



the gaia project
realistic environmentalism

Project Guide: Food Audit

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Project Guide: Food Audit

A guide to delivering a Food audit project in your classroom

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The Gaia Project is a charitable organization dedicated to providing project based learning opportunities in the areas of energy, environment and sustainable engineering.

We develop projects, provide professional development, technical support and ongoing project support for teachers and students. Our projects aim to incorporate three key principles, which symbolise our focus on realistic environmentalism.

1. **Data Informed Decisions** – We want students to be able to explain why, and quantify the effect of each decision they made along the way to their final solution.
2. **Economic Assessments** – We expect students to be able to assess the cost effectiveness of their solutions, and be able to optimize their projects with limited budgets.
3. **Environmental Impact and Lifecycle Assessments** – We need students to take a holistic view to their projects. This means looking at their projects from cradle to grave, as opposed to just examining the use phase, and acknowledging that greenhouse gas reduction is not the only environmental issue at stake.

For more information, please visit www.thegaiaproject.ca

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Food Audit

Food plays an essential role in our everyday lives.

Asking where our food comes from can be an important part of a sustainability plan, as growing, manufacturing, transporting and disposing of food can have many hidden environmental, social and economic considerations.

Sustainable development is often defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”.

Sustainable development must consider the impact of all our decisions, and food is no exception. The definition for sustainable development listed above does not exclusively focus on the environment. That’s because in order to be truly sustainable we need to consider our actions from a number of viewpoints – their environmental, economic and social impacts.

With almost 7 billion people on earth, access to food is a major issue. Even close to home, many struggle for access to nutritious and environmentally conscientious food. As we try to make decisions about buying the best types of food for our money, we are confronted with an enormous amount of often conflicting information.

This project guide will explore how to conduct a food audit. It will focus on examining food from a school cafeteria, but the same idea can be applied anywhere. This food audit is based on doing a life cycle assessment—that is, tracking a product from its production/manufacture to its consumption and subsequent disposal, and examining all of the processes in between that

results in that delicious food on your plate.

The driving question behind this project is: how can the site being audited provide food in a more sustainable manner?

Discussing with your class

To start off this project, ask students to think about or record what they eat for a couple of days. Have them identify what they purchase at the school, bring from home, or buy from elsewhere. To get students thinking about where the food that they are consuming might come from, have them identify their most commonly eaten food and develop something like a concept map of all of the steps and resources required to get it into their hands.

This guide should always be used in conjunction with our Sustainability Plan project guide, which provides the overarching framework for conducting this sort of inventory and improvement process. It is not necessary to complete the entire sustainability plan, but many components of this project can overlap with other aspects of developing a sustainability plan.

This guide can also be used with our Sustainable Design guide where we analyze the entire lifecycle of the things we buy.

Essential Resources

Sustainability Plan: The Gaia Project

<http://www.thegaiaproject.ca/projects/sustainability-planning>

Waste Auditing

One major component of building a

sustainability plan is to examine waste with the goal of finding out the type and quantity of waste produced at a site and firstly reduce the amount of waste and then divert as much of the remaining waste as possible away from the landfill.

A food audit ties in well with a waste audit by examining what types of food-related waste are produced at a site. In the case of a food audit, if it is not possible to do a waste audit on the entire site, it is best to focus on where the majority of food is consumed. At a school, this will likely be the cafeteria.

A good place to start your food audit then, would be to do an audit of all of the waste produced at the cafeteria.

Refer to the Waste Audit Project Guide for more specific details on conducting a waste audit. Choosing your sorting categories will determine how you will be able to interpret your data. You may want to do a preliminary exam of the most commonly used waste receptacle at the school to get an idea of what's there. See Table 1 at the end of this document for an example of sorting categories relevant to a food audit. This project can be combined with a waste audit of the school.

In the example from Table 1, the waste audit revealed that 29% of the waste in the cafeteria was compostable matter. Take notes during the waste audit process—perhaps the majority of this was fruit peels indicating that a lot of fruit is being consumed at the school.

Conversely, it might be the case that this compostable matter is half-eaten foods. If this is the case, then this might be worth further investigation. Is there one type of food that is commonly partially eaten? If the school serves large pieces of pizza and there are many half eaten pieces in the trash, perhaps the portion size needs to be reconsidered. While sorting

waste, it is worthwhile to group the compostable matter into sub-categories. These might be sandwiches, meat, vegetables, candy, processed food, or any other category that represents what you see in the garbage.

Additionally, 9% of the waste was uneaten food. This deserves closer examination as well. Is this purchased food, or food brought from home?

The data in Table 1 reveals that 5% of the waste is food wrappers, 8% is plastic baggies, 2% reusable lunch containers, 33% paper plates and 15% disposable cutlery and cups. This reveals that 63% of waste is from materials used to package or serve food.

Cafeteria Auditing

The goal of a food audit is to ensure food at a site is produced and consumed (and disposed of, if needed) sustainably. Now that you have stock of what is being thrown away, you can examine the usage and consumption trends at the cafeteria.

Inventory

The waste audit will have given you an idea of how often the cafeteria is used, especially if food is served on disposable plates.

However, to really do a food audit properly, you need a lot more details. You are going to have to find out the types of food that are served, the quantities, where it comes from, how it is prepared, and how it is served/packaged.

There are a couple of ways that this could be achieved, but it will likely have to be some combination of both.

Measuring Consumption

One way the food audit can be conducted is to look at and measure what is being consumed in the cafeteria. This could be achieved a couple of ways.

- **Continuous Observation:** Physically counting each and every purchase at the cafeteria over a defined period. This is very labour intensive, but precise.
- **Observing key time periods and assuming these are representative:** you may choose to only record data on a Monday and assume that this is typical of every school day. This can save a lot of time, but is not as precise. Students will need to ask themselves if their assumption is reasonable. For example, certain foods on certain days may change buying habits.
- **Surveys:** Asking consumers how often and how much they purchase a food item can be a quick method of obtaining an estimate. Surveys need to be used with caution, as they aren't always the most reliable source of information. Why is this? Firstly, what you are asking people may not be the type of thing they usually keep track of so they don't have an accurate idea. Secondly, surveys are subject to bias. People like to try and give the answer that will portray them in the best light. In this case people are probably likely to say that they eat healthier options than they do and that they throw less out.

All of these methods can be appropriate, and it is likely that will use a mix of them. Surveys may enable quick data collection, though it may be a good idea to verify some of the data by continuous observation. In cases where continuous observation reveals that people are

under- or overreporting, continuous observation can be used to calculate an approximate correction factor for data gathered through surveys.

It is also necessary to think about what this doesn't tell us. We won't be able to find out much about where the food is from, how much is prepared versus actually served, how it is prepared, and how much it costs, etc. These questions will need to be addressed by a different method.

Measuring Production

To answer the above questions, you need to look at the food production side of the cafeteria.

Again, you can record measurements on the types and amounts of foods in much the same ways as we did when looking at purchases.

In addition, you need to start identifying where specific foods originate, which can usually be achieved by looking at packaging. This will enable you to think about the full lifecycle of the food items by including transportation. Consult the **Transportation Audit** for more information on how to factor this environmental impact into your food audit.

You'll also need to start looking at how food is prepared, and considering the energy that is required to prepare the food. Consult the **Energy Audit** for more information on how to factor this environmental impact into your food audit.

Energy Audit: The Gaia Project

<http://www.thegaiaproject.ca/projects/sustainability-planning/energy>

Transportation Audit: The Gaia Project

<http://www.thegaiaproject.ca/projects/sustainability-planning/transportation>

Interviews and Surveys

Cafeteria Staff

Before starting a food audit of a cafeteria, one of the first things you want to do is inform relevant stakeholders such as cafeteria staff.

If possible, set up some interviews with cafeteria staff or representatives (they will be more likely to agree to participate if they've been involved from the beginning). They may be able to provide information on where food comes from, how often it is ordered, the quantities being ordered and prices. They can also help you determine how representative your inventory from the previous step is because they see what people order on a daily basis.

Don't get discouraged if they are unwilling or unable to discuss details with you.

Consumers

To supplement counts of frequency of purchase of items in the cafeteria, interview consumers at the school: students, teachers, administration.

You can ask questions like what they typically buy, what motivates them to buy it (taste, convenience, price), what they would like to see in the cafeteria that might not already be there. This information can be used to help you develop solutions after doing a life cycle assessment of foods in the cafeteria.

You could also supply a group of randomly chosen consumers with a survey, as previously discussed. You could include an open-ended question asking consumers what they would like to see that isn't already there to help inform your recommendations later in the project.

Interviewing Tips

Develop a set of four or five questions designed

to gather the most essential pieces of information. Identify what you want to find out from these interviews and design your questions accordingly. Make sure that they don't sway the interviewee to answer the question in a particular way but are as open-ended as possible.

- *Question:* Why don't you bring your lunch from home rather than buy food at the cafeteria?
- *Better question:* Why do you buy food at the cafeteria?

You can ask probing questions to get more information within one of your predesigned questions but again try to ensure that you are not influencing their answers.

Assembling Data

After collecting all of this information, it will be necessary to assemble this information in a logical format so that some recommendations can be made, and so that any future audits can have something to be compared to.

Examples of this an inventory can be seen in Tables 2 and 3 in the Appendix.

Life Cycle Assessment

At this point, you likely have a good idea of what and how much food is being thrown away at the school and purchasing/consumption habits. Now you want to take a closer look at the food itself.

We often consider the nutritional benefits of the food that we eat, the energy that it gives us, the content of various nutrients, and how many

portions we are eating from each of the food groups from the Canada Food Guide.

This time, we also want to consider where this food originates and what type of resources went into its production by asking questions like where was it grown, was it processed (and if so, how), how was it transported and packaged?

This guide will follow the same procedure as the Sustainable Design project guide by conducting a product life cycle assessment examining:

- Raw materials
- Production
- Distribution
- Consumption
- Disposal

Each of these steps will consider as many of the environmental, social and economic impacts as possible. Depending on the time available for this project, it can become as complicated as you would like.

A sample concept map of the type of materials and resources going into an item commonly found in school cafeteria—an egg salad sandwich—has been supplied in Figure 2 at the end of this document.

As students start to build the product's life cycle, they can start to think about possible ways to redesign it to reduce negative impacts. This concept map will be a stepping stone that students can revisit as they move through the life cycle assessment.

Some of the steps in the life cycle may have negative impacts like the CO₂ emissions from the transportation steps, though some may have positive impacts like providing employment to farmers or retailer. This map is a starting point, and students should be

encouraged to keep it somewhere easily accessible to elaborate on it as they build new information and to use it as a tool. **This map can potentially be used as part of an educational campaign on where the school's food comes from.**

The next sections will go through rest of the life cycle assessment asking students to analyze the various steps that culminated in their product and to consider where the product will go after disposal. If it's something like a piece of fruit, maybe there will be nothing to dispose of, or easily compostable. Or maybe it's something that has a lot of packaging, or is served on disposable plates.

Resources

Canada's Food Guide

<http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/index-eng.php>

Sustainable Design: The Gaia Project

<http://www.thegaiaproject.ca/projects/sustainable-design>

Raw Materials

For each product of interest, identify each raw material that goes into the product. In the sample concept map in Figure 2, the raw materials are listed as: eggs, mayonnaise, bread and lettuce.

Each of these raw materials has a potential impact. If possible, identify the source of each of these raw materials. How far away were they produced? How were they produced? If anything is labelled as organic, investigate what it means according to the retailer/manufacturer. There aren't strict regulations for labelling foodstuffs as organic and producers often use different definitions. Consult the internet link listed below for

current laws to have products labelled as organic in Canada.

Also consider the materials required for packaging—where did they originate and how many different types of resources are required.

Resources

Organic Products Regulation, 2009—Gov't of Canada Department of Justice

<http://laws-lois.justice.gc.ca/eng/regulations/SOR-2009-176/>

Distribution

In this step, identify where each raw material originated and how far it had to travel before it became a part of the food item being evaluated. In the case of a sandwich, the eggs might have been produced at a farm in another province, the flour for the bread grown in the Prairies, and the lettuce produced in a local greenhouse. All of these materials then have to travel before being put together into a sandwich and potentially packaged.

If the food item requires assembly and packaging, how far must it subsequently travel to reach its destination for consumption? Are there many distributors and suppliers? Students can start think about potential ways to reduce the distance travelled by food to reduce its environmental impact.

Consumption

The data collected about how the quantity of consumed products at the school will inform this step. Is it popular? Are consumers only eating a portion of the product and throwing the rest out?

When trying to make improvements to the sustainability of food supply, it is important to think about the effort required to make any

changes and the potential impact. Making a massive change to a food item that is only consumed by one person per week may not have much of an impact, while making a small change to something consumed by hundreds every day might have a far greater impact.

Disposal

If there is anything left after consumption, what happens to it? If there is leftover food, is it composted or does it go into the garbage can? If there is packaging, does it get recycled?

If you're examining something like a hot meal served at the school, perhaps it is served on reusable plates with reusable cutlery that is washed in-house and there is nothing to be disposed. Or maybe it is served on paper plates that are recyclable, but because no recycling receptacles exist in the cafeteria, they instead going into the garbage can.

Identifying Improvements

Now that you have collected information on consumption and examined product life cycles, you can start to identify how they can be redesigned more sustainably. Solutions custom-designed for your site will be the most effective.

Of course everything is easier with a visual. **Fishbone diagrams** are visualizations of cause-and-effect relationships (also used in the Sustainable Design project guide). These diagrams can be used to trace the many inputs affecting an output – this output could be a product such as processed food in the cafeteria or a process like food choices presented to cafeteria consumers. A fishbone diagram, seen

in Figure 3 at the end of this document can be used to discover limiting factors, allowing you to maximize time by focusing on the areas that will have the most profound effect.

To make a fishbone diagram:

- Set the problem to be studied as the ‘head of the fish’ (*poor nutritional value foods offered in schools* in Figure 3); for example, this might be Large Amounts of Imported Food being Consumed.
- Label each ‘bone of the fish’ as a major category (*people, communities and ingredients* in Figure 3).
- Identify factors within each category that may be affecting the overall problem (secondary and tertiary).
- Continue to do this for each factor, generating sub-factors along each of the major branches
- Repeat this until the point is reached where the question ‘why is this happening?’ can no longer be answered.
- Analyze the diagram looking for areas that appear on multiple bones, which signify that they are likely to be a significant cause of the overall problem. Also look for easy to change factors with solutions that could be implemented quickly.
- Create a priority list of factors that must be looked at in solving the overall problem.

In Figure 3, the fishbone diagram identified that the widespread availability of poor nutritional value foods in the school was primarily due to lack of nutritional education both at the school and in the community. In this case, an educational campaign should focus not only on people at the school but also the community.

Setting Targets

Setting targets should be an area where the students have a chance to be innovative and can take a variety of forms. Setting your targets appropriately is always difficult, but you should keep these pointers in mind.

- Targets should be measurable.
- Targets should always be achievable, but challenging to reach.
- There should be times when you don’t meet your targets (hopefully you are close).
- Targets can be adjusted as you go through the process and begin to realize what is appropriate.

Maybe one of the things you identify throughout your food audit is that 65% of the consumers at the cafeteria buy processed food and that the majority of that processed travelled many kilometres to reach the school. You might design a health and environmental awareness campaign at the school educating the population on healthier and less environmentally-damaging options that are available at the cafeteria. This can be done through video, poster, announcements, flyers, classroom visits—basically whatever you think would be effective at your school.

Students could help design new dishes and host taste-testings that also educate consumers on the environmental impacts of the food, alongside the nutritional information.

You also need to identify a way to determine whether this campaign is effective—maybe you take an inventory of what people consume at the cafeteria before, at the middle and again at the end of the campaign, targeting a 20% reduction in the distance food travels before it arrives on plates for consumption.

Perhaps the school is interested in producing a community garden so that more food is locally grown, reducing transportation and therefore emissions. A garden could be run by the multiple classes: culinary tech, biology and nutrition are some examples of curricula where this could easily fit. An online gardening blog could chronicle student experiences. In this case, a target might be to have 5% of the food offered at the cafeteria grown on-site.

Calculating Savings, Costs and Benefits

Calculating costs and benefits made from any of the proposed changes is an essential step. Before we actually implement any changes, people are going to want to see that the change is one worth making. We want to direct our resources to where they are going to be most useful and conducting a cause-effect analysis will help.

Savings don't always have to be financial (although those will usually get the most attention). We can also calculate any environmental benefits such as tonnes of CO₂ avoided, or better dietary choices (which might lead to increased productivity!).

One of the key elements here is going to be the cost benefit/analysis. This allows any decision maker to see the costs and benefits of any proposed change. Where the benefit can be seen in financial terms, we can also calculate how long it will take to pay back the initial investment.

As a simple example, say we invest \$5000 on a school garden, but we save \$10 a day because

we no longer buy as many vegetables for the cafeteria (in a typical growing year), it would take us 500 school days to pay back the initial investment (a little over 2 school years). This doesn't take into account the harder to measure variables like increased nutritional education or stronger communities.

Reduced CO₂ emissions, means lower mitigation costs for climate change (maybe our flood defences won't have to be quite as high). We can usually assign a cost to society for each tonne of CO₂ emitted (although finding the right price is usually difficult).

Consult our project guide on Calculating Savings for more detailed information on these calculations.

Essential Resources

Calculating Savings: The Gaia Project

<http://www.thegaiaproject.ca/sites/default/files/teacher-resources/additional-resources/calculating-savings.pdf>

Marketing Your Findings

Implementing the recommended improvements is the next step. The availability of disposable cutlery or plates at the school may not be in your control, but encouraging students to bring their own containers and providing either a place to wash or store them might be.

Implementing behavioural changes are usually a case of effective marketing. How do you convince people to make a change their way of life? There are a variety of ways to do this.

Quantifying the impact is often useful. Instead of just pointing out that someone's consumer

choices are having negative impacts, actually inform people of the size of their impact can help influence behaviour.

Making people aware of the impact of their decision might be enough. People might know that eating processed food that travelled across a couple of provinces before arriving at the school isn't really good for you or the environment, but may not know why. However, pointing out the negative impact may not be enough.

Social marketing can be effective. People behave in certain ways simply because everyone else does it. Peer pressure can result in a positive change; you are less likely to eat French fries every day if all your friends eat salads and colourful sandwiches. This could be part of an awareness campaign on your life cycle assessment research encouraging peers to consume the healthiest and most sustainable products because it's the most popular and fun option.

Or if one of the goals is to encourage people to bring more food from home, consider hosting cooking classes at the school that teach people how to cook or prepare simple but tasty meals with commonly available ingredients.

Incentives can be another useful tool to cause people to make a change; however, it is unlikely that the incentive can stay in place forever, so people need to see a reason to continue once they have made a change.

All of the changes need to be as easy and as enjoyable as possible for people to respond positively. No matter how often you tell someone what the effect of their choice is, they are unlikely to choose unprocessed foods if all of the processed options taste much better.

Students could design new dishes with locally grown foods for the cafeteria and they could be voted on by the school through a day of taste-

testing. Check out The Fun Theory for some more ideas.

Resources

The Fun Theory

<http://www.thefuntheory.com/>

Measuring Success

As we have said before, you can't manage what you don't measure. And that is still important. Even though you may have already implemented your changes, it is still important to track their performance and see if they are falling below, meeting or exceeding expectations.

This is usually as simple as following the initial measurement process conducted in the audit. You'll be able to track improvements over the years very easily this way and see if your estimates match up with the actual realized improvement.

If they do match – great. You can pat yourself on the back for a job well done and look for more improvements.

If they don't, then it is time to look at why. It is likely due to an assumption you had to make. *Are people behaving as expected? Are as many people taking part as anticipated?*

Looking at how things actually happened compared to your assumptions can assist you in determining whether you could improve the way you estimate, measure and make assumptions in the future.

Ties with other projects

Water Auditing

Part of a food audit could be tied with a water audit at the school by examining how many water bottles are consumed at the school. The impact of these water bottles can be mapped and compared the impact of drinking from the tap.

Regulations surrounding bottled vs. municipal or well water provided at the school could also be compared. This could result in a challenge at the school where people drinking out of the fountain are randomly rewarded in some way for their choice.

To ensure effectiveness, attention should not be drawn to people choosing bottled water but pat those on the back who are making a more sustainable choice like drinking out of the fountain or bringing their own reusable water bottles.

Resources

Water Audit: The Gaia Project

<http://www.thegaiaproject.ca/projects/sustainability-planning/water>

Glossary

Compost

Decomposed organic matter that is recycled for use as fertilizer

Fishbone Diagram

A tool used to identify the root causes of a problem as the first step towards finding a solution.

Waste hierarchy

The classification of waste reduction strategies according to their usefulness: 1. reduce, 2. reuse, 3. recycle.

Table 1. Waste audit of garbage bins in school cafeteria

Sorting Class	Can 1	Can 2	Can 3	Total Weight (kg)	Percentage of Waste (%)
Compostable matter	3.0	1.3	1.0	5.3	27%
Food wrappers	0.5	0.2	0.3	1.0	5%
Wholly uneaten food	1.0	0.4	0.4	1.8	9%
Plastic baggies	0.5	0.6	0.5	1.6	8%
Reusable lunch containers	0.3	0.1	0.0	0.4	2%
Paper plates	2.4	2.1	2.0	6.5	33%
Disposable cutlery and cups	1.5	0.9	0.5	2.9	15%
Total	9.2	5.6	4.7	19.5	100%

Table 2. Inventory of food production and consumption at school

Type of food	Origin	Number Produced	Number Purchased	Serving Weight (g)	Packaging	Preparation
Sandwich	Multiple	100	75	300	10g of plastic wrap	Toasted for 1 minute
Cheeseburger	Multiple	150	80	350	20g paper plate	Grilled for 6 minutes
Fries	Multiple	150	100	200	20g paper plate	Deep fried for 6 minutes
Juice	Toronto, ON	50	50	500	30g refundable bottle	Cooled for an average of 72 hours
Pop	Montreal, QC	30	30	350	20g refundable can	Cooled for an average of 72 hours

Table 3. Inventory of the sub-items/ingredients of a final meal (sandwich)

Ingredient	Origin	Weight per item
Whole wheat bread	Halifax, NS	200
Lettuce	California	20
Tomato	Mexico	35
Cheese	Quebec City, Quebec	35
Mayonnaise	Toronto, ON	10

Figure 2: Life cycle assessment of an egg salad sandwich in a typical school cafeteria

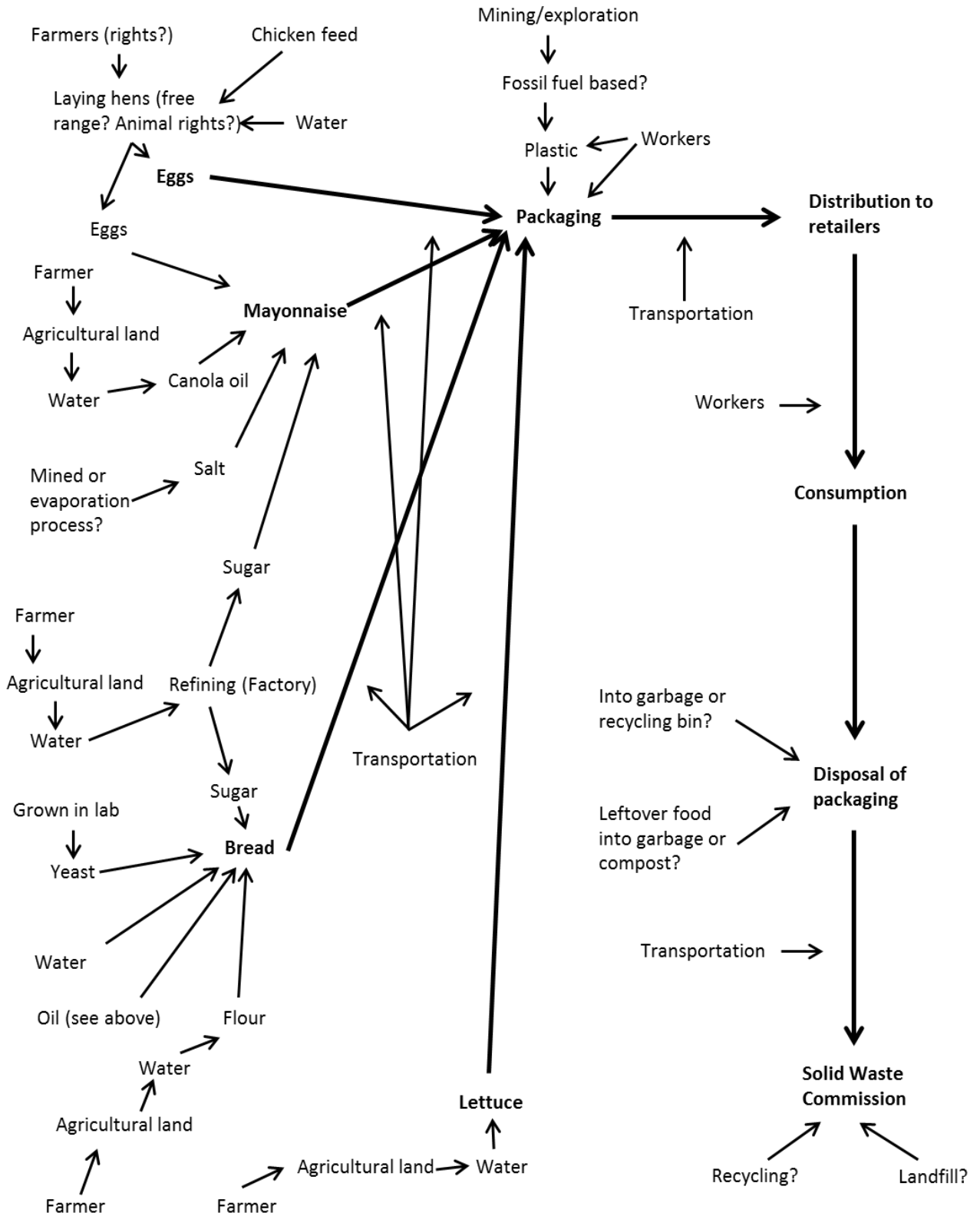


Figure 3: Fishbone diagram for poor nutritional value foods being offered at school

