Less Meat Monday

Kathryn Bostwick, Joe Damron,

Samantha Strom, and Anna Thurston

December 18, 2011

Middlebury College

Econ 0265: Environmental Economics

Professor Jonathon Isham

**I. Introduction**

The past two centuries have seen an exponential growth in industrialization and urbanization, which have led to increased environmental destruction. A major consequence is global warming caused by increased Green House Gases in the atmosphere. The consequences of extreme climate change are expected to be extensive and include: sea level rise, extreme weather events, increased droughts, and species extinction.[[1]](#footnote-1) Increased environmental degradation also includes water, air, and soil pollution and biodiversity loss. Mitigation techniques and alternative lifestyles need to be identified in order to decrease environmental destruction. Our research group wanted to identify an environmentally friendly change that could be made in the dining halls at Middlebury College. We investigated serving more local, organic, or sustainable food but were informed that expensive for the Middlebury Dining halls to purchase on a regular basis. We then turned towards reducing meat consumption and were encouraged by the multitude of recent studies focusing on the environmental benefits of changing diets from heavy meat consumption towards an inclusion of more vegetarian diets.[[2]](#footnote-2)We turned to the idea of “Meatless Monday” which had been attempted at other colleges in various capacities and which survey results had been attained for previously at Middlebury. The group’s goal was answering; do the economic and environmental benefits outweigh the costs of reducing meat in the dining hall? If they do, the next question is how do we implement meatless Mondays at Middlebury College in an effective way.

The group began by meeting with Matthew Biette, the head of dining services, to talk about the project ideas and feasibility. Matthew was very helpful in challenging the group to identify some of the obstacles inherent in meatless Monday, but supported us with any data we needed as well as advised us with his expert opinion. After meeting with Matthew a second time, the group came up with a plan for how the project would be broken down. We were able to divide it into four distinct sections. The first is a cost benefit analysis of the environmental impacts of meat versus vegetarian food production. The second is section is a cost benefit analysis of the monetary cost of serving meat in the dining hall as opposed to a substitute meatless source of protein. . The next section is a study of social barriers to adopting a vegetarian lifestyle as well as a study of other institutions’ implementations of meatless Mondays. The final step in the process is the implementation plan at Middlebury College.

**II. Survey of the Literature on Environmental Costs of Meat**

To assess whether substituting vegetarian options for meat in the Middlebury College dining halls was environmentally beneficial, we first made a few assumptions. First, we define meat as any animal flesh, including fish, and the vegetarian substitutes as grains and legumes. Second, we assume that the Middlebury dining halls buy the majority of their food in bulk from large scale, non local producers.[[3]](#footnote-3) This means that both meat and vegetarian items will produce C02 from transportation from its production site to Middlebury, a term known as “food miles”. For the sake of our project, we assume that the food miles from each item will be roughly equivalent. The focus of this paper is on the different environmental impacts of the production of meat versus the production of non-meat substitutes. The production phase is actually where the majority of the environmental impacts occur. For example, one study found that 83% of green house gas emissions are created in the production phase and only 11% were from food miles.[[4]](#footnote-4)

The environmental impacts of meat are intrinsically tied to a historically recent shift in the way first world produces and consumes meat. Over the last century, the majority of agricultural and meat production has intensified and industrialized by moving to large scale farms that use more energy, water, and land in exchange for decreased human labor. This has allowed for efficiency gains at the expense of environmental impacts[[5]](#footnote-5). Within this same time frame, demand for meat has grown tremendously. Meat consumption has grown 37% since 1980, and consumption is predicted to double by 2050, from 229 million tons in 1991 to 465 million tons in 2050. [[6]](#footnote-6) [[7]](#footnote-7) The intensification of meat production combined with increased demand compounds environmental impacts, and more environmentally friendly diets need to be identified and promoted.[[8]](#footnote-8)

The greatest impact and arguably the most quantifiable environmental impact of meat production is the emission of green house gases (GHG), the driving cause of global climate change.[[9]](#footnote-9) Meat production produces three different types of GHG’s, carbon dioxide (CO2), methane, and nitrous oxide. Carbon is emitted at many different stages during the production progress, through energy intense fertilizers, industrialized equipment, and through land use changes such as deforestation and desertification.[[10]](#footnote-10) Of these, the carbon released from soils during deforestation causes the greatest amount of C02 emissions.[[11]](#footnote-11)One study also included the C02 emitted from the breath of livestock animals in their GHG calculations at an estimated 10 billion tons annually.[[12]](#footnote-12) The majority of the methane produced by livestock comes from the fermentation process in ruminant animals such as cows.[[13]](#footnote-13) Nitrous Oxide is emitted through solid and liquid waste from animals, as well as in the production of fertilizer.

According to the Food and Agricultural Organization of the United Nations (FAO) report “Livestock’s Long Shadow”, livestock production accounts for 9% of C02, 37% of methane, and 65% of nitrous oxides of manmade GHG emissions globally.[[14]](#footnote-14) While C02 is the most common form of global GHG emissions, it is not the most potent. Calculated over a 100 year time frame, Methane and Nitrous Oxide are 23 and 296 times more potent, respectively.[[15]](#footnote-15) Using these C02 equivalents, the FAO calculated that livestock production accounted for 18% of global GHG emissions.[[16]](#footnote-16) Another study estimated the GHG emissions from livestock to be as high as 51%.[[17]](#footnote-17) The GHG emissions from meat are estimated at 3.2 billion tons of CO2 equivalent annually, not including emissions from nitrous oxide.[[18]](#footnote-18)

Aside from GHG emissions, meat production detracts from environmental quality in many other ways. First, it leads to increased species extinction and biodiversity loss.[[19]](#footnote-19) The FAO concluded in its report that, “the livestock sector may well be the leading player in the reduction of biodiversity, since it is the major driver of deforestation, as well as one of the leading drivers of land degradation, pollution, climate change, overfishing, sedimentation of coastal areas and facilitation of invasions by alien species”.[[20]](#footnote-20) Second, livestock production also accounts for 8% of global human water use.[[21]](#footnote-21) It is also most likely the largest source of water pollution worldwide.[[22]](#footnote-22) Wastes such as manure often contaminates surface and ground water, increases salinity in soils, destroys wetlands, increases eutriphication, and degrades coral reefs.[[23]](#footnote-23) Third, livestock accounts for 33% of excess fertilizer use, which can result in a decrease in biodiversity, air pollution, and surface and groundwater contamination.[[24]](#footnote-24) [[25]](#footnote-25) Fourth, land use changes from agriculture can also increase soil erosion, soil compaction, and sedimentation of wetlands.[[26]](#footnote-26) For example, livestock production in the U.S. accounts for 55% of soil erosion and sediment.[[27]](#footnote-27)

Livestock production is taking up a majority of the land used for agriculture, which brings up environmental and moral questions of efficiency. Livestock accounts for 70% of all agricultural land, which is equivalent to 30% of the land surface on earth.[[28]](#footnote-28) Half of this land is used to house the animals themselves and the other half is needed to grow their feed, which exceeds 33% of the world’s grain production.[[29]](#footnote-29) Different animals consume different amounts of grain, and which can be calculated as a feed conversion ratio, (the ratio of kg of grain required to produce 1 kg of animal weight). One study concluded that poultry has a feed conversion ratio of 1.7, Pork 2.43, and Cattle 5-10.[[30]](#footnote-30) A similar study stated that on average it takes 10 grams of vegetable protein in order to generate 1 gram of animal protein.[[31]](#footnote-31) These conversion ratios have caused many to argue that livestock production is inefficient, first because water, oil, and land could be better allocated to vegetarian options.[[32]](#footnote-32) Second, the land could be used for more environmentally friendly purposes such as wilderness or as a carbon sequestering forest. Third, extra land could either be used to create a greater quantity of vegetarian foods for humans.

Although this paper focuses primarily on its environmental impacts, meat production also has health detriments that are worth noting. The waste produced by animals contains nitrogen, phosphorous, potassium, metals, hormones, and antibiotics.[[33]](#footnote-33) [[34]](#footnote-34) Most waste goes untreated, and ends up contaminating water, soil, and air. This waste can be detrimental to human health, for example it can produce antibiotic resistant strands of diseases. Livestock production actually accounts for half of the world’s antibiotic use. Animals waste also produces 64% of all ammonia emissions, which contributes to acid rain.[[35]](#footnote-35) Other miscellaneous health concerns include the spread of zoonotic diseases and invasive species and plants, toxic residue in food, and the health hazards for workers and consumers caused by pesticides.[[36]](#footnote-36)

The overall statistics of the environmental impacts of meat must be compared to the impacts of producing vegetarian alternatives. Two studies have compared the environmental inputs of meat production versus vegetarian food. This table summarizes their findings, using their differences as a range.[[37]](#footnote-37) [[38]](#footnote-38)

|  |  |  |
| --- | --- | --- |
| **environmentally relevant effect** | **effect of processed protein food based on soybeans** | **relative effect of meat protein production** |
| Land use | 1 | 6 to 17 |
| Water requirement | 1 | 2.9 to 26 |
| Fossil fuel requirement | 1 | 2.5 to 20 |
| Phosphate rock requirement | 1 | 7 |
| Emission of acidifying substances | 1 | >7 |
| Emission of biocides | 1 | 1.4- 6 |
| Emission of copper | 1 | >10 |
| Emission of Fertilizer | 1 | 13 |

Note- Effect refers to identical amounts of protein. The effect of soybean protein–based food is (arbitrarily) given the value of 1.

One of these studies calculates that grains and legumes have a positive return of 2-3 nutrient calories per calorie of primary energy put into production animals have a positive return of 0.01 to 0.05.[[39]](#footnote-39) Overall they conclude that energy inputs are 2.5-5 times more for meat products than for plant products.[[40]](#footnote-40) The second study concludes that fresh vegetables, cereals, and legumes cause the lowest emission levels and that meat products cause the highest, and that protein from soy is much less impactful than protein from meat.[[41]](#footnote-41)

In order to analyze the environmental impact of meat consumed at Middlebury College, the impacts needed to be calculated on a per pound basis. Two studies calculated GHG emissions in a ratio of CO2 equivalent per pound per pound of meat produced. This table combines the results from these two studies:[[42]](#footnote-42) [[43]](#footnote-43)

|  |  |
| --- | --- |
| **product** | **ratio of kg C02 equivalent/kg product** |
| Soybeans | 0.92 |
| Chicken | 1.1 to 4.3 |
| Pork | 3.8 to 9.3 |
| Beef | 14.8 to 30 |

This is the only comprehensive data available on the environmental impact of different types of meat on a per pound basis. The cost-benefit analysis of Middlebury dining halls meat consumption therefore leaves out many environmental externalities, including water use, land and water degradation, and biodiversity loss. However, looking at GHG emission and climate change can be seen as a useful proxy to examine environmental sustainability as a whole.[[44]](#footnote-44)

In attempting a cost benefit analysis of meat production at Middlebury, an approximate monetary value can be placed on the green house gases emitted by using what is known as the social cost of carbon. This is defined by William Nordhaus, a leading climate change expert, as “the economic cost caused by an additional ton of carbon-dioxide emissions or its equivalent”, and has been used as a policy tool to find the right amount of money to spend on regulations of emissions.[[45]](#footnote-45) This social cost of carbon is extremely difficult to measure and contains many uncertainties and assumptions. The first assumption is that environmental costs and benefits can be measured monetarily. Many disagree and believe that natural resources are priceless and cannot be substituted for manmade capital. Other critiques disagree with using cost benefit analysis because the results could be irreversible, long term, and potentially catastrophic.[[46]](#footnote-46)

Working on the assumption that cost benefit analysis can be achieved and is a useful tool, the uncertainties must be addressed. Clarkson and Deyes give an excellent summary of the uncertainties of putting a monetary value on GHG emissions, dividing them into scientific and economic unknowns. Their list is copied below:

Scientific:

* “the measurement of present, and prediction of future emissions;
* the translation of emissions levels to changes in the atmospheric concentration of carbon
* estimating the climate impact associated with an increase in atmospheric concentration; and,
* the identification of the physical impacts resulting from climatic change”.[[47]](#footnote-47)

Economic:

* “estimating monetary values for non-market impacts (i.e. those impacts for which a market based price does not exist);
* predicting how the relative and absolute value of impacts will change into the future;
* determining the way in which damage estimates should be aggregated across regions with different levels of national income; and,
* determining the rate at which the value of future impacts should be discounted to today’s prices.” [[48]](#footnote-48)

One more uncertainty that should be added to their list is how risk adverse policy makers should be, which would depend on the likely hood of climate change leading to a catastrophic event such as the end of the human race.[[49]](#footnote-49)

The price of Carbon will range severely given the assumptions that someone makes about these uncertainties. For example, Nordhaus has priced CO2 at 12$ per ton. He has done so using RICE modeling, which gives increased consumption a decreasing marginal utility, which he equates to the equivalent of a social equity weight.[[50]](#footnote-50) His social price of carbon was also affected by his choice of how much pollution was too much, or what level of CO2 can the world can tolerate. He chose 2.55 degrees Celsius, but the price of carbon would have increased dramatically if he had chosen a lower threshold.[[51]](#footnote-51)

Ackerman and Stanton give a critique of the main forms of economic analysis used to predict the social cost of Carbon, including the Nordhaus model. These three models give Carbon an average cost of 21$ per ton. They criticize the RICE model for not accounting for equitable distribution, and criticize the other two models for claiming that warming will actually benefit many populations and for assuming that developed nations can adapt to climate change at a relatively small cost.[[52]](#footnote-52) They also criticize Nordhaus and others for using high discount rates of 2.5-5%. They take the side that government should look at a worst case scenario of catastrophic events, and prepare for the worst. Overall they agree with the UK model of pricing Carbon Dioxide at 41 to 124$ per ton, with an average of 83$ per ton.[[53]](#footnote-53)

**III. Calculations of Social Cost of Carbon**

Using the CO2 emissions per pound and the social cost of Carbon and the EU estimate for the SCC at 83$, we calculated the GHG emitted in the Middlebury dining halls per year, per meal, and per serving. [[54]](#footnote-54) The total CO2 emissions from meat (note- these numbers are only for pork, chicken, and beef and do not include turkey, lamb, and seafood which would raise these estimates).

Using excel, we were able to generate a table of what the total CO2 equivalents and social cost of carbon are at current levels as well as with 10, 25, and 50% reductions in meat consumption at Middlebury per year:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Column1** | **Current levels** | **reduction by 10%** | **reduction by 25%** | **reduction by 50%** |
| Total CO2 equivalents | 119,174- 2,700,172 | 107,256-2,430,154 | 89,380- 2,025,129 | 59,587- 1,350,086 |
| Total Social Cost of Carbon | 4481- 101,526 | 4,033- 91,374 | 3,360- 76,145 | 2,240- 50,763 |

**IV. Cost-Benefit Analysis of Meat for the Middlebury Dining Hall**

To determine the cost-benefit analysis of meat, we compare the prices of meat and their alternatives on the basis of private marginal cost per serving, moving then to consider their social marginal cost per serving after incorporating associated externality costs. In order for it to make sense to implement meatless Monday, the monetary costs of buying meat in bulk must be greater than or equal to the cost of buying a non-meat protein substitute.

We first seek to estimate the benefits associated with consumption of either food option. In holding to the idea that substitutions in protein are possible without detracting from their value, we assert that the benefit received from non-vegetarian and vegetarian options is equivalent. It is possible for us to assume that the price each student pays to eat in the dining hall, a portion of tuition, represents the value that they would be willing to pay for whatever the dining hall supplies. Assuming that benefits of the two options are comparable leaves us with basically a cost comparison of the two options. We make the assumption that the ‘in-house’ energetic costs of cooking any of the food choices is the same and that labor required for each possibility are equal. This is consistent with our group’s discussions with Matthew Biette, head of dining at Middlebury College.

After the above assumptions, we embark on an analysis of each protein type to determine which type poses the greatest cost to the dining hall. An invoice of purchases made for all protein supplies for the month of September at the three Middlebury dining halls was obtained with gracious assistance from dining services.[[55]](#footnote-55) For each of the twenty purchases of beef, a total cost was found by multiplying quantity and individual unit price. Then each unit price was extrapolated to ounces, for which the number of servings (either 3oz or 4oz each) was determined. The number of servings was based on the total number of ounces of protein type. Serving sizes were found from the Cleveland Clinic’s current dietary guidelines[[56]](#footnote-56). This individual purchase costs were summed for each type of protein, and a breakdown of a total monthly expenditure of approximately 40,000 dollars by meat type was achieved.[[57]](#footnote-57) Then, a dollar cost per serving for each of the seven protein types was determined, and -- with adjustment for serving size -- this easily yielded a comparable dollar cost per pound metric.[[58]](#footnote-58)

A crucial assumption for our analysis is that there is no significant difference in the energetic value of a given unit of the various proteins considered. We make the assumption in developing a cost per lb metric that a pound of each type of protein yields the same metabolic value. The energy in kilocalories provided by a unit of protein is its metabolic value. Certain proteins innately contain more water than others or are composed of more protein per pound. This goal of the substitution is that one will still be able to gain the needed metabolic value from consumption of either the vegetarian substitute or original protein. Therefore, we calculated the caloric density of each type of protein per the Cleveland Clinic data on calories per ounce. This was converted to kilocalories per ounce of protein. For example, a very lean cut of meat yields 105 calories per serving while a high fat cut yields three times as many calories per serving. Lean meats such as chicken, seafood and pork provide 35 to 50 calories per serving.[[59]](#footnote-59) Hence, when looking at a breakdown of total kilocalories purchased throughout the month of the various types of proteins, beef and chicken still represented over half[[60]](#footnote-60) , comparable to the previous breakdown by dollar expenditure.[[61]](#footnote-61) This, along with similarity in the trends shown in the caloric density cost[[62]](#footnote-62) and pound based costs[[63]](#footnote-63) gives us confidence in assuming cost per pound metric regardless of energetic density.

A graph combining both the social and private marginal costs of each protein is developed, subsequent to estimation of each externality cost described previously[[64]](#footnote-64). For this graph a metric for the externality in a dollar per pound unit is added to each dollar per pound of dining hall expenditures. We adjust the cost of each protein type to include the externality[[65]](#footnote-65):

and we see that beef production results in externalities which make up about a quarter of its total adjusted cost.[[66]](#footnote-66) Given that beef accounts for about 1/3 of the monthly dining expenditures[[67]](#footnote-67), this is a striking result. It is evident that beef is the most costly relative to its share of the dining budget of all the protein types.

Finally, in addition to the cost analysis based specifically on the protein type, we estimated the price of a sample of some complete meals, either vegetarian or non-vegetarian. For example, a turkey meatloaf costs three dollars per serving, roast chicken with seasoning costs about one dollar and fifty cents, and a serving of pork costs around fifty cents[[68]](#footnote-68). The externality cost came to 3 cents and 7 cents for the chicken and pork dishes, respectively, not a trivial sum when considering overall consumption amounts. This serves to situate the analysis of each protein the context of a meal in which it would be consumed, a logical second step. Since garnishes cost about the same for the two dishes, consideration of solely the social cost associated with each meat is appropriate, and hence, the garnishes to meat are roughly equivalent to those of the vegetarian options.

**V. Cost-Benefit Analysis of Other Protein Sources**

In order to fully understand the costs-benefit analysis of meatless Monday, we had to find the costs and benefits of alternate proteins. Finding the costs of alternatives encouraged our study and made it possible to strategically find meals that could substitute the meat embellished meals that the dining hall once served. By finding substitute meals, obtaining the costs of the individual proteins in the recipes, obtaining the costs of the overall recipe per 100 people, and by finding the environmental effects of the new proteins, we were able to conclude that although the alternate protein source may have similar initial costs to the meats, the environmental externalities associated with producing wheat, peas, beans, tofu, pasta and rice are considerably less than that of meat. As Michael Allen Fox said, “A diet that relies heavily on meat only appears affordable and environmentally sustainable to those who are unaware of the larger ecological costs of meat production; who assume they do not have to be factored into our choice and their consequences”.[[69]](#footnote-69) Our method was simple: find a cost to the environment in dollars per pound of protein for each food. We would then add this to our known value cost that the dining services pays for the protein per pound (final cost=Cost of original protein+ externality).

We first obtained the costs per pound of the alternative proteins by giving Matthew Biette a list of recipes that included wheat, peas, beans, tofu, pasta and rice as the main protein sources in vegetarian dishes. Below are the key costs per pound of the different proteins.

|  |  |
| --- | --- |
| **Food Type** | **Cost Per lb** |
| gluten (wheat) | $1.28 |
| peas | $0.96 |
| beans | $0.96 |
| tofu | $2.08 |
| pasta | $1.28 |

These initial costs that the dining services pay are very similar to the initial costs of the meats. However, we realized that the benefit of implementing meals that disregarded meat would stem from the environmental externalities impacts, where the externalities were much lower in the alternate protein source. We focused our analysis on three specific impacts in the main GHG emission groups: Carbon dioxide, Nitrous oxide and Methane. We analyzed the table from Carlsson-Kanyama that we previously used to assess the environmental impacts of meat to find the GHG impact of the specific proteins that we wanted to use as meat substitutes (appendix table 3).[[70]](#footnote-70) For plant-based foods with the exception of rice, emissions of carbon dioxide were the dominant contribution, with very little nitrous oxide and methane emission. For example the total emission for soybeans is .92 kg CO2 equivalents/kg product. As shown in the table, this stems directly from carbon dioxide. Whole wheat similarly emits .54 kg CO2 equivalents/kg product, while a small amount of .08 kg CO2 equivalents/kg product is emitted by nitrous oxide. Using the amount emitted from carbon dioxide shown in the table, in kg CO2 equivalents/kg product, we were able to find the cost to the environment that we would eventually add to the initial cost per pound that the dining services supplied for the alternate proteins.

It is important to note that the study by Carlsson-Kanyama and Gonzalez that calculated CO2 per protein type was based in Sweden and therefore the GHG scores may be relatively similar but not exact for various meat types and meat substitutes grown and produced in the United States. While we still considered this study, we realized that there would be uncertainty around the GHG numbers because of factors such as transport, the amount of fossil fuel and energy used, and land occupation in different areas of the world. Both land and sea transport accounted for a small percentage of the kg co2/kg within the total GHG emission. The vegetarian options were actually from overseas, and the meat products were domestic. Future study should compare protein sources from the same location, however, we chose to use this study because even with that discrepancy the GHG emissions from meat were greater than the vegetarian options.

We formulated a series of equations to help find the dollar cost to the environment of wheat, beans, tofu, pasta and rice, by taking the total emission in kg Co2 equivalent/kg product and dividing it by 1 kg of that protein. We then multiplied this by 1kg divided by 2.2 lbs (to convert to pounds). Finally we multiplied by the social cost of carbon (83.00) divided by 1000 tons of CO2 equivalent. This allowed us to find the dollars per pound that we would be adding together with the initial cost of the alternate protein. The table below summarizes our results.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Protien** | **specific impact** | **kg/lb** | **Social Cost of Carbon** | **Cost to env.** |
|  |  |  | 0.083 |  |
| Gluten (wheat) | 0.54 | 0.25 | 0.083 | 0.02 |
|  |  |  |  |  |
| Beans | 1.2 | 0.55 | 0.083 | 0.05 |
| Tofu | 0.92 | 0.42 | 0.083 | 0.03 |
| Pasta | 0.96 | 0.44 | 0.083 | 0.04 |
| Rice | 0.59 | 0.27 | 0.083 | 0.02 |

We were able to finalize the price of the alternate proteins to show that, with the externality of carbon dioxide, methane and nitrous oxide emission, these foods cost much less, and thus there is a large benefit from not eating meat. This cost-benefit analysis also shows that producing protein from soy and other legumes has a very low environmental effect compared with protein production from animal products. By substituting one of these proteins for meat, this helps to mitigate the massive amount of emissions that are associated with meat production.

|  |  |
| --- | --- |
| **Food type** | **$ Cost per lb plus social cost of carbon** |
| Gluten | 1.28+.02 =1.30 |
| Beans | .96+.05 = 1.01 |
| Tofu | 2.08+.03 = 2.11 |
| Pasta | 1.28+.04=1.32 |

**VI. Meatless Monday on Other Campuses**

After weighing the environmental and monetary benefits and costs of reducing meat in the dining halls, it is necessary to address the second question of whether or not it makes sense to implement a meatless Monday on Middlebury’s campus. In order to help make this decision, the group conducted a review of meatless Monday’s on other campuses.

The group looked at articles online to see how some of the major universities across North American had been implementing meatless Monday. The University of South Florida started a Meatless Monday where the school offers more vegetarian and vegan options, and students receive a $1 discount when they check-out if they choose one of the meatless options.[[71]](#footnote-71) Out of the 47,000 students at SF, 2,000 students signed a petition asking for more vegetarian options and backed the initiative.[[72]](#footnote-72) Another notable Meatless Monday occurred on the campus at the University of California Santa Cruz. As of the fall of 2009, the university began serving Meatless Monday Dinners, which would rotate throughout the multiple dining halls on campus, so students who want great vegetarian options can follow the rotation and those who want meat can avoid the dining hall serving the Meatless Monday meal.[[73]](#footnote-73) Feedback from the students has been about 80% positive, with one student commenting that she “‘didn’t even notice that it was Meatless Monday’”.[[74]](#footnote-74)

The research was rounded out by looking at two similar institutions to Middlebury College, Dartmouth and Bowdoin. Working closely with dining services at each of these schools, it was possible to communicate via email and telephone to gather information about the Meatless Monday initiatives on their campuses. In the past Dartmouth has increased vegetarian options for special occasions at the request of the vegan society, but the focus for these meals was primarily on health and secondarily on animal rights.[[75]](#footnote-75) The vegetarian meals were very popular, attracting more students than a standard meal, and there was little to no backlash from the student body as it was easy for students to obtain meat at another dining hall.[[76]](#footnote-76) Dartmouth has also tried to solicit pledges from meat eating students to go meatless for a day, but they have never implemented a meatless Monday in all of their dining halls at once or in a regular rotation.[[77]](#footnote-77)

In an email from Mary Lou Kennedy, the director of dining services at Bowdoin College, she explained that in 2010 they had a successful meatless dinner, “but a very small group of students complained quite vocally afterwards that it took away their choice”.[[78]](#footnote-78) Just like Middlebury, Bowdoin has a dining plan in which students pay a fee for the year and can eat as much as they want in any dining hall on campus. Since students have already paid to eat their meals on campus, students who desired meat would have to pay for an additional meal elsewhere. As one student pointed out in the student newspaper, *The Bowdoin Orient*, “‘You're forcing students to eat non-meat products when they paid for meat. […]One dining hall would have been fine’”.[[79]](#footnote-79) This year, Bowdoin has taken a different approach and is asking students to sign a pledge online “to give up meat for one additional meal per week”.[[80]](#footnote-80) The meatless Monday pledge is part of a larger environmental campaign in which students can sign environmental pledges as a way of choosing to support environmental activities that are meaningful to them.[[81]](#footnote-81)

**VII. Implementation of Less Meat Monday at Middlebury**

After surveying what other schools have done, the group looked at the data the Middlebury College Organic Garden had collected in the spring of 2011 to see how Meatless Monday might be received on this campus. The survey, titled the Middlebury College Food Survey, received 880 responses out of the student body of 2,500 and asked various questions about meat in the dining halls, food sources, dietary restrictions, and food preferences.[[82]](#footnote-82) The most significant data of the survey in relation to this study was the statement that “[m]any similar colleges currently have ‘Meatless Mondays’”, which was followed by the question, “Would you be in favor of this at Middlebury?”[[83]](#footnote-83) The results are as follows:



More than half of the students who responded to the survey admit to being in favor of meatless Monday. Of the 880 people that answered the survey, only 10% claimed to be vegetarian or vegan.[[84]](#footnote-84) This means that the majority in favor of Meatless Monday consists of meat eaters, and thus Meatless Monday would not catering to just a small vocal minority. Based on the results of the Organic Garden survey, there is reasonable evidence to think that Meatless Monday would be well received on Middlebury’s campus.

With the number justification for implementing Meatless Monday, the next step was the actual implementation as well as the marketing challenge. Based on the initiatives at other schools, we decided that the best way to implement Meatless Monday at Middlebury was to start with a “less meat Monday” pilot plan for dinner in both of Middlebury’s dining halls, Proctor and Ross. Matthew Biettte informed the group that if we were to implement Less Meat Monday, we would have to do it in both dining halls to avoid overcrowding. The choice to serve less meat as opposed to no meat was largely based on the unique meal plan at Middlebury College. Due to the lump sum fee student’s pay for an unlimited meal plan, the group decided that it would be too invasive to completely take away meat. We want to avoid backlash from students who may claim that we were taking away their options and imposing our beliefs on them. Instead of looking at meatless Monday as a negative, we want to educate students about the positive environmental impact of not eating meat. Additionally, we want the decision to not eat meat on Monday to be each individual student’s choice. This choice allows us to focus our energy on the education about the environmental impacts as well as the benefits of having a delicious vegetarian meal. Matthew Biette also supported this out of concern for his staff members and possible student backlash directed at them.

Since we left the decision up to the students, we wanted them to be as informed as possible about the benefits that can be gained from eating less meat. Right around 4 pm on the night of the pilot “less meat Monday”, Matthew Biette sent out an all school email, written by the group, that informed the student body of the initiative and the resulting change it would have on the dinner that night.[[85]](#footnote-85) From 4pm to 8pm in Proctor, and 5pm to 8pm in Ross, the four of us along with members of the Organic Garden, Weybridge House, and Sunday Night Group stood outside of the dining halls with posters and other informational material that outlined the environmental savings associated with eating less meat.[[86]](#footnote-86) There were also educational signs on the tables for further information on how eating meat effects the environment.[[87]](#footnote-87)

After the pilot plan was executed we followed up with a campus wide survey to investigate how “less meat Monday” was received. The survey asked if the students liked having vegetarian options or not, if they thought eating meat was more harmful to the environment, if the information influenced them to reduce the amount of meat they ate at dinner, and most importantly if they would support having more Less Meat Mondays in the future.[[88]](#footnote-88) The response to the survey was incredible with 990 students completing it out of a student body of around 2,500. The high number of responses along with the comments proved to us that we made a significant impact on the student body. Of the 990 responses, 524 students left comments. Some were supportive, some were critical, and others were suggestions for how we could have done things differently. One valuable aspect of the survey was that after reading the comments we were able to see where our efforts to educate the student body had not been effective and where our message was misconstrued. In order to clarify our message and goals for the project, Samantha wrote an op-ed in the student newspaper that tackled some of the biggest misconceptions students had from the pilot night.[[89]](#footnote-89) Regardless of all the comments and misconceptions, the most important survey result was the answer to the last question about students supporting Less Meat Monday in the future. This response was overwhelmingly positive with 64% of the respondents favoring Less Meat Mondays in the future.[[90]](#footnote-90) We are in ongoing discussions with Matthew Biette to decide how to move forward with LessMeat Mondays in the future.

1. "Climate Change: Effects." *Climate Change: Vital Signs of the Planet*. Web. 21 Nov. 2011. <[http://climate.nasa.gov/effects/](https://mail.middlebury.edu/owa/redir.aspx?C=965f280e7d3344e3a451e7714028c8d0&URL=http%3a%2f%2fclimate.nasa.gov%2feffects%2f)>. [↑](#footnote-ref-1)
2. A. Carlsson-Kanyama and A. D. González. "Potential contributions of food consumption patterns to climate change." *The American Journal of Clinical Nutrition* 89.5 (2009): 1704S. Print. [↑](#footnote-ref-2)
3. Biette, Matthew. Personal interview. 4 Nov. 2011 [↑](#footnote-ref-3)
4. E. Stehfest, et al. "Climate benefits of changing diet." *Climatic Change* 95.1 (2009): 83-102. Print. [↑](#footnote-ref-4)
5. H. J. Marlow, et al. "Diet and the environment: does what you eat matter?" *The American Journal of Clinical Nutrition* 89.5 (2009): 1699S. Print. [↑](#footnote-ref-5)
6. R. Goodland. "The Overlooked Climate Solution: Joint Action by Governments, Industry, and Consumers." *Journal of Human Security* 6.3 (2010): 50. Print. [↑](#footnote-ref-6)
7. H. Steinfeld, et al. *Livestock's long shadow: environmental issues and options.* FAO, 2006. Print. [↑](#footnote-ref-7)
8. Carlsson-Kanyama and González. [↑](#footnote-ref-8)
9. "Climate Change: Effects."  21 Nov. 2011. [↑](#footnote-ref-9)
10. Marlow, et al. [↑](#footnote-ref-10)
11. Steinfeld, et al. [↑](#footnote-ref-11)
12. Goodland. [↑](#footnote-ref-12)
13. G. Koneswaran and D. Nierenberg. "Global farm animal production and global warming: impacting and mitigating climate change." *Environmental health perspectives* 116.5 (2008): 578. Print. [↑](#footnote-ref-13)
14. Steinfeld, et al. [↑](#footnote-ref-14)
15. Ibid [↑](#footnote-ref-15)
16. Ibid [↑](#footnote-ref-16)
17. Goodland. [↑](#footnote-ref-17)
18. H. Steinfeld, et al. "Livestock in a changing landscape." *Livestock in a Changing Landscape, Volume 1: Drivers, Consequences, and Responses* 1 (2010): 373. Print. [↑](#footnote-ref-18)
19. Marlow, et al. [↑](#footnote-ref-19)
20. Steinfeld, et al. [↑](#footnote-ref-20)
21. Ibid [↑](#footnote-ref-21)
22. Ibid Steinfeld, et al. [↑](#footnote-ref-22)
23. Marlow, et al. [↑](#footnote-ref-23)
24. Ibid [↑](#footnote-ref-24)
25. Steinfeld, et al. [↑](#footnote-ref-25)
26. Marlow, et al. [↑](#footnote-ref-26)
27. Steinfeld, et al. [↑](#footnote-ref-27)
28. Ibid [↑](#footnote-ref-28)
29. T. Garnett. "Livestock-related greenhouse gas emissions: impacts and options for policy makers." *Environmental Science & Policy* 12.4 (2009): 491-503. Print. [↑](#footnote-ref-29)
30. Garnett. [↑](#footnote-ref-30)
31. L. Reijnders and S. Soret. "Quantification of the environmental impact of different dietary protein choices." *The American Journal of Clinical Nutrition* 78.3 (2003): 664S. Print. [↑](#footnote-ref-31)
32. Goodland. [↑](#footnote-ref-32)
33. Marlow, et al. [↑](#footnote-ref-33)
34. Steinfeld, et al. [↑](#footnote-ref-34)
35. Ibid [↑](#footnote-ref-35)
36. Ibid [↑](#footnote-ref-36)
37. Reijnders and Soret. [↑](#footnote-ref-37)
38. Marlow, et al. [↑](#footnote-ref-38)
39. Marlow, et al. [↑](#footnote-ref-39)
40. Ibid [↑](#footnote-ref-40)
41. Carlsson-Kanyama and González. [↑](#footnote-ref-41)
42. Carlsson-Kanyama and González. [↑](#footnote-ref-42)
43. N. Fiala. "How meat contributes to global warming." *Scientific American* 300.3 (2009): 72-5. Print. [↑](#footnote-ref-43)
44. Goodland. [↑](#footnote-ref-44)
45. W. D. Nordhaus. *Estimates of the Social Cost of Carbon: Background and Results from the RICE-2011 Model* (2011) Print. [↑](#footnote-ref-45)
46. Ibid [↑](#footnote-ref-46)
47. R. Clarkson and K. Deyes. "Estimating the social cost of carbon emissions." *Government Economic Service Working Paper* (2002) Print. [↑](#footnote-ref-47)
48. Ibid [↑](#footnote-ref-48)
49. Pearce D. Pearce. "The social cost of carbon and its policy implications." *Oxford Review of Economic Policy* 19.3 (2003): 362. Print. [↑](#footnote-ref-49)
50. Nordhaus. [↑](#footnote-ref-50)
51. Ibid [↑](#footnote-ref-51)
52. F. Ackerman and E. A. Stanton. "The social cost of carbon." *Economics for Equity and Environment (E3 Network).Available online at* [*http://www.e3network.org/papers/SocialCostOfCarbon\_SEI\_20100401.pdf*](http://www.e3network.org/papers/SocialCostOfCarbon_SEI_20100401.pdf) (2010) Print. [↑](#footnote-ref-52)
53. Ackerman and Stanton. [↑](#footnote-ref-53)
54. See Table 1, Appendix. [↑](#footnote-ref-54)
55. See Table 2, Appendix. [↑](#footnote-ref-55)
56. Cleveland Clinic. (2011) Serving Size Suggestions and Caloric Densities of Various Proteins. Retrieved from: <http://my.clevelandclinic.org/heart/prevention/weight/servingsize.aspx> on 11.6.11. [↑](#footnote-ref-56)
57. See Figure 1, Appendix. [↑](#footnote-ref-57)
58. See Table 3, Appendix. [↑](#footnote-ref-58)
59. Cleveland Clinic Guidelines (2011). [↑](#footnote-ref-59)
60. See Figure 2, Appendix. [↑](#footnote-ref-60)
61. See Figure 1, Appendix. [↑](#footnote-ref-61)
62. See Figure 3, Appendix. [↑](#footnote-ref-62)
63. See Figure 4, Appendix. [↑](#footnote-ref-63)
64. See Table 4, Appendix. [↑](#footnote-ref-64)
65. Complete social cost for each protein type comprised of the cost to the dining hall (blue) and the costs of accrued externalities from production (red). Average protein costs per pound for Middlebury Dining Halls in September 2011 and externality estimates derived with Ackerman’s (2010) social cost of carbon estimate of 83 dollars per metric ton of CO2 equivalents emitted. [↑](#footnote-ref-65)
66. See Figure 5, Appendix. [↑](#footnote-ref-66)
67. See Figure 1, Appendix. [↑](#footnote-ref-67)
68. See Table 5, Appendix. [↑](#footnote-ref-68)
69. Michael Allen Fox. “Ethics & the Environment: Vegetarianism and Planetary Health.” Project Muse, Volume 5, Number 2, 2000, pp. 163-174 [↑](#footnote-ref-69)
70. Carlsson-Kanyama and González. [↑](#footnote-ref-70)
71. "The University of South Florida Takes On "Meatless Mondays"" *The Digital Bullpen*. Ed. AJoiner. 29 Apr. 2011. Web. 3 Nov. 2011. <http://jou2100.wordpress.com/2011/04/29/the-university-of-south-florida-takes-on-meatless-mondays/>. [↑](#footnote-ref-71)
72. Ibid [↑](#footnote-ref-72)
73. White, Dan. "Where's the Beef? Dining Makes Moves toward Meatless Meals - UC Santa Cruz." *University News & Events*. University of California, 17 June 2010. Web. 3 Nov. 2011. <http://news.ucsc.edu/2010/06/3890.html>. [↑](#footnote-ref-73)
74. Ibid [↑](#footnote-ref-74)
75. Newlove, Donald J. Telephone interview. 4 Nov. 2011. [↑](#footnote-ref-75)
76. Ibid [↑](#footnote-ref-76)
77. Ibid [↑](#footnote-ref-77)
78. "Meatless Mondays." Message to Matthew Biette. 7 Oct. 2011. E-mail. [↑](#footnote-ref-78)
79. Aasen, Claire. "‘Meatless Monday’ Continues to Spur Student Controversy." *The Bowdoin Orient*. Bowdoin College, 25 Feb. 2011. Web. 18 Nov. 2011. <http://orient.bowdoin.edu/orient/article.php?date=2011-02-25>. [↑](#footnote-ref-79)
80. "Meatless Mondays." Message to Matthew Biette. 7 Oct. 2011. E-mail. [↑](#footnote-ref-80)
81. Ibid [↑](#footnote-ref-81)
82. Middlebury College Organic Garden. Middlebury College Food Survey. 5 May 2011. Raw data. Middlebury College, Middlebury. [↑](#footnote-ref-82)
83. Ibid [↑](#footnote-ref-83)
84. Middlebury College Organic Garden. Middlebury College Food Survey. 5 May 2011. Raw data. Middlebury College, Middlebury. [↑](#footnote-ref-84)
85. See Document 1, Appendix [↑](#footnote-ref-85)
86. See Signs 1-6, Appendix [↑](#footnote-ref-86)
87. See Table Tents 1-4, Appendix [↑](#footnote-ref-87)
88. Strom, Samantha, and Kathryn Bostwick. Less Meat Monday Survey. 29 Nov. 2011. Raw data. Middlebury College, Middlebury. [↑](#footnote-ref-88)
89. See Document 2, Appendix [↑](#footnote-ref-89)
90. Strom, Samantha, and Kathryn Bostwick. Less Meat Monday Survey. 29 Nov. 2011. Raw data. Middlebury College, Middlebury. [↑](#footnote-ref-90)