Designing Plant-Based Recipes for the Mobile Market in Meadville, PA

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Animal agriculture is a large contributor to greenhouse gas emissions such as methane, nitrous oxide and carbon dioxide from fossil fuels and land usage. These gases affect atmospheric chemistry leading global warming and other environmental impacts such as eutrophication and loss biodiversity. A decline in the consumption of meat and dairy products is essential. This means transitioning towards plant-based diets or greatly reducing the amount of animal-proteins we consume. Eating patterns revolve around accessibility, learned behaviors and how food is perceived. This project looks into the impact of recipes containing mainly products from the Mobile Market in Meadville and how they can impact people's food choices. Five recipes were created and chosen based on the ingredients, time, cost and visual appearance. In addition, each recipe contains an alternative protein source such as tofu and lentils. Two of these recipes were made for sampling during a community event in order to gather feedback from Meadville residents through observation and informal conversations. Based off the information collected, ideas suggest that in order to influence people's choices, it is easier to incorporate these new plant-based proteins with familiar foods such as pasta. For future studies, it should be taken into consideration that sampling events are not the most efficient when trying to change people's eating patterns. Recipes alone are not going to show a difference in food choices but could be more effective with a combination of changes in accessibility and the overall food production system.

Introduction

A global transition towards plant-based diets and reduction of meat consumption could reduce methane and nitrous oxide emissions around 50% by 2050 (Stehfest et al., 2009). This would help increase air quality and reduce temperature rise (Ainsworth et al., 2012). Globally, 34% of the greenhouse gas emissions related to livestock production are due to deforestation, 25% are methane emissions from enteric fermentation of ruminants, and 31% of the emissions are from manure management (Lessechen et al., 2011). This raises increasing concern about the ecological footprint of our animal agricultural production system. The environmental impacts of our animal agriculture system not only include greenhouse gas emissions but can also leads to water contamination, sinking groundwater levels, soil erosion and dysfunction, and loss of biodiversity (Lemaire et al., 2014). The variety of concerns listed above suggest the need for changes within our current livestock production system and shift in consumer diets in order to protect the environment from a catastrophe in the future.

Environmental Impacts of Meat Consumption

Growing Animal Feed

One negative environmental impact of meat production is a result of growing feed for livestock. Feed efficiencies vary depending on the type of animal but all require land, water and synthetic fertilizers (McAuliffe, Chapman, & Sage, 2016). Feed can be made from barley, oat, sorghum and corn which is the most used ingredient in the United States (USDA ERS, 2018). More than 90 million acres are used to grow corn in the U.S and a majority of that corn is going

towards livestock feed (USDA ERS, 2018).This raises concern about the effectiveness because the largest amount of land used to produce meat comes from growing crops for feed and not the animals themselves (Swain, Blomqvist, McNamara, & Ripple, 2018).

Crops require water and synthetic fertilizers in order to increase productivity and fulfill the amounts needed. The water footprint of livestock production is larger than plant-based diets because not only are large amounts needed to cover these acres of crops but the animals also need water to survive (Swain, Blomqvist, McNamara, & Ripple, 2018). Synthetic fertilizers are also used to increase the crop yield of feed ingredients. However, excess amounts of nitrogen from these fertilizers can disrupt the natural cycling of nitrogen that already occurs in the soil (Mosier, Syers, & Freney, 2013). Since these fertilizers are synthetic, reactive forms of nitrogen have been created and enter in the agricultural land posing threats to the surrounding areas (Mosier, Syers, & Freney, 2013). Decline in forests is one result of decreased soil productivity from damaging fertilizers (Zhang et al., 2011). Use of synthetic fertilizer also releases ammonia emissions in the form of urea which takes the natural nitrogen out of the soil reducing the amount of usable land (Zhang et al., 2011).

Land Usage

Similarly to that of growing feed, clearing land for pastures has led to the loss of native species in those areas and will continue to decline as we continue to produce meat (Tichenor et al., 2017). Decreases in vegetation from destruction of forests can also lead to erosion making sections on land unsuitable for growing anything and increase the possibility of landslides depending on the geography (Sutton et al., 2012). Constant grazing from livestock prevents regrowth of vegetation in these areas which could be a habitat for native plants and wildlife (Leip et al., 2015). Soil is also a sink for nutrient cycling and animal agriculture alters the chemistry

ultimately disrupting the patterns of native plant species (Allan et al., 2015). This has led to decreased productivity of ecosystems contributing to the overall decline of biodiversity in certain areas such as grasslands (Allan et al., 2015). Fisheries also create the same problem because some aquaculture sites result in damage to those bodies of water or deforestation as a result of clearing mangroves (Páez-Osuna 2001). The land usage needed for animals creates just a small variety of environmental problems while the livestock themselves pose additional threats.

Manure Management

Unsuccessful manure management of livestock contaminates surrounding bodies of water, produces greenhouse gases and leads to acidification of soil. A common agricultural practice is to use manure of livestock as a fertilizer for crops instead of synthetic materials (Clark & Tilman, 2017). Not all the nutrients are taken up by plants leaving mainly nitrogen and phosphorus to leach into soil or runoff into the water (Clark & Tilman, 2017). In addition, antimicrobial substances are incorporated into animal feed in order to prevent mortality and disease but add to the chemicals being washed into surrounding water sources (Stone et al., 2011). When these highly soluble substances enter the water, eutrophication occurs. Eutrophication occurs when excess amounts of nitrogen and phosphorus stimulate the overgrowth of algae in bodies of water (NOAA, 2018). Over time algal blooms create a low-oxygen environment killing the organisms that live there due to no sunlight or oxygen (NOAA, 2018). As algal blooms continue to grow, dead zones are created destroying sections of marine habitats and making them uninhabitable (Dunn, 1989). Currently 65% of US bodies of water are affected by eutrophication from agriculture emphasizing the importance of changing agricultural practices (NOAA, 2018).

Not only can nitrogen and phosphorus enter bodies of water but it can also leach into the soil causing acidification (McAuliffe, Chapman, & Sage, 2016). When manure is spread across the rest of the farmland, it releases ammonia and nitrous oxide into the soil (Seidavi, Zaker-Esteghamati, & Scanes, 2019). When these substances enter the ground, changes in pH and chemistry make it unsuitable for plants to grow (Goulding, 2016). Crops vary in tolerance of acidity but severe acidification can lead to the destruction of clay minerals in soil eliminating that part of land for agriculture (Goulding, 2016). Land usage is already a large problem and acidification only adds to the decrease in available space left. Nitrates, phosphates and potential pathogens from waste can also seep into both ground and surface water sources contaminating drinking water (Seidavi, Zaker-Esteghamati, & Scanes, 2019).

Greenhouse gas emissions are also a side effect of using manure for fertilizer. As mentioned before, manure contains an inorganic form of nitrogen which when combined with carbon and water produce nitrous oxide and methane (Chadwick et al., 2011). In manure nitrogen is in the form of ammonium which undergoes nitrification producing nitrous oxide and enters the atmosphere (Chadwick et al., 2011). Methane emissions result from the anaerobic decomposition of the manure in which the organic compounds are broken down into other compounds such as volatile acids (Chadwick et al., 2011). These acids are then used by methane producing bacteria to create methane and which is released from the soil (Chadwick et al., 2011). Livestock manure contains compounds that greatly impact the environment through the air, water and soil which is why it is important to minimize or figure out a more sustainable practice of management.

Transportation

In 2016, transportation in general accounted for 28% of total U.S greenhouse gas emissions (EPA, 2016). This includes planes, cars, trucks and train some of which are used for transporting feed to various animal agriculture farms. If feed needs to be flown in from other countries such as some soybean based options used for poultry and pork, transportation emissions add up (McAuliffe, Chapman, & Sage, 2016). The feed being used for animals are rarely grown on the same site as that farm resulting in emissions from long distance travel (Lessechen et al., 2011). In addition to feed, livestock also require transportation. In the case of fisheries, emissions result from the fuel needed for boats and tanks housing farmed fish. Trawling fisheries emit 2.8 times more greenhouse gases than non-trawling due to higher fuel requirements in order to pull the net across the sea floor (Clark & Tilman, 2017). Besides emissions from fuel for boats, if aquaculture is being used the tanks require fuel to function. Livestock on the other hand have to travel from agricultural sites to slaughter houses and then distribution centers (Roy et al., 2012). In addition, refrigerator trucks are used to transport meat for distribution among stores requiring even more fuel to keep the truck cold (Roy et al., 2012). One study in Japan found that 9.7% of emissions from groceries are due to the meat that is bought (Roy et al., 2012). Additional emissions from transportation can come from moving manure to off-site locations (McAllister et al., 2011). Meat production requires multiple steps before entering the store adding transportation emissions from the distances traveled.

Meat Consumption Patterns

The Food and Agriculture Organization (2011), predicts that consumption of animal-based productions will increase from 29% to 35% in 2030 and 37% in 2050. Developing countries in particular are anticipated to rise from 87 kg per capita in 2018 to a predicated 95kg

by 2050 (FAO, 2011). This raises concern that meat consumption will progress faster than anticipated due to the growth in population of developing countries. Based on these statistics, a few decades from now development will have increased meat consumption in certain countries while developed countries stay at a constantly high level (Vranken et al., 2014). As the economies of developing nations grow meat becomes more accessible to all people (Vranken et al., 2014). Countries such Brazil, Russia, India, China and South Africa are in the substitution stage of the nutritional phase, which refers to a switch in carbohydrate-rich staples, roots and tubers to vegetable oils, animal products and sugar (Vranken et al., 2014).

The structure of the US food systems and Western way of eating has made it hard to avoid or reduce eating meat. It varies across the country but alternative proteins may not be accessible to certain populations because meat is valued as the main protein source in our diets (Daniel et al., 2011). In the US, meat contributes to more than 15% of our daily energy intake and 40% of our daily protein intake (Daniel et al., 2011). This has been an upward trend which will continue to grow with the growing economy and affordability of meats throughout the country (Daniel et al., 2011). There has been small shifts such as an increase in lean meat and decrease in red meat due to health implications (Daniel et al., 2011).These behaviors have originated from cultural eating patterns which emphasize the consumption of resource-demanding foods such animal-based protein (Röös et al, 2016). Overall, our meat consumption in the United States has always been much larger than Europe and other developed countries because we tend to over-consume protein in our everyday diet (Röös et al, 2016). In addition to meat being accessible, it has been a cultural aspect of the U.S. diet for years and created the idea that the norm is to eat large amounts of meat.

Environmentally Sustainable Diets

Understanding the definition and criteria of a sustainable diet is the first step in changing the negative impacts associated with our current food production system and consumption patterns. According to the Food and Agriculture Organization, sustainable diets are defined as "diets with low environmental impacts which contribute to food and nutrition security and to a healthy life for present and future generations" (Sabate & Soret, 2014). Sustainable diets work towards eliminating food insecurity through access to low-impact and affordable foods to ensure there is a healthy food supply (Johnston, Fanzo, & Cogill, 2014). Reducing meat and dairy consumption and food waste are two changes that will increase the sustainability of our food system by decreasing the amount of greenhouse gas emissions and land usage (Sustainable Development Commission, 2009).

Although changing an overall diet can be complex, promotion of plant-based diet such as the "Mediterranean diet" can set an example for future shifts. Many studies used the Mediterranean diet as a model due to the reliance on fruits, vegetables and legumes resulting in a lower environmental impact (Dernini & Berry, 2015). The vegan diet is the most sustainable due to low emissions from growing legumes or other plant-based proteins (Carlsson-Kanyama & Gonzalez, 2009). According Van Dooren et al. (2014), vegan diets have around 20% less emissions compared to an average diet due to less land required for agriculture. Not only does it eliminate the impacts of livestock production but also dairy products. Both meat and dairy require extensive resources for production while a diet primary of legumes and other plant-based proteins do not.

Understanding how to influence dietary change requires more research. In one study, consumers were unwilling to reduce meat consumption for the sole cause of the environmental

impacts (Macdiarmid, Douglas, & Campbell, 2016). They were either unaware of the connection between meat consumption and climate change or believe that is does not make a difference (Macdiarmid, Douglas, & Campbell, 2016). This creates resistance to dietary changes and although a vegan diet is the most sustainable option, making the extreme change of eliminating meat and dairy can be hard for a majority of the population. A semi-vegetarian or semi-vegan diet, is a more feasible change that people are more likely to try (Tobler, Visschers, & Siegrist ,2011). In order to achieve a shift in diet towards plant-based products, economic and educational factors need to be considered.

Barriers of Plant-based Diets

A plant-based diet consists of mainly fruits, vegetables and alternative proteins. Determining the barriers preventing populations from accessing these products is important. The first barrier towards eating mainly vegetables and fruit is access to stores that provide a selection of produce. The United States has gone under rapid suburbanization and has led to a loss in full-service grocery stores decreasing the amount of households able to access healthy food options (USDA, ERS, 2017). Especially in low-income areas, transportation is a main determinant in where people can go to get groceries therefore influencing food options. If people do not have their own car, they are required to rely on other forms of transportation such as buses, walking and carpooling (Wig & Smith, 2009). This limits the flexibility of where and how frequently someone is able to go to the store whereas someone who has a car is able to go whenever they want. In addition, walking or taking the bus limits how much a person can carry requiring that person to only get groceries that are absolutely needed (Wig & Smith, 2009). Especially in low-income communities cost and quality of fresh produce prevent people from buying it. There is a

perceived financial barrier of viewing plant-based diets as expensive (Corrin, & Papadopoulos, 2017). Not only do meals that are vegetable-based take longer to prepare, but they also require larger quantities of produce which increases the amount of trips to the grocery store and cost (Pollard, Kirk , & Cade, 2002). Even if people have access to a variation of fruits, vegetables and alternative proteins there is still a lack of adoption of plant-based diets due to perceived barriers of this diet.

One of the barriers that has prevented people from adopting a plant-based diet is the concern of losing the nutritional value of meat. People perceive vegetarian and vegan diets as unbalanced because meat provides protein and iron in an everyday diet (Corrin, & Papadopoulos, 2017). Animal proteins are considered "complete proteins' and plant proteins are viewed as "complementary" because they do not contain all the amino acids as meat does (Hughes et al., 2014). However, plant-proteins such as some soybean products do contain the complete amino acids that meat does, but most people are unfamiliar with the options or how to cook them. This connects to another barrier, knowledge about plant-based foods and how to prepare them. Corrin and Papadopoulos (2017) mentions in a study that in two different groups of participants said the lack of information about meatless diets was a reason that they were less likely to adopt that way of eating. This was because they did not know how to prepare meals without meat or what to eat in place of meat (Corrin, & Papadopoulos, 2017). In a survey done amongst dietitians who were asked about perceptions of plant-based diets, the two barriers mentioned were lack of interest and perceived difficulty (Hughes et al., 2014). The conclusion made was that knowledge about plant-based diets needs to be stronger amongst dietitians in order to convey information to the general public (Hughes et al., 2014). In addition it was mentioned that vegetarian eating is perceived as boring and bland, therefore people avoid eating that way (Corrin, & Papadopoulos,

2017). Based off these two barriers, the main concern is closing the gap between knowledge about how to cook meals without meat and that provide enough protein.

Other small barriers include meat consumption as part of culture, taste and lack of interest in plant-based eating. For cultural purposes, telling people how or what to eat can come across as asking to change a part of the cultural identity and make it seem that other view their cultural inheritance is flawed or unacceptable (Wright et al., 2016). As mentioned before, meat consumption patterns vary throughout the world whether it be the economic status or cultural. Understanding what is preventing people from eating plant-based foods is important in determining the next steps towards a shifting to more sustainable eating.

Meadville and the Mobile Market

Food security can be defined as, "having physical and economic access to sufficient and nutritious food that meets dietary needs and food preferences for an active and healthy life" (FAO, 2008). As of 2017, 11.8% of the US population which is around 15.0 million households experience some level of food insecurity (US Census Bureau, 2018). Meadville, is a small town in rural Pennsylvania where 24.9% of the population live in poverty (US Census Bureau, 2018). Although there are available food pantries and a soup kitchen, there is a problem with access to fresh fruit and vegetables mainly due to lack of transportation or not having these products as an option at nearby stores (Bloeser et al., Unpublished). Mobile markets are one solution towards addressing accessibility issues like this. A mobile market system is usually a truck or some other vehicle that provides and distributes local produce to low-income neighborhoods (Widener, Metcalf, & Yaneer Bar-Yam, 2012). The design of mobile markets is

an efficient way to reach these communities because the cost is much lower than opening a new grocery store or food pantry (Noth, 2017).

The creation of the Mobile Market in Meadville took three years of research from students and faculty at Allegheny College. Data collected through interviews and surveys indicated that access to fruit and vegetables was especially hard for low income families in this area. Not only do residents not have reliable transportation to stores but some are frustrated with the federal food subsidy programs provided and wanted a solution for easier access (Bloeser et al., Unpublished). Finally during focus groups amongst the community members, the idea of a mobile market was brought up and others showed interest and support of the topic (Bloeser et al., Unpublished). Having the feedback that Meadville residents actually wanted to improve the situation and design mobile market was a green flag for the project to begin. Next steps included getting a bus or mode of transportation and connecting with local farmers that were willing to provide produce. Today the Mobile Market is a project initiated by the Market House and serves Meadville area (French Creek Food Hub). Residents can pay with cash, check or vouchers, and the program is currently working on getting approved to accept SNAP vouchers as well.

The goal of my work is to develop plant-based recipes that are both low-cost and take a minimum amount of time to prepare. The recipes will be distributed to people shopping at the Mobile Market who would like to try a new recipe with their purchased items. While the Mobile Market addresses access to fruits and vegetables, my recipes will provide guidance on how to efficiently use the products available in plant-based recipes in an effort to promote long-term changes in diet.

Justification

In order for recipes to be chosen exploring the motives behind eating patterns and how to get people to eat more sustainably were reviewed. Eating revolves around accessibility, learned behaviors and how food is perceived.

Appeal / Visual Presentation

Our brain is trained to use the senses of taste, smell, and vision to find nutritious food and avoid consuming harmful substances (Spence et al., 2016). Vision is the first sensory cue that is used when eating and determines whether we continue to consume what is placed in front of us or not (Mehta et al., 2012). We are drawn to food images and choices that look to be pleasant and presentable (Pereira, & Van der Bilt, 2016). For example, take a look at any cookbook, each dish is carefully placed and photographed to look appealing and encourage the reader to test it out. Today we are exposed to so many different digital screens and media that contain multiple pictures of food and drink. Because visuals have a strong influence on decision making, it is a useful tool when trying to find influential ways to make healthy food more attractive and push people to make healthier decisions (Spence et al., 2016). Wadhera & Capaldi- Phillips (2014) assessed the importance of food display and found that children were more inclined to eat what was provided when there were various colors of food and items were cut into different figures In contrast, another study discussed how people were less inclined to try new dishes because in the past their bad experiences with food looked unappealing and tasted bad (Price et al., 2016). Both studies support the underlying idea that presentation does matter to people and can alter the perceptions of different foods. The visual appeal of food is important when picking

recipes because these visual cues can facilitate acceptances of new products. Recipes that have an intriguing photo of food can encourage people to try that dish. This will be beneficial for Mobile Market customers when they are choosing what products to buy. People will be able to look at a recipe and decide whether it looks appealing or not and have the available ingredients right in front of them.

Accessibility

The accessibility of food items affects the decisions people make when purchasing and consuming them. What we decide to eat depends on the choices and options that are available in that moment (Campbell-Arvai, Arvai & Kalof, 2014). For example, if fast food joints are the only feasible option then that is what their diet consists of and it becomes a habit (Wright et al., 2016). A study done in Philadelphia looked into whether providing access to fresh produce would change eating patterns and found that increased access was not a guarantee towards change but that money, time and nutritional knowledge were still barriers towards consuming healthier options (Elbel et al., 2015). This brings up the issue of encouraging people to try the new options that are accessible. The Mobile Market is one of Meadville's solutions towards expanding accessibility of local fresh produce to residents who do not have the ability to purchase these products on their own. There is a large variation of seasonal fruits and vegetables sold by the Mobile Market but people may not know how to cook or create meals with the new options available. This is the importance of creating recipes that consist mainly of the products sold at the Mobile Market. Being able to buy a majority of ingredients for a meal in one location makes it much easier for people to shop for groceries. Now that access is available to certain

fruits and vegetables, the goal of the recipes is to provide a selection of different combinations so that people learn how to use these new products in the future.

Learned Behavior

As Bee Wilson (2015) quotes in her book *First Bite*, eating is a learned behavior that develops throughout our life. We have labelled foods, "good', "bad", "healthy" and "unhealthy" which shape the choices we make on a day to day basis. When a certain food is labeled "good" it is perceived as likeable and attractive making it more desirable to consume or purchase (Almerico, 2014). Humans start off as omnivores and over time we figure out which foods we like, love and think are disgusting and that is how we create our own pattern of eating (Wilson, 2015). All decisions revolving around food have been hardwired since day one and everywhere around us we are told to eat a certain way. Eating can be considered a learned behavior because we watch people such as our parents and learn what foods our good and bad based on what is given to us (Stevenson & Prescott, 2014). Since we learn from others, everyone develops different interpretations of "food" and things such as culture and access can influence one's perception. A common example is the idea of eating insects as a source of food. In the Western culture this is considered odd or disgusting when in other places around the world it is perfectly normal (Shelomi, 2015). Much of what we learn to know as food depends on the resources that are provided in our certain geographical region which connects back to access and availability (Blass, 2003). By having a repeated exposure to particular foods, we develop what we believe is the "norm" and base assumptions off of that (Shelomi, 2015).

Recipes can help change perceptions of unfamiliar foods and alter current consumption patterns (Tobler, Visschers, & Siegrist, 2011). In the case of the Mobile Market, the goal is to

provide fresh produce to people who originally did not have unlimited access to it. Therefore providing recipes will help customers learn how to best use the products available and create meals they will enjoy.

Time & Cost

Time spent on cooking and food preparation influences the dietary choices we make (Monsivais, Aggarwal, & Drewnowski, 2014). This can include the time spent grocery shopping, preparing ingredients and cleaning utensils and dishes used. Today, many people have busy schedules and do not have time to prepare elaborate meals, especially working parents (Monsivais, Aggarwal, & Drewnowski, 2014). By the end of the day people are usually exhausted from their job or long commute which leads them to turn towards convenient food options such as microwave meals and fast food restaurants (Seguin et al., 2014). In many cases, finding the healthiest options are not the top priority for people unless it is available and does not require much time (Kelly et al., 2016). In addition, when healthier options are available, cost is a barrier for many people because it is too expensive (Seguin et al., 2014). Efforts towards providing affordable options to communities are being done and an example is the Mobile Market.

Recipes help alleviate the stress around time constraint because people do not have to think about what they are going to make or how to use what they have in their kitchen. Instead of having to worry about finding the healthiest option, the recipe will lay out everything and the best options available. Some require more time but mainly for items that need to simmer or cook so that people can be doing other things during this time period and not need to focus on preparing the meal. The recipes will revolve around what is bought at the Mobile Market and to make things even easier focus on minimizing the amount of utensils needed in order for a quick

clean up. Now people will be able to effectively use the produce that is available to them and conveniently make nutritious meals with little stress and time.

List of Parameters for Recipes

- Plant-based protein similar to the amount of protein from an animal source
- Time: The recipes cannot be any longer than 30-40 minutes
- Ingredients are mainly products sold at the Mobile Market
- Cost
- Incorporation of fruit or vegetables that people do not usually buy
- Visually appealing
- Minimum number dishes and utensils needed

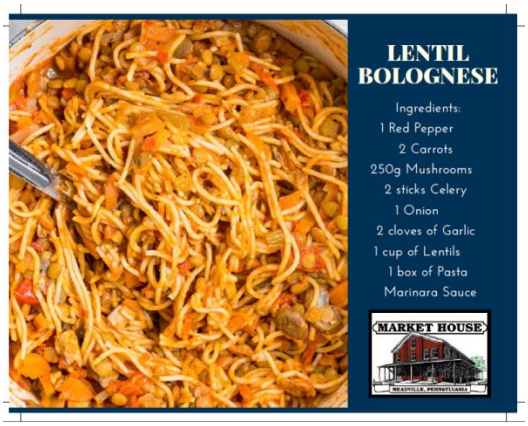
Specific Recipes Chosen

Recipe 1: Lentil Bolognese

The Lentil Bolognese was chosen mainly because people know of Bolognese but are unaware of how to make it without meat. Using a recipe with a familiar ingredient such as pasta helps ease people into trying alternative options for meat. In addition, lentils are a great source of protein and it is uncommon to use these in a pasta dish which can provide a new idea for people. In addition, the vegetables that are in this recipe are available at the Mobile Market and most people are familiar with carrots, mushrooms and celery. Pasta is also a common ingredient that is cheap and most people have access to. By incorporating a more protein filled dish, people can create a more nutritious way to make pasta. Although this recipe does take a little longer than some of the others, most of the time is the simmering of lentils which doesn't require you to do anything.

This time can be used for any cleanup needed or other things. In addition, it should be an easy cleanup since there is only one saucepan required to make this recipe.

Figure 1: Lentil Bolognese Recipe Card



Instructions:

ESTIMATED COST: $12.14 TIME: 45 MINS
SERVES: 4-5 PEOPLE
PROTEIN: 14G

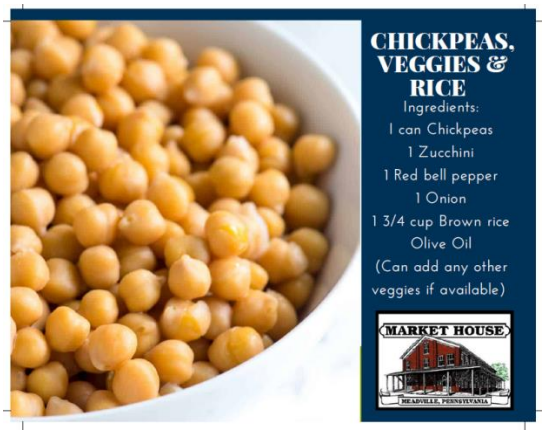
1. Chop vegetables, onion and garlic
2. In a large pan, add olive oil, onion, garlic and celery.
3. Add carrots, mushrooms and red pepper, cook for 5-10 minutes.
4. Add marinara sauce and lentils
5. Simmer for 30-40 minutes, until lentils are soft.
6. While simmering, boil water and cook pasta.
7. Once the lentils are ready, stir in the pasta.

Image Retrieved from:https://thefoodmedic.co.uk/2018/06/lentil-bolognese-x-deliciously-ella/

Recipe 2: Chickpeas, Veggies & Rice

This recipe was chosen because it is very simple and a can chickpeas contains around 27.67 grams of protein and cost 2 to 3 dollars. In this recipe, tomatoes and zucchini were chosen because they are top sellers at the Mobile Market which means these products are well liked and people are likely to try them in a new recipe. It is a simple recipe that only requires six ingredients and people can add more vegetables if they would like. Brown rice can provide additional protein and is a staple that most people have or can buy for no more than 3 dollars. The utensils needed for this recipe include a saucepan, spoon, knife, cutting board and strainer which allows for an easy clean up and cuts the time needed.

Figure 2: Chickpeas, Veggies & Rice Recipe Card



Instructions:

ESTIMATED COST: $7.02 TIME: 15 MINS
SERVINGS: 2-4
PROTEIN: 30G

1) Boil water and cook rice.
2) Chop onions, zucchini and red pepper into pieces.
3)Saute onions in saucepan until cooked through, then add vegetables.
4) Add chickpeas and stir for 2-3 minutes.
5) Once rice is cooked, drain and place in bowl.
6) Place chickpeas, onions and vegetables on top.

Image Retrieved from: https://simpleveganblog.com/chickpea-and-vegetable-stir-fry/

Recipe 3: Black Bean Quinoa Salad

The quinoa black bean salad was chosen for a few reasons. First off a cup black beans is around fourteen grams of protein and costs no more than two dollars. In addition, quinoa is a great grain that provides some extra protein. It is becoming a popular grain but a lot of people are unaware of interesting ways to cook it. Through a recipe, it allows people to get an idea of how a certain ingredient can be used and could help them use that ingredient again. The utensils needed are not a huge amount of clean up time because they are not many of them. In addition, people can add more ingredients depending on what is available to them. Other vegetables can be added and if certain seasonings sound good those are available too.

Figure 3: Black Bean Quinoa Salad Recipe Card



Instructions:

ESTIMATED COST: $12 TIME: 30 MINS
SERVINGS: 8
PROTEIN: 25G

1) Prepare and cook quinoa in a saucepan.
2) Whisk olive oil, salt, cumin and garlic in a bowl.
3) Let it sit while you chop the veggies.
4) Cut vegetables into small pieces (size of the beans).
5) Drain the beans and rinse beans and then add to bowl with vegetables and olive oil.
6) Once quinoa is done add to the bowl and mix all ingredients together..

Image Retrieved from: https://www.spendwithpennies.com/black-bean-quinoa-salad/

Recipe 4: Hummus Quesadilla

This recipe was chosen because it is one of the easiest and fastest recipes that most people are able to do on their own. It is a unique twist to a quesadilla and the hummus provides people with an alternative protein. Someone said to me they would have never thought of putting hummus in a quesadilla and thought it was a great idea which is beneficial in exposing people to new options. In addition this recipe can be a snack, lunch or dinner and additional "toppings" can be altered depending on the person. The utensils only require a non-stick pan and cooking time is only 5-10 minutes.

Figure 4: Hummus Quesadilla Recipe Card



Instructions:

ESTIMATED COST: $5.21 TIME: 10 MINS
SERVINGS: 1 SERVING
PROTEIN: 3G

1) Heat olive oil in pan over medium heat, add garlic and red peppers
2) Sprinkle salt and pepper to taste, saute for 2-3 minutes
3) Add spinach and cook for another minute, remove from pan
4) Spread hummus evenly on half of the tortilla
5) Add vegetable mixture, then fold tortilla in half
6) Place quesadilla in non-stick pan for around 5-10 mins until warm
and golden brown on the outside

Image Retrieved from: https://www.thissavoryvegan.com/simple-vegan-hummus-quesadillas/

Recipe 5: Tofu Stir Fry

The last recipe incorporates the alternative protein source tofu and any vegetables that are available from the Mobile Market. Again, this recipe is not strict and can be altered to add any vegetables that people like or have available to them. The cooking time is no more than 20 minutes and is easy for people who do not cook a lot to do. The pepper, green beans, and carrots can be bought from the Mobile Market and olive oil, salt and pepper are common cooking materials people already have in their kitchen.

Figure 5: Tofu Stir Fry Recipe Card



Reflection

Summary of Event

In order to gather people's thoughts on some recipes from the list, I provided some samples during Meadville's Winterfest, an event in which small businesses come together to bring the community activities. The two recipes chosen were the Lentil Bolognese and Quinoa Black Bean Salad. I picked the Lentil Bolognese because pasta is a familiar food to most people. The quinoa

dish was chosen because it it a less familiar grain and I wanted to see what people were more comfortable with. My table was set inside one of the "warming" stations located in the Unitarian Universalist Church which was located on the street next to Diamond Park. This set the station away from where the main event was happening. In this building there were a few other stations from other organizations in the area. I set up my samples in the center of the room with the other refreshments which were coffee and cookies. It was interesting to see when people came over to get coffee or tea, whether they took a cookie or came to try what was in the sample cups. There was also a cotton candy machine next to the table and since there were a lot of kids that came in, they were more interested in that than the healthy samples provided.

Throughout the two hours I was there a variety of people came up to ask what each sample was, however very few actually knew about the Mobile Market and where it went in Meadville. Once I explained it, they were interested about what it did and liked the idea of local produce. This observation suggested that not many of the people who came to this event were customers of the Mobile Market. However, there is interest in the Mobile Market which could suggest expanding this service might be beneficial. In addition, many people enjoyed the sample given but did not ask for a recipe or any other information on the actual dish. I also took into account the age range that came over and tried the samples. I only had a few kids come over and once they heard what each item was they were not interested. The pasta dish however was more popular with them which brought up the importance of using familiar or popular foods and combining them with new food to ease people into trying new things. I did notice that some adults also were unsure about trying these items as well. So even though people were given the chance to try something new, it does not always work because people are still not willingly to take the risk.

Effectiveness of Winterfest

Based off the feedback that I got during the event, I thought that it was effective in getting a sense of how people could react to the recipes that are being created. The overall idea of an event that exposes people to new foods is a good way to provide new ideas to people. However, I would change a few things to make something like this more effective. When samples are just given out, I feel like people just take them and if they really like them they will actually go out and try to make them at home. Many people did express how much they enjoyed the sample but did not ask for a recipe or further information. I do think this could have been different if I had printed some recipes and had them on the table for convenience. Adding cooking lessons or showing people how each dish is made could create a more memorable way of remembering the recipe and actually get people to be involved with the process of making each recipe seems more beneficial. In addition, many of these people were not customers of the Mobile Market, and even though you can still get these products at the store, they seemed to dismiss the idea since it did not apply to them. I did however, introduce my samples as relating to the Mobile Market instead of plant-based recipes in general which could have sparked a different reaction. Going off of the population that is being sampled, there were a lot of children who came in looking for something to eat. Since there were other options such as cookies and cotton candy available, they were more inclined to choose these options over the healthy samples. It might have been easier to get feedback if these recipes were the only options available or the main focus of the event. But in this environment it did provide me with an unbiased population because it was not only about the samples. It gave me a realistic big picture about how open and interested people might be about plant-based protein eating. I did not however talk about the how the recipes were structured to eliminate meat because I thought that

might deter people away from even trying it. I think it would have been interested to test this theory and maybe have another event where it was explained that each recipe had an alternative protein source.

Another observation I made was that the presentation of the samples also played an important role. It might have been more appealing to have the pasta dish in a warm pot and then dish it out instead of already having them measured into the cups. It was a cold day and many people were coming inside this building to warm up and towards the end of the event the cups were a little cold and maybe did not look as good. As mentioned earlier, visual representation of food can have an impact on people's eating choice.

Lastly, the location was also not in the middle of the event which could have grabbed more people's attention. Instead of having the table inside a church maybe having it in the park where all the booths are set up in order to catch more people walking by. Even if I placed myself in a different location I am not sure if the interest in the recipes would have changed. As mentioned previous, to encourage people to try these recipes on their own an interactive activity such as cooking lessons would show more significance.

Conclusion

The information gathered from this small event and my project suggests in order to determine the impact of providing plant-based recipes for the Mobile Market, more research on the specific population is needed. It is hard to tell exactly how the customers of the Mobile Market will react to these recipes because most of the people who tried them are not getting their food products from there. It would beneficial moving forward to connect with the customers in order to determine effective ways of encouraging people to try plant-based recipes. To gather

more information on the customers of the Mobile Market, I think the surveying the neighborhoods that the Mobile Market goes to would be beneficial. Questions should include topics such what residents buy and how they use these certain products. Do they think that recipes would be beneficial and helpful for them? If these were available would they actually try something new if given the option? The survey could provide more background information which could be helpful in deciding whether more events like this lead to people experimenting with new foods.

If someone were to create another "event", I believe that an interactive cooking class or meal planning session could be more influential than just sampling. There was a study done in Utah with SNAP participants and a series of curriculum that covered topics such as nutrition, physical education and cooking demonstrations. The goal was to teach people ways to make healthy meals under a budget. It mentioned that having the hands-on cooking demonstration was a way of keeping things fun and lively (Savoie-Roskos et al., 2019). Influencing younger populations could be beneficial towards seeing a shift in later generations. In addition, recipes were adapted based on the limited resources that people had and made it seem like a real-life situation (Savoie-Roskos et al, 2019). Although the overarching goal of this study was different, it provides an example of how incorporating demonstrations had an positive effect on people's eating patterns and should be considered as an options in the future. Another study was done on students who participated in a four-week cooking program that used recipes to increase fruit and vegetables consumption (Flynn, George, & Schiffman, 2019). The results found that through this program student's did change their eating habits and were still using the example recipes two-months later (Flynn, George, & Schiffman, 2019). Again, the demographics of the study

population are different than the Mobile Market which is why more information on the our area will be extremely helpful in determining the most effective next steps.

An important take-away is that changing what people eat is a slow process that won't change overnight. In addition, there is not one solution that can solve this issue but instead many obstacles have to be addressed for this to be achieved. So how can we successfully shift people more sustainable diets? O'Neill et al. (2019) says that in an ideal world a balance between radical changes such as policies and promotion of sustainable practices could lead to improvements. Examples include subsidies for supermarkets that sell sustainable products to community gardens and cooking lessons (O'Neill et al., 2019). Observational learning and environmental activities show people how everything connects which allows them to visually see what they are eating and how it can affect them and the environment instead of just telling them what to eat.

Recipes and alternative options are just small steps towards providing resources that could change people's diet choices to a more sustainable way of eating. Dibbs and Fitzpatrick (2014) state successful eating behavior change will not come from persuasion alone but require a systematic approach involving government policies, new practices and education. One survey found that there is an increasing interest in non-meat protein sources but a lack of knowledge about alternative proteins among the general public (Dibbs and Fitzpatrick, 2014). This is where recipes play an important role in spreading information and can be used to show people that a plant-based diet is feasible for everyone. In order to do this recipes that take meat substitutes and make them flavorful and likeable are important to close the barrier and perception that meat-free food is bland and boring (Dibbs and Fitzpatrick, 2014). My project is just one example of how plant-based alternatives can be passed on to a wider audience. Specifically, providing recipes

when people are getting their groceries or produce like at the Mobile Markets, makes it extremely accessible and easy to use. With today's technologies recipes have become accessible and assist in expanding food choices and diets like "vegan" and "gluten free" (Vaterlaus et al., 2015). But for those still not relying on technology providing cookbooks and recipes is more effective in spreading information. Another tactic is connecting people with where their food comes from and who produces it can also encourage a change in eating behaviors (Lee et al., 2019). The Mobile Market is a good example of this because all the produce is sourced from local farmers and it could be even more beneficial if a wider audience could access this produce and increase awareness. Unlike many of the problems we face where reducing usage or consumption can benefit the health of our environment, we need to continue to eat which stresses the importance of finding ways to encourage people to move towards sustainable diets.

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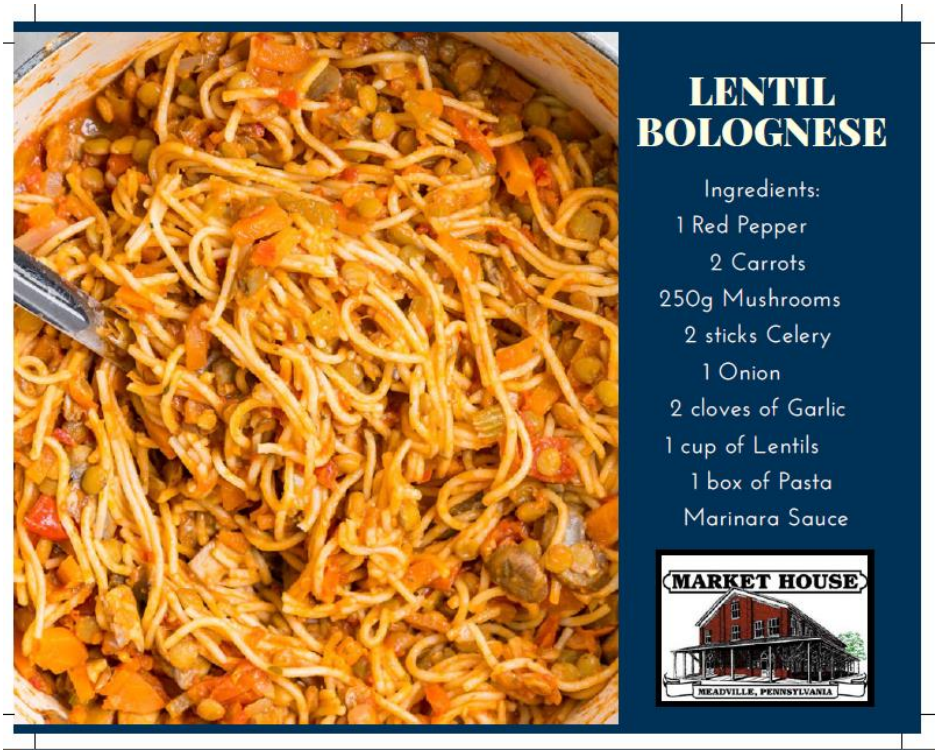
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Appendix

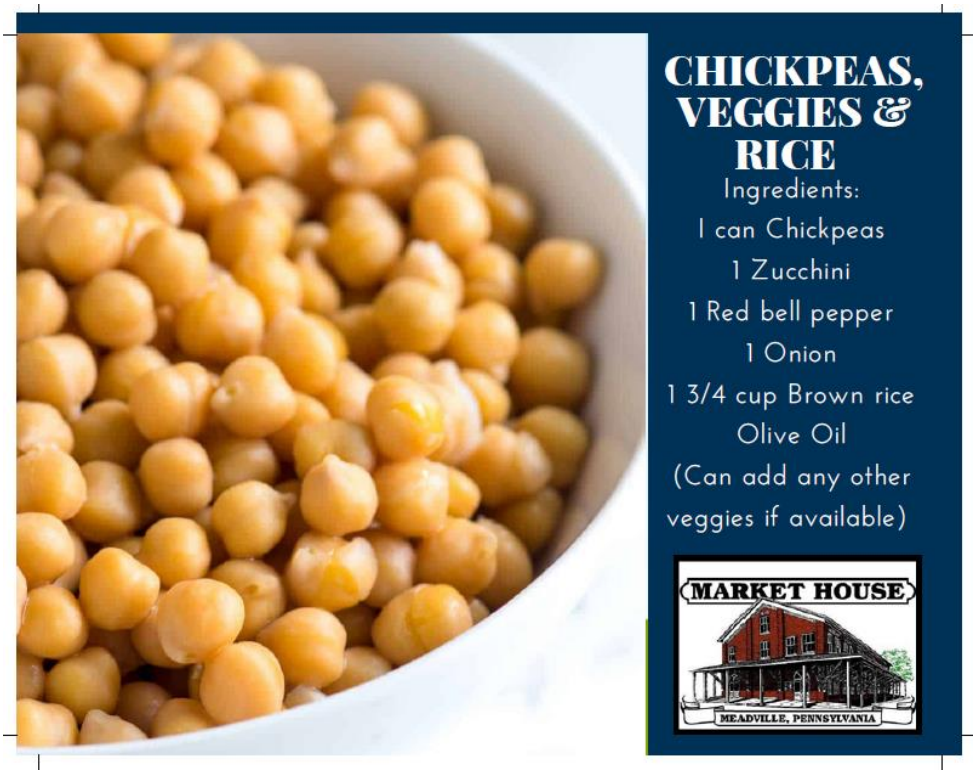


Instructions:

ESTIMATED COST: $12.14 TIME: 45 MINS
SERVES: 4-5 PEOPLE
PROTEIN: 14G

1. Chop vegetables, onion and garlic
2. In a large pan, add olive oil, onion, garlic and celery.
3. Add carrots, mushrooms and red pepper, cook for 5-10 minutes.
4. Add marinara sauce and lentils
5. Simmer for 30-40 minutes, until lentils are soft.
6. While simmering, boil water and cook pasta.
7. Once the lentils are ready, stir in the pasta.

Image Retrieved from:https://thefoodmedic.co.uk/2018/06/lentil-bolognese-x-deliciously-ella/

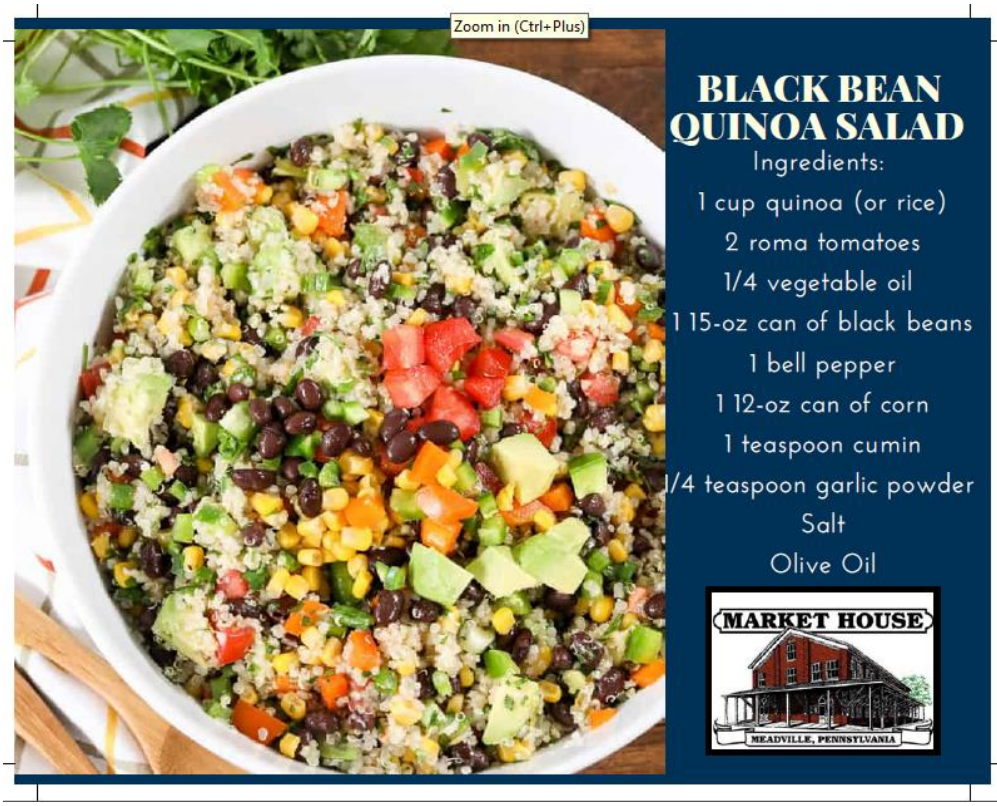


ESTIMATED COST: $7.02 TIME: 15 MINS
SERVINGS: 2-4
PROTEIN: 30G

Instructions:

1) Boil water and cook rice.
2) Chop onions, zucchini and red pepper into pieces.
3)Saute onions in saucepan until cooked through, then add vegetables.
4) Add chickpeas and stir for 2-3 minutes.
5) Once rice is cooked, drain and place in bowl.
6) Place chickpeas, onions and vegetables on top.

Image Retrieved from: https://simpleveganblog.com/chickpea-and-vegetable-stir-fry/



Instructions:

ESTIMATED COST: $12 TIME: 30 MINS
SERVINGS: 8
PROTEIN: 25G

1) Prepare and cook quinoa in a saucepan.
2) Whisk olive oil, salt, cumin and garlic in a bowl.
3) Let it sit while you chop the veggies.
4) Cut vegetables into small pieces (size of the beans).
5) Drain the beans and rinse beans and then add to bowl with vegetables and olive oil.
6) Once quinoa is done add to the bowl and mix all ingredients together..

Image Retrieved from: https://www.spendwithpennies.com/black-bean-quinoa-salad/



HUMMUS QUESDILLA

Ingredients:

whole wheat tortilla
1/4 cup spinach
1/4 cup hummus
1/4 red pepper
1/4 mushrooms
1 clove of garlic

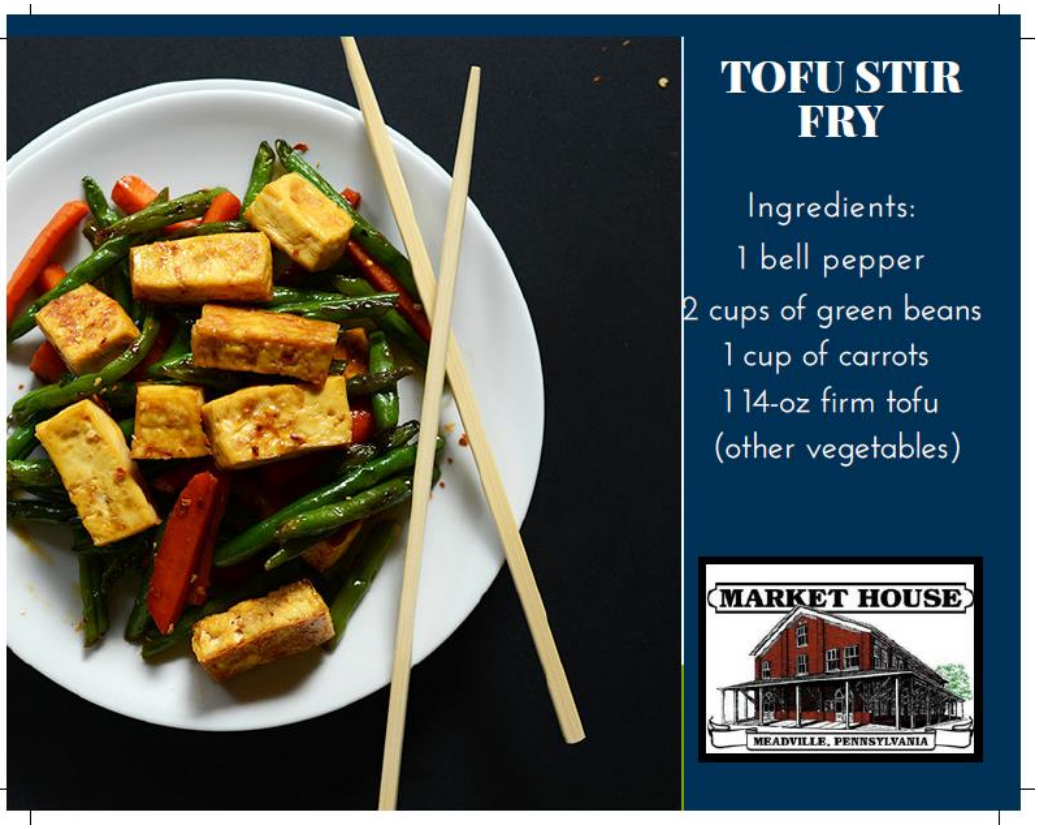
MARKET HOUSE
MEADVILLE, PENNSYLVANIA

ESTIMATED COST: $5.21 TIME: 10 MINS
SERVINGS: 1 SERVING
PROTEIN: 3G

Instructions:

1) Heat olive oil in pan over medium heat, add garlic and red peppers
2) Sprinkle salt and pepper to taste, saute for 2-3 minutes
3) Add spinach and cook for another minute, remove from pan
4) Spread hummus evenly on half of the tortilla
5) Add vegetable mixture, then fold tortilla in half
6) Place quesadilla in non-stick pan for around 5-10 mins until warm
and golden brown on the outside

Image Retrieved from: https://www.thissavoryvegan.com/simple-vegan-hummus-quesadillas/



ESTIMATED COST: $7.48 TIME: 35 MINS
SERVINGS: 2 SERVINGS
PROTEIN: 10G

Instructions:

1) Drain and pat dry tofu with paper towel, cut into 1 inch cubes.
2) Saute with olive oil, salt and pepper in large pan.
3) Once tofu is browned on all sides, place in a bowl on the side.
4) Cut veggies into sections and place in large saucepan with olive oil.
5) Saute for about 5-10 minutes or until veggies are tender.
6) Add tofu and stir.

Image Retrieved from: https://minimalistbaker.com/tofu-that-tastes-good-stir-fry/