Reducing Carbon, Water, and Land Footprint at Prysmian Group through Plant-based Foods

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Executive Summary

As Prysmian has stated within their Sustainability goals, the reduction of our carbon footprint is a critical strategy for our future. The goal of this proposal is to promote sustainability within Prysmian Group by reducing carbon emissions, water usage, and land footprint through shifting food/beverage consumption to more plant-based sources. This can be accomplished through three preferred solutions: increasing plant-based options at vending/canteen services within the facilities, participation in the Veganuary workplace challenge, and/or increasing plant-based options at catered events and company lunches. No direct financial investment is required to accomplish these solutions and there is no risk to product, sales, or quality. As the estimated environmental benefits are variable depending on solution and engagement rate, please see Section 9 for these figures.

Mission Statement

The goal of this proposal is to promote sustainability within Prysmian Group by reducing carbon emissions, water usage, and land footprint through shifting food/beverage consumption to more plant-based sources.

Preferred Solutions

Vending and Canteen

The first solution for this proposal is to increase the plant-based options to become 25% of the total vending/canteen options. This 25% increase would be done through the replacement of current options, instead of increasing the SKU. An important part of this solution is the actual purchase rate of these newly stocked plant-based products. The most practical way to test this is to run a small pilot program using one location first. For the purposes of simplicity, I will use the Lawrenceburg plant as this pilot program. An inventory list could be provided by our vendor, AVI Foodsystems, who should also be able to provide a purchase rate per product. This information, combined with a listing of which goods are plant-based vs non-plant-based, could be multiplied into the amount of money spent on plant-based vs non-plant-based products. This number would then be converted into a percentage of plant-based vs non-plant-based money spent. A more intensive approach of getting caloric content per item can be taken to provide further accuracy if deemed necessary. An example set of these calculations is shown in Appendix F.

With these variables known, AVI Foodsystems could be asked to increase their plant-based options by 25%. An inventory of the fridge/freezer showed 40 food options with 0 of those options being plant-based. Therefore, in this situation 25% of the existing SKU would be replaced with plant-based options. Once the pilot program at Lawrenceburg is implemented, the data will be evaluated. Any sales of this product would be deemed as positive movement, but a sales figure by plant-based SKU of 15% or higher would be considered successful. This equates to a 60% return rate on plant-based products introduced. If the pilot program is determined to be successful, it would then be rolled out to different locations around the world. The 25%

plant-based options and 60% return rate goals are both early place-holder estimates, these could be altered without affecting the solution.

It is important to note that these options are readily available at vending/canteen services within the United States. For example, the company aptly named "canteen" claims to serve 98 of the 100 companies in the Fortune 100 that display the option for "Vegan" products, which falls under the "plant-based" foods category. This is shown in Figure 1:
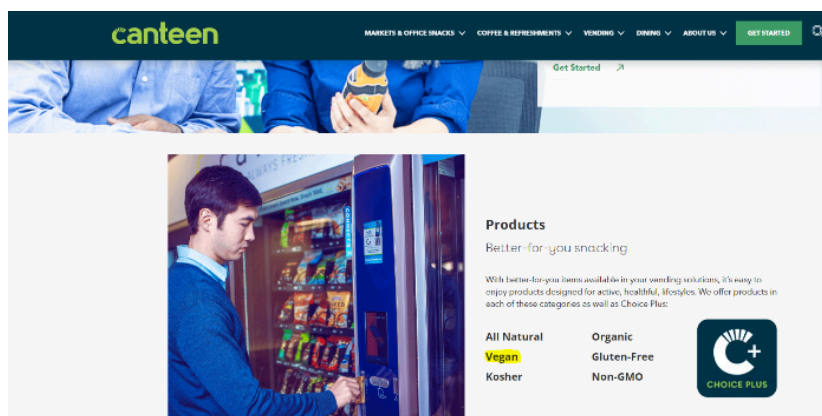

Figure 1: Vegan product options at canteen

Additionally, the current vendor for the Lawrenceburg plant, AVI Foodsystems, has a linked article on their LinkedIn page discussing their role in/ability to cater [or similar] catering to vegan students at Goshen college (source). Based on this information, it is likely that any vending service would be able to increase their plant-based options provided to us.

Veganuary Workplace Challenge

The Veganuary Workplace challenge is a completely voluntary, free to join challenge that encourages people to go plant-based for the 31 days of January each year that is coordinated through the charity Veganuary [true statement?]. More than 100 companies worldwide signed up for this challenge in 2022, with such names as: PwC, Volkswagen, EY, Verizon, and Papa Johns. To sign up for this, a company representative just needs to send an email to the Veganuary charity's representative stating that their workplace would like to take part in the challenge. Then Veganuary provides a dedicated, trackable sign-up link that the Veganuary charity representative shares with the company for participation. Engagement could be monitored through this link or through a site-wide survey at the beginning and the end of the month. Joining this challenge would require very little effort/oversight and no added costs. Figure 2 shows the steps required to sign up.
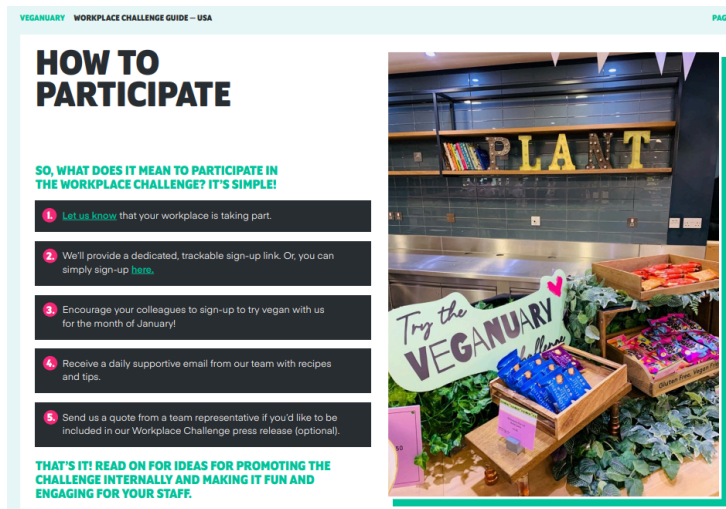
Figure 2: Veganuary Participation Guide

Catering/Company Meals

The current rate of plant-based options could be increased within our catering, company meals and Holiday handouts. This increase would be particularly difficult to monitor for carbon, land, and water savings due to variability of these events and occurrences. However, I believe we could confidently increase our plant-based consumption rates through outward encouragement from our leaders at each of our locations to support the prioritization of increasing plant-based options. The HappyCow app is a great global resource for showing local options that fit the plant-based description. There are also an increasing number of restaurants, vendors, and stores that offer these options and aptly show them on their menu. It is my experience at the Lawrenceburg plant that these options are rarely, if ever, available at these events.

For the Holiday handouts at the Lawrenceburg site, there are a few plant-based options that the company could choose. The first option would be an opt-out option for the handouts altogether. Another option would be to offer a plant-based option that the employee could choose instead. Plant-based substitutes, such as Tofurkey, are increasing rapidly and are generally of similar value to current non-plant-based options [true statement?]. Finally, a third option could be workers choosing to donate the cost of the Thanksgiving/Christmas handout to a charity of Prysmian's choosing.

Strategic Alignment

The reduction of carbon emissions is tantamount to Prysmian Group's sustainability goals, with the goals to be NET ZERO by 2035 in Scope 1 and 2 emissions and NET ZERO by 2050 for Scope 3 emissions. This importance is truly shown by the plan to invest 100 million euros over the next 10 years to achieve these emissions goals. Prysmian Group's sustainability report also lists reducing water consumption as an environmental performance indicator. Any combination of the 3 solutions previously described would help in the achievement of reducing our carbon footprint by 1,809,044 $kgCO_2e$ with a 25% plant-based canteen/vending shift and a 5% Veganuary engagement rate as a

company. It would also reduce our water footprint by 238,977 m^3 with a 25% plant-based canteen/vending shift and a 5% Veganuary engagement rate as a company.

Benefits

The most obvious benefits of this proposal are the reduction of carbon emissions, increase in carbon sequestration, decrease in land use, and decrease in water use. Additionally, these changes would be more inclusive for workers who have previously adopted plant-based diets.

Risks

These solutions do not affect any of our production, processes, quality, or customer relationships. Therefore, the major risks of typical changes are not relevant. While there is the possibility of a slight risk that some employee pushback may be encountered, it does not outweigh the potential benefits from the proposed changes.

Financial Analysis

None of the three solutions suggested would require any direct financial investment. There is the possibility that some of the plant-based products could be slightly more expensive than their non-plant-based counterparts, there is also the possibility that some of the plant-based products could be less expensive than their non-plant-based counterparts. There would also be some cost savings associated with employees who choose to opt-out of Holiday handouts.

Resources Required

Vending and Canteen

For the vending and canteen services change either the North American or the local sourcing representative would need to contact the vending service. A volunteer at each site could help manage this transition as well.

Veganuary Workplace Challenge

The only resource needed for this would be an individual to contact the Veganuary organization and distribute the ensuing information to the workforce. This individual may also need to create, deploy, and evaluate a site-wide survey for participation information, or evaluate participation information through the provided link from Veganuary.

Catering/Company Lunches

No resources would be specifically required for catering/company lunches. Leadership support would be requested to cascade the prioritization of including plant-based options for all provided meals. For Holiday handouts, there would be some upfront work required to create/modify the options list for employees and the processing of their responses. Additionally, a charity or list of charities would need to be selected by Prysmian if this option is to be included as an option.

Estimated Carbon and Water Footprint Reductions

Vending and Canteen

Figure 3 shows the estimated carbon emission reductions combined with the estimated carbon sequestration increase for the entire Prysmian Group workforce. Appendix A, B, and C show the calculations for these figures.

Figure 3: Total Carbon Savings Based on Plant-based Shift %

Figure 4 shows the water footprint decrease for the entire Prysmian Group workforce. The calculations for these figures are shown in Appendix D.

Figure 4: Decreased Water Footprint Based on Plant-based Shift %

Veganuary Workplace Challenge

Figure 5 shows the estimated carbon emission reductions combined with the estimated carbon sequestration increase for the entire Prysmian Group workforce. Appendix A, B, and C show the calculations for these figures.
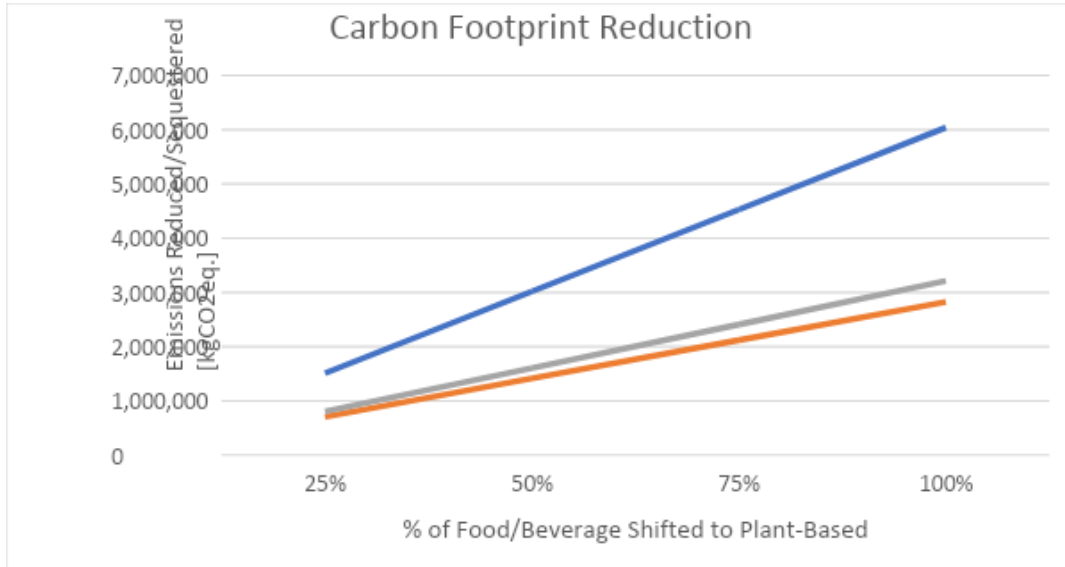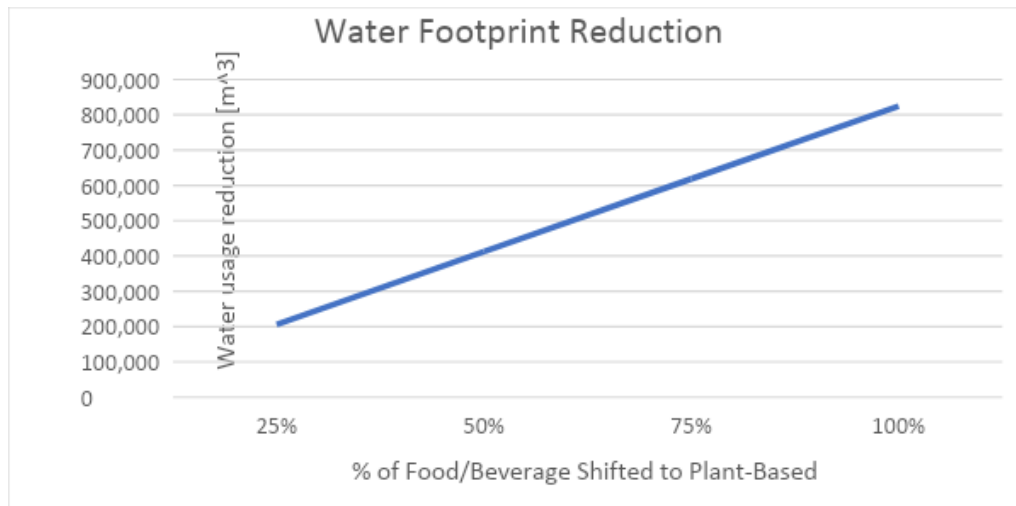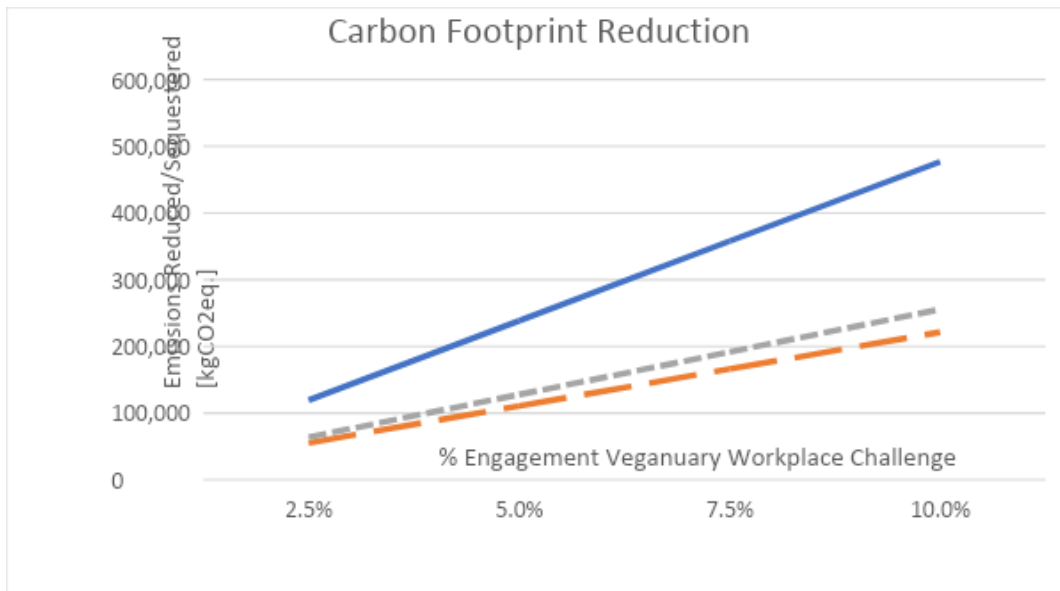

Figure 5: Total Carbon Savings Based Veganuary Engagement Rate

Figure 6 shows the water footprint decrease for the entire Prysmian Group workforce. The calculations for these figures are shown in Appendix D.
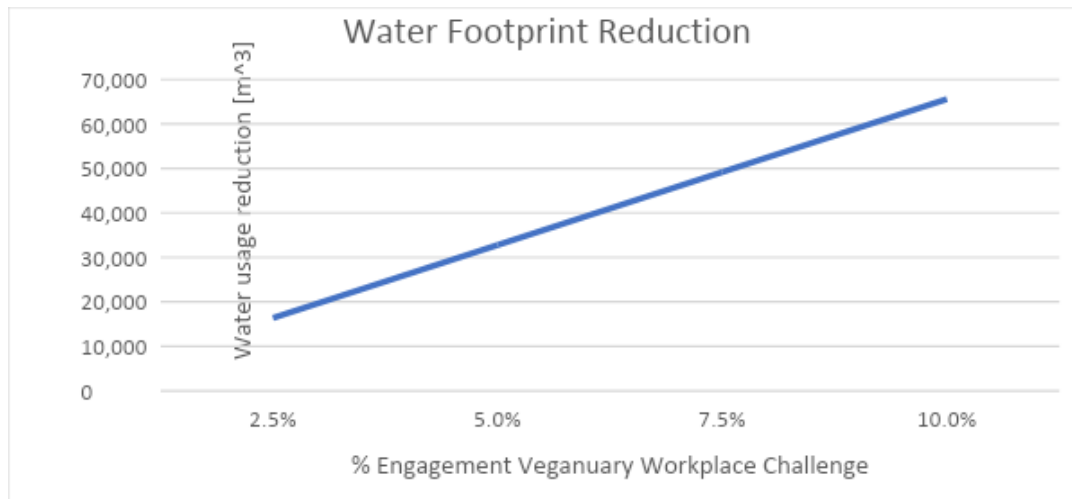

Figure 6: Decreased Water Footprint Based on Veganuary Engagement rate

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Appendix A
General Assumptions and Information on Carbon Calculations

The greenhouse gas emission figures were taken from an analysis of the Epic-Oxford Study (Scarborough, P., 2014) and from (Poore, J., 2018). Both studies are compiled datasets. Greenhouse gas figures will be displayed as CO_2e on global warming potential related to a 100-year time scale. Using this, methane is weighted as 25x potency, nitrous oxide as 298x potency, and carbon dioxide as 1x potency. The water footprint figures were taken from (Francesca H., 2020). The calculations will be done in two different manners. One will be in relation to shifting the food/beverages we serve within the workplace. The calculations for this will be done at a 100% plant-based shift, but Tables 3, 4, and 5 will show the corresponding figures with these values at 25%, 50%, 75%, and 100%. The 25% figure is the one referenced as the preferred solution. The other rates are for a frame of reference for possible future plant-based increases. The other calculation will be done for the Veganuary Workplace Challenge. These corresponding tables will be done with estimated 2.5%, 5%, 7.5%, and 10% engagement rates. I was not able to find the engagement rates for companies that signed up, so these are estimated engagement rates.

Appendix B
Carbon Emission Reduction Calculations

The carbon emission reduction calculations are based on 2 meta-analyses. These 2 are the Epic-Oxford Study and Poore & Nemecek. These were chosen because of the reliability of the data presented due to the large quantity represented by meta-analysis style studies. The two studies will be compared to get a range of estimated carbon emissions reduction.

The CO_2e per diet type is given in values per day per person in the Epic-Oxford study. So, we can use a few calculations to convert this estimate into one that fits the proposed solution. First, we have to make some assumptions that we can use for these calculations. These assumptions are shown in Table 1.

# of Employees (EMP)	28000
# of Work Days (WD)	240
% of Calories consumed at Work (MPDW)	33%
% of Employees that eat Work Based Meals (EAW)	50%

Table 1: General assumptions for calculations

Please note that the finished CO_2e values are proportional to each of these assumptions. Therefore, the finished CO_2e can be linearly adjusted if any of these assumptive values are adjusted. So, in Table 2 the CO_2e per person per day as calculated by the Epic Oxford study is shown below. For the current omnivore diet, a medium meat-eater emission was selected:

	Epic-Oxford	Poore & Nemecek

Daily Carbon Emissions/diet [g CO2]	Omnivore	Vegan	Omnivore	Vegan
	3959	2336	5820	2905
Emissions per meal [g/CO2]	1320	779	1940	968

Table 2: Emissions rate by diet type

From Table 2, we can quickly calculate the daily carbon emissions reduction per person (CERPP) for a shift to a plant-based diet of 2.74 $kgCO_2e$ (a 49% reduction). Next, this number needs to be adjusted for a person while at work at Prysmian (CEPP). This is done using Equation 1:

$$CEPP = MPDW * EAW * CERPP \qquad (1)$$

This equation accounts for the percentage of the average person's diet that will actually be impacted by food choices presented in the work environment. The result of this shift is 0.452 $kgCO_2e$. Since this result is a daily number, it needs to be moved to a yearly figure. Since people do not spend all of their days at work, it will need to be multiplied by workdays (WD). This annual carbon emissions reduction per person (ACEPP) is calculated using Equation 2:

$$ACEPP = CEPP * WD \qquad (2)$$

This makes the ACEPP 108.5 $kgCO_2e$. Finally, to convert this number to the global Prysmian workforce, the ACEPP is turned into a total annual carbon emissions reduction of (TACEPP) 3,038,112 $kgCO_2e$ using Equation 3:

$$TACEPP = ACEPP * EMP \qquad (3)$$

The carbon emission reduction number cited for carbon emission reduction by a shift to a plant-based diet Poore & Nemecek is 6.6 Gigatonnes CO_2e worldwide per year (TACEW)Therefore, slightly different calculations need to be done to convert this to the TACEPP value. First, the number needs to be converted to a per person calculation by dividing by the world population. This study is from 2018, so the world population from 2018 will be used. The resulting value is found using equation 4:

$$CERPP = \frac{TACEW}{Worldwide\ Population * Days\ in\ Year} \qquad (4)$$

This results in a carbon emissions reduction per person (CERPP) of 2.36 $kgCO_2e$. We can quickly use equations 1,2, and 3 to convert this number in total annual carbon emissions reduction (TACEPP). Since, all equations are linear, we can also use proportionality to quickly calculate as well. This results in a TACEPP of 2,616,749 $kgCO_2e$. Therefore, with the 2 studies results in tow we can estimate a carbon emissions reduction of between 2,616,749 $kgCO_2e$ and 3,038,112 $kgCO_2e$. Table 3 shows these figures by % reduction rate. Please note these values correspond to shifting the food/beverage options at work and do not correspond to the Veganuary Workplace Challenge or the Catering/Company Meals/Holiday Handouts.

% of Work allocated Food/Beverage shifted to Plant-Based	Emissions Reduction [$kgCO_2e$]	
	Low Estimate	High Estimate
25%	654,187	759,528
50%	1,308,375	1,519,056
75%	1,962,562	2,278,584
100%	2,616,749	3,038,112

Table 3: Emissions Reductions Based on Plant-based Shift %

To calculate these figures for the Veganuary Workplace Challenge, we will take the 2.74 $kgCO_2e$ CERPP value as our starting point. Since, this correlates to our high estimate, we can use proportionality to determine our low estimate of this number. This shows the low estimate for CERPP to be 2.36 $kgCO_2e$.

Then these numbers just need to be multiplied by the number of days in January and the number of employees. This results in the values at various engagement rates shown in Table 4.

% Engagement Veganuary Workplace Challenge	Emissions Reduction [$kgCO_2e$]	
	Low Estimate	High Estimate
2.5%	51,212	59,458
5%	102,423	118,916
7.5%	153,635	178,374
10%	204,846	237,832

Table 4: Emissions Reductions Based on Veganuary Engagement rate

The TACEPP value is the figure related to the direct reduction of carbon emissions, but does not include the carbon sequestration potential. The carbon sequestration is a number directly related to the reduction in farming land use requirement that would result from this shift. This is calculated using values from the Poore & Nemecek study:

Appendix C
Land use Reduction and carbon Sequestration Calculations

One way to calculate the carbon sequestration change that would occur is to first calculate the land use requirement change. Table 5 shows the land use requirement estimates by diet type from Poore & Nemecek.

Diet	Land use [ha]
Current Diet	4,130,000,000
Vegan Diet	1,000,000,000

Table 5: Land use requirements by diet type

Since this study was taken in 2018, the estimated world population from 2018 will be used. That population is 7.662 billion people. Using equation 5 we can estimate the land use per person for each diet:

$$Land \; required \; per \; person = \frac{Land \; use(total)}{Total \; Population} \qquad (5)$$

This results in the land required for a plant-based diet per person to be 0.13 hectares and for a traditional diet to be 0.54 hectares. This results in a difference of 0.41 hectares between the two diets (a 76% reduction). Using this in conjunction with the assumptions from Table 1, we can calculate the land use change if the company switches to plant-based food sources. This is done using equation 6:

$$Land\ Use\ Reduction\ = \frac{EMP*MPDW*WD*EAW*Land\ required\ per\ person\ difference}{\#\ days\ in\ year} \tag{6}$$

In this formula, we are taking an overall land use number by diet type and reducing it down to the land use reduction that would be associated with just estimated meals consumed at work. Table 6 shows this estimated land use reduction.

% of Work allocated Food/Beverage shifted to Plant-Based	Land use Reduction [ha]
25%	312,399
50%	624,799
75%	937,198
100%	1,249,597

Table 6: Land use Reduction Based on Plant-based Shift %

Table 7 shows the estimated land use reduction values for the Veganuary Challenge.

% Engagement Veganuary Workplace Challenge	Land use Reduction [ha]
2.5%	24,851
5%	49,702
7.5%	74,553
10%	99,404

Table 7: Land use Reduction Based on Veganuary Engagement Rate

This number is not an annual figure since the land use change would be a stagnant figure. We can, however, use this number to estimate the amount of carbon sequestration that would occur from the land removed from agricultural needs. This estimation has a significant amount of variation due to various landscapes that would be reclaimed. The number used in the Poore & Nemecek study is 2.588 tonnes $CO_2 ha^{-1} year^{-1}$. Looking at the Carbon Balance and Management Study, this number seems to be a reasonable figure. The Carbon Balance and Management study cites forests and woodlots having a CO_2 removal rate of 4.5 to 40.7 $tonnes CO_2 ha^{-1} year^{-1}$. Obviously, not all of land that is currently be farmed could be shifted to forest and woodlots, however. Williams (2003)-Deforesting the Earth states that 57% of the earth's surface was covered in forests 10,000 years ago, indicating that is the natural stasis point. So, using the most conservative value of 4.5 $tonnes CO_2 ha^{-1} year^{-1}$ and multiplying by the 57% of potential forest cover, a value of 2.57 is obtained. This number is extremely close to the one used in Poore & Nemecek and indicates they used a conservative estimate. Applying this rate to the land use reduction number that we calculated earlier results in a sequestration of 3,211,465 $kgCO_2 e$ using equation 7:

$$Carbon\ Sequestration\ Total\ = Sequestration\ rate\ *\ Land\ use\ reduction \tag{7}$$

% of Work allocated Food/Beverage shifted to Plant-Based	Sequestration Increase [$kgCO_2e$]
25%	802,866
50%	1,605,733
75%	2,408,599
100%	3,211,465

Table 8: Carbon Sequestration Based on Plant-based Shift %

In order to calculate the carbon sequestration for the Veganuary Workplace Challenge, we just need to take the 0.41 hectares per person difference and multiply that by a CO_2 removal rate that is adjusted for just the month of January. The adjusted CO_2 removal rate is 0.218 tonnes $CO_2 ha^{-1} year^{-1}$. This number is multiplied by the 0.41 hectares per person and the EMP and then adjusted based upon engagement rates. These values are shown in Table 9:

% Engagement Veganuary Workplace Challenge	Sequestration Increase [$kgCO_2e$]
2.5%	63,867
5%	127,734
7.5%	191,601
10%	255,468

Table 9: Carbon Sequestration Based on Veganuary Engagement rate

Appendix D
Combination of Carbon Emission Reduction and Carbon Sequestration

Adding this number to the TACEPP value calculated earlier would result in combined emissions reduction/sequestration range of 5,828,214 to 6,249,577 $kgCO_2e$ (at 100% switch to plant-based).

% of Work allocated Food/Beverage shifted to Plant-Based	Emissions Decrease/Sequestration Increase [$kgCO_2e$]	
	Low Estimate	High Estimate
25%	1,457,054	1,562,394
50%	2,914,107	3,124,789
75%	4,371,161	4,687,183
100%	5,828,214	6,249,577

Table 10: Total Carbon Savings Based on Plant-based Shift %

Adding this number to the TACEPP value calculated earlier would result in combined emissions reduction/sequestration ranges shown in Table 11 for the Veganuary Challenge.

% Engagement Veganuary Workplace Challenge	Emissions Decrease/Sequestration Increase [$kgCO_2e$]	
	Low Estimate	High Estimate
2.5%	115,079	123,325
5%	230,157	246,650
7.5%	345,236	369,975
10%	460,314	493,300

Table 11: Total Carbon Savings Based Veganuary Engagement Rate

Appendix E
Water Usage Reduction Calculations

To calculate the water usage savings the source used is (Francesca H., 2020). The water footprint that will be referred to for the rest of this proposal is in reference to the total water footprint, which is the combination of the green and blue water footprints. Also, for simplicity, the water footprint values of the continents will be combined into a mean value. This mean value from study 3 is 2952 L/d. Also, the study shows an average % difference effect size of -25.2% for a diet of "No animal source foods". We can multiply these two numbers to arrive at a daily water usage reduction of 744 L/d. Equations 1, 2, and 3 can be modified for a water footprint instead of a carbon reduction to convert this number to an annual water usage reduction for Prysmian. These resulting values are shown in Table 12:

% of Work allocated Food/Beverage shifted to Plant-Based	Water Savings [m^3]
25%	206,175
50%	412,351
75%	618,526
100%	824,701

Table 12: Decreased Water Footprint Based on Plant-based Shift %

Using the same calculations for the Veganuary workplace challenge gets:

% Engagement Veganuary Workplace Challenge	Water Savings [m^3]
2.5%	16,401
5%	32,802
7.5%	49,203
10%	65,604

Table 13: Decreased Water Footprint Based on Veganuary Engagement rate

Plant-Based SKU Calculations for Vending/Canteen Solution
To determine the success of the proposal, an engagement rate needs to be calculated showing the actual purchase rate of items that are substituted with plant-based options. To determine this, first the current SKU ratio for plant -based options needs to be determined using Equation 7:

$$SKU\ ratio_{plant-based} = \frac{SKU_{plant-based}}{Total\ SKU} \tag{8}$$

Adding the 25% replacement rate proposed to this calculated SKU ratio plant-based gives the target SKU ratio. Therefore, for refrigerated/freezer goods at Lawrenceburg that would mean going from a SKU ratio of 0% to 25% for plant-based options. For the engagement rate, the simplest solution would be to track the sales for these new SKU's and compare them to total sales as shown in Equation 8:

$$Sales\ ratio_{plant-based} = \frac{Sales_{plant-based}}{Total\ Sales} \tag{9}$$

Now comparing these two ratios shows the purchase rate of plant-based products in comparison to their non-plant-based counterparts.

$$Return\ rate_{plant-based} = \frac{Sales\ ratio_{plant-based}}{SKU\ ratio_{plant-based}} \tag{10}$$