operations whilst customer must demand better eco friendly policy from companies. By not purchasing products from companies who make no effort to reduce emissions will force them into altering their methods.

All of the calculations are based upon best estimations and academic report results with the exception of figures which are available through the accounts, such as the amount of diesel consumed on the farm each year and level of fertiliser spread. Although the calculations may vary slightly from the actual levels, because of the reliability of the sources used and the scrutiny their reports will have faced, the data produced from them can be considered trust worthy. Having accurate figures is essential in order to see exactly the position that North West Turf is in and whether or not, the impact they are having is a positive or negative one for the environment and global climate change issues.

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