

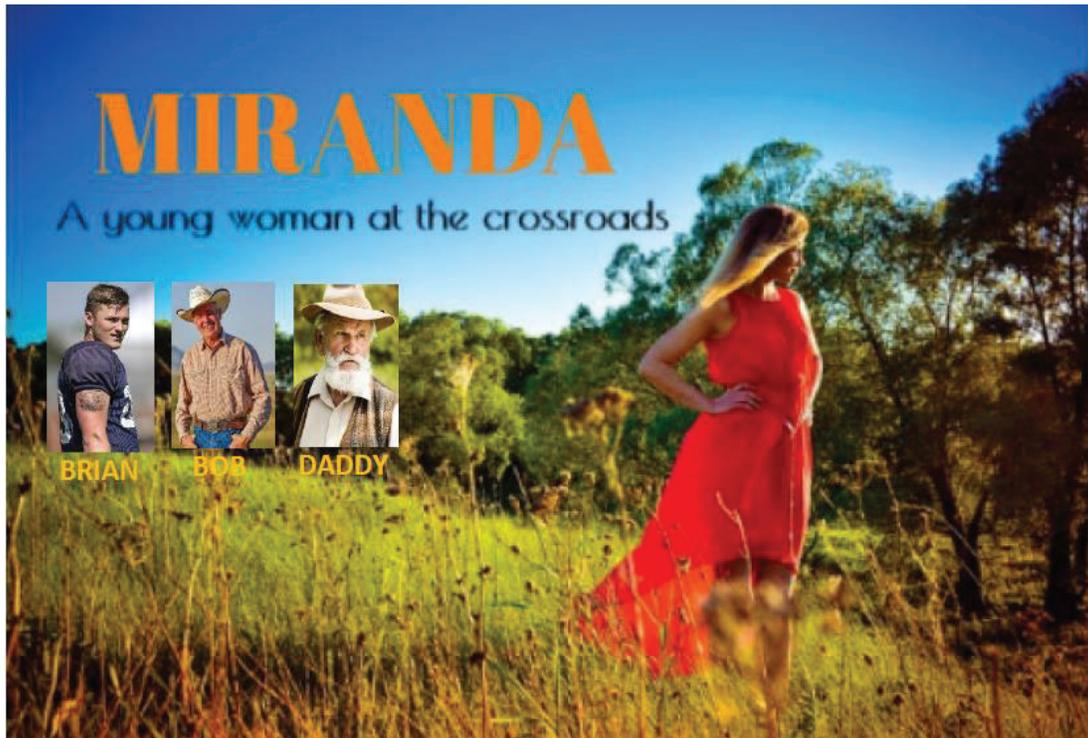
# Big Sandy, Montana: Built on Sand or Food? (Module 1) Student Handouts

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## BIG SANDY – INTRO STORY



### **INTRO**

*Miranda stares, horrified, at her former professor.*

*“Have you decided what you want to do now that you’ve graduated with a degree in Sustainable Food Systems?”*

*She’s still in her graduation gowns, having just sat through the commencement ceremony. Her father is standing behind her and she can feel him staring holes into her back. A third-generation wheat farmer, her father is very proud of his only child with a university degree coming back home to Big Sandy. All of her siblings have already decided to leave Big Sandy, leaving her widower of a father all alone. However, Miranda is no longer sure if that’s the career path she wants to take.*

*Miranda looks over to her friend, Brian -who has found a job in Bozeman, and feels jealous. She always told her friends that her plan was to return to Big Sandy, but now that the prospect is here, she isn’t sure if it’s the right plan. Miranda had grown used to Bozeman, where it is very different than Big Sandy. Bozeman has what Big Sandy lacks: a thriving youthful population, outdoor activities, and clothing shops and bars. Big Sandy, on the other hand, has 571 inhabitants (a 7% decline since 2011), where 35% of the*

*inhabitants earn less than \$20,000 per year, and almost a third did not attend high school. Also, most households lack access to internet. No wonder that young people tend to abandon the community (Figure 1). The median age in Big Sandy is consequently elevated, 51 years.*



*Figure 1: Main Street, Big Sandy, MT. Not a place that offers many young people prosperity.*

### **MIRANDA TAKES A DECISION**

*After extreme peer-pressure from her father, Miranda has decided to move back to Big Sandy. Her goal is to make a positive change to the community through sustainable farming practices. However, if she is not successful in 5 years, she will get her Masters in Las Vegas.*

*But Big Sandy needs a lot of help. It is an agricultural town in the so-called golden triangle of Montana, the main crops in the region are: wheat, hay, barley, lentils, safflower, durum wheat, chickpeas, and dry peas, where the climate is semi-arid. A 2018 survey showed that health, employment, education, and housing are the most serious concerns in Big Sandy. For 40% of the people, access to affordable food is an issue, despite the*

*fact that most residents work in agriculture. Additionally, 78% of the households include at least one person without health insurance.*

*While there are certainly economic, social, and environmental barriers to farming sustainability in Big Sandy, there is light at the end of the tunnel: Bob Quinn. Bob Quinn*



*Figure 2: Bob Quinn has proved that farming has a future in Big Sandy.*

*(Figure 2) was raised on a family-operated wheat and cattle farm in Big Sandy. He studied botany at Montana State and gained a PhD in plant biochemistry at UC Davis. He returned to Big Sandy in 1978 to take over the conventional family farm; in 1984, he started selling organic wheat and acquired a flourmill; in 1985, he sold his cattle to focus on diversified cropping; and by 1989, the entire farm was organic. When the demand exceeded the supply, Quinn began buying and marketing wheat from surrounding farms. Then, he started to produce Khorasan wheat, an ancient relative of durum wheat.*

*Quinn sells it successfully under the brand Kamut.*

*Today, over 2000 Kamut products, produced by 250 organic farmers in Montana and Canada, are sold globally.*

*Quinn is also an innovator and experiments with long-cycled crop rotations. Currently, he produces and presses enough safflower oil to supply the food service at the University of Montana. Additionally, he runs all the machinery on his farm with the used oil. In 2019,*

*his first book was published. 'Organic farming made me a better farmer because I'm forced to really study what's going on with my fields (...). And it is more fun than conventional agriculture', said Quinn in a recent interview.*

### **MIRANDA ASKS FOR HELP**

*Miranda realizes that if she wants to accomplish her goal of revitalizing her community through a sustainable food system, she will have to do some research analysis. She is dedicating her first year in Big Sandy to research. She decides to reach out to her former professor to ask: How do we revitalize Big Sandy in a sustainable way through the food system?; How can I identify the community stakeholders and their relationships?; Finally, what do I need to do to base my plans on concrete facts?*

### **YOUR TASK**

Educate yourself on Big Sandy and the four areas of sustainable food systems. Your goal is to design a research project Miranda could use to help her revitalize Big Sandy through a sustainable food system.

## Sample Concept Map

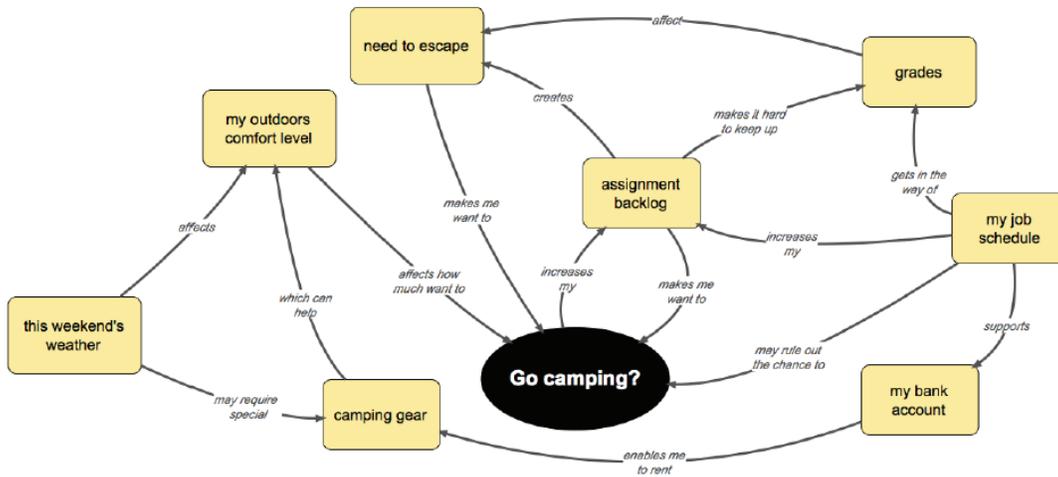


Figure 1: Concept map that addresses the question “How will I decide if I should go camping with my friends this weekend?”

- The main question is shown prominently in the large black oval near the center.
- Each node (oval or rectangle) either has an arrow leading into it or out of it.
- There are no “unconnected” nodes.
- the arrows are labeled with verb phrases (action phrases) that describe the relationship between the two connected nodes.

### Reference

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## Agriculture in the Golden Triangle of Montana

The "Golden Triangle" is an area of Montana known for intensive grain production. It represents a large part of north-central Montana. The actual Golden Triangle is limited by the cities of Havre, Conrad and Great Falls (Figure 1).



Figure 1: Geographic Area Map of Montana, including the wider Golden Triangle Area.

- The climate is semi-arid. Dryland crops predominate the agricultural landscape.
- Most parts of the Golden Triangle, including Big Sandy, are part of Hardiness Zone 3b. Smaller areas belong to the zones 3a or 4a.
- In Big Sandy, the average temperature is 7.35° C and the annual precipitation is 341 mm (Figure 2).
- For the mid of the 21<sup>st</sup> century, Montana summers are predicted to be warmer than today, with daytime high temperatures across the state averaging 28.8° C (now: 25.4° C), while the precipitation is predicted to remain constant or decrease slightly.
- The soils in the Golden Triangle are widely deep, loamy, and well-drained, also known as Scobey soils. They formed in glacial till. The A-horizon, 15 cm thick, is made of clay loam texture and has a dark grayish-brown color. The B-horizon (150 cm) is more clayey in its top sub-layer and then again clay loam in the lower parts.
- History: During the Homestead Era, thousands of farmers settled in the region on false pretenses a favorable climate. They obtained 160-320 acre parcels. After the drought years of the 1920s, many of them left, while the remaining farmers increased their farm size. By 1950, the average farm size had increased to almost 2000 acres.
- Today, there are less than supported 5000 farms covering over 14 million acres, which results in an average size of approximately 2,800 acres.

- (Both, winter and spring) wheat is the most important crop. Apart from modern varieties, some producers seed heritage-varieties. Despite annual fluctuations, the Golden Triangle produces wheat on more than 2,4 million acres (> 970 000 ha), where winter wheat grown on 60% of the area. The total annual wheat production is > 90 million bushels (2.4 million t).
- Some of Montana's wheat is milled locally, but most of it is shipped out of the state and exported to Asia.
- Wheat production is usually part of crop rotations including legumes, oil seeds, and alternate fallow years.
- Barley is the second most important crop in the Golden Triangle. It is produced on around 500 000 acres (> 200 000 ha), followed by lentils on 250 000 acres (> 100 000 ha). Other important crops include (alfalfa) hay, safflower, durum wheat, chickpeas, and dry peas.
- Livestock agriculture is less important than in other parts of Montana.

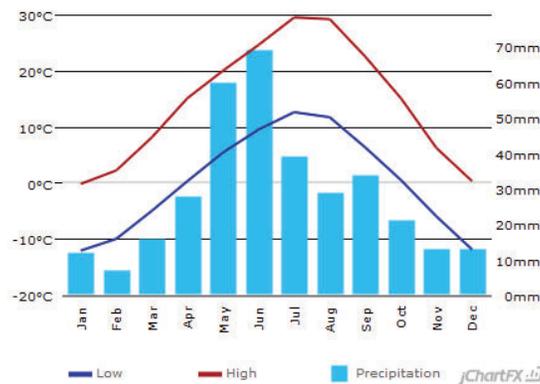


Figure 2: Climate diagram (monthly high/low temperature and precipitation), Big Sandy, MT.

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**Appendix: Key numbers, agriculture in the Golden Triangle** (Montana Department of Agriculture & USDA National Agricultural Statistics Service, 2019)

**Census of Agriculture: Number of Farms, Land in Farms, & Average Farms Size, by County – Montana: 2007 & 2012**

County & District	2007			2012		
	Number of Farms	Land in Farms (Acres)	Average Size of Farms (Acres)	Number of Farms	Land in Farms (Acres)	Average Size of Farms (Acres)
Blaine	655	2,930,605	3,558	546	2,204,248	4,037
Chouteau	849	2,277,842	2,583	774	2,071,771	2,677
Glacier	625	1,700,179	2,720	602	1,570,323	2,609
Hill	854	1,697,232	1,987	802	1,597,982	1,992
Liberty	299	904,327	3,025	304	897,946	2,954
Phillips	556	2,006,068	3,608	507	2,066,540	4,076
Pondera	542	944,486	1,743	505	956,635	1,894
Teton	770	1,152,691	1,497	742	975,173	1,314
Toole	428	1,115,019	2,605	423	1,128,523	2,668
<b>North Central</b>						

**Winter Wheat: Acreage, Yield, & Production by County & District – Montana: 2016**

Counties & Districts <sup>1</sup>	Area Planted (Acres)	Area Harvested (Acres)	Yield (Bushels/Acre)	Production (Bushels)
Blaine	80,100	76,800	55.4	4,256,400
Chouteau	403,500	399,500	58.7	22,650,000
Glacier	86,500	84,500	42.5	3,595,000
Hill	313,300	308,300	49.7	15,322,000
Liberty	175,900	174,800	48.5	8,478,000
Phillips	38,400	37,400	52.0	1,943,800
Pondera	94,000	93,700	62.1	5,820,000
Teton	100,200	100,000	61.2	6,119,000
Toole	117,400	116,900	41.6	4,861,800
<b>North Central</b>	<b>1,409,300</b>	<b>1,391,900</b>	<b>52.5</b>	<b>73,046,000</b>

**Spring Wheat: Acreage, Yield, & Production by County & District – Montana: 2017**

Blaine	155,000	145,000	18.5	2,677,000
Chouteau	168,000	157,000	25.9	4,063,000
Hill	239,000	236,000	29.7	7,000,000
Liberty	101,000	100,000	27.7	2,767,000
Phillips	94,500	75,800	16.9	1,280,000
Teton	63,000	52,800	35.7	1,885,000
Toole	134,000	133,600	21.4	2,865,000
Other	114,500	112,000	30.5	3,412,000
<b>North Central</b>	<b>1,059,000</b>	<b>1,012,000</b>	<b>25.6</b>	<b>25,949,000</b>

**Barley: Acreage, Yield, & Production by County & District – Montana: 2016**

Blaine	20,000	15,500	49.4	765,000
Chouteau	80,000	78,000	53.4	4,165,000
Glacier	81,000	74,000	47.1	3,488,000
Hill	29,000	28,000	57.3	1,605,000
Liberty	23,000	22,500	51.3	1,155,000
Phillips	34,000	13,000	62.3	810,000
Pondera	99,000	98,000	70.0	6,864,000
Teton	104,000	101,000	72.2	7,295,000
Toole	76,000	70,000	39.7	2,776,000
<b>North Central</b>	<b>546,000</b>	<b>500,000</b>	<b>57.9</b>	<b>28,925,000</b>

**Lentils: Acreage, Yield, & Production by County & District – Montana: 2016-2017**

Blaine	(D)	(D)	(D)	(D)
Chouteau	26,300	25,500	920.0	235,000
Glacier	21,800	21,600	980.0	212,000
Hill	56,600	54,100	900.0	488,000
Liberty	38,600	38,600	800.0	309,000
Phillips	29,200	28,300	630.0	179,000
Pondera	19,100	18,700	930.0	174,000
Toole	23,000	23,000	1,020.0	235,000
Other	39,400	37,700	580.0	217,000
<b>North Central</b>	<b>254,000</b>	<b>247,500</b>	<b>830.0</b>	<b>2,049,000</b>

# Big Sandy, Montana

- County: Chouteau County
- Inhabitants: 571 (93% white, 3% Native Americans, 4% others)
- Area: 1.14 km<sup>2</sup>
- Average temperature: 7.35° C
- Annual precipitation: 341 mm
- Unemployment rate: 3%
- Median household income: \$36,000
- Agriculture: Predominantly dryland wheat in monocropping systems
- Number of grocery stores: 1
- Number of churches: 4
- Attractions: Big Bud 747, the world's largest farm tractor; Big Sandy Historical Museum
- Notable people: Jon Tester, senator; Bob Quinn, organic farmer and businessman

## Outlook: Agriculture in Montana

Montana has experienced a period of economic growth during the last decade. Though a rural state, Montana's jobs are clustered around seven scattered urban regions, providing 72% of the state's jobs (Figure 1). Farming is considered a low-pay (-10% since 2009) and low-growth (-5%) sector of Montana's economy.

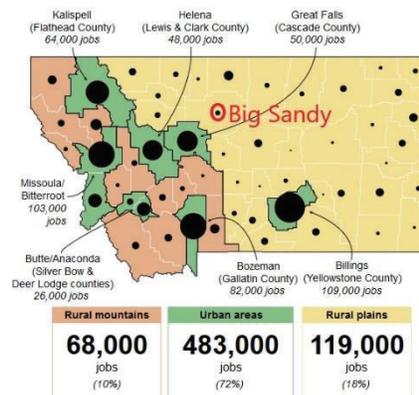


Figure 1: Montana, jobs per county 2016.

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## Sustainability Index Handout

Sustainability Dimension	Dimension Component	Score
<b>Human Health</b>		
Human Health	The ingredients in the food product are nutritious / nutrient dense and contribute to dietary quality (based on Dietary Guidelines)	
Human Health	This food product takes a holistic approach to promote overall health (based on ethnomedical / ethnonutritional perspectives)	
Human Health	The ingredients in the food product contribute to dietary diversity (include ingredients that are not in top most consumed foods nationally)	
Human Health	The ingredients in the food product are safe with no / low chemical and pesticide residues (ex: GRAS, Organic certification etc)	
Human Health	The ingredients in the food product have relatively low overall calories and / or can be consumed as part of a diet with limited energy consumption	
Human Health	The ingredients in the food product do not consist of ultra-processed foods and foods high in added sugars	
Human Health	The ingredients in the food product are mostly plant-based	
Human Health	The ingredients in the food product have no meat or a relatively low portion of meat as percentage of the total food product	
	<b>Total Human Health Sustainability Score</b>	<b>0</b>
<b>Ecological</b>		
Ecological	This food product includes ingredients that are sourced locally or regionally	
Ecological	This food product includes ingredients that are in season (locally in season at time of assessment)	
Ecological	This food product includes ingredients that are sourced from vendors that use sustainable agricultural practices (have no / low agrichemical pesticide, herbicide and fertilizer input) and / or sustainable harvesting practices	
Ecological	This food product includes ingredients that are sourced from diversified farming systems (crop genetic diversity and species diversity) and / or promote biodiversity (prevent deforestation) and ecosystems	
Ecological	This food product includes ingredients that are sourced from production, distribution, and preparation methods that use green, sustainable, or	

Ecological	This food product includes ingredients that are sourced from production methods that protect wetlands, watersheds, and water quality	
Ecological	This food product includes ingredients that are sourced from production, distribution, and preparation methods with relatively low GHG emissions	
Ecological	This food product includes ingredients that are sourced from production vendors that prevent soil degradation and contamination while building	
<b>Total Ecological Sustainability Score</b>		<b>0</b>
<b>Economic</b>		
Economic	The food product can be purchased through direct marketing options	
Economic	The food product contributes to local farm incomes and livelihoods	
Economic	The food product contributes to low food waste (ex: the whole plant is used)	
Economic	The food product has minimum packaging	
Economic	The food product is affordable	
Economic	The food product supports local food enterprises and sustainable food networks such as farmers' markets, CSAs (community supported agriculture), Food Hubs, and Cooperatives	
Economic	The food product does not require high energy food storage (ie cold chain items) or high energy preparation (ie microwaves)	
Economic	The ingredients in the food product do not include detrimental food advertising to children	
<b>Total Economic Sustainability Score</b>		<b>0</b>
<b>Social</b>		
Social	This food product promotes family, community, cultural and / or traditional values	
Social	This food product supports food sovereignty, food rights and / or food justice	
Social	This food product includes ingredients that support equitable labor conditions	
Social	This food product includes ingredients that support animal welfare	

Social	This food product is desirable from a taste perspective (sensory attributes are pleasing)	
Social	This food product is desirable based on personal, cultural, and traditional preferences	
Social	This food product is linked to emotional value (feels goods, brings back memories)	
Social	This food product contains ingredients that are accessible in the local built food environment (ie supermarkets, ethnic food stores, farmers markets)	
	<b>Total Social Sustainability Score</b>	<b>0</b>
	<b>TOTAL SUSTAINABILITY SCORE</b>	

#### Scoring System

0 = Absence or unknown

1 = Low presence

2 = High Presence

\*Each Sustainability Dimension has a total of 8 categories

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# Developing A Research Question

1. To begin, what broad topic, issue, or problem are you interested in?  
It's always easier to begin broadly and then narrow your topic down.
2. What specific part of the topic are you interested in?  
Break the topic apart into different parts. Think of how your topic interacts with the different dimensions of sustainability – health, environment, economics, and social/cultural.
3. List some questions you may have about the topic.  
How? Why?
4. Choose one question to focus on.
5. Make your question as clear, concise, and specific as possible.  
Clarify any vague words. Specify as much as possible and make sure your question is feasible and measurable.
6. State your hypothesis.  
Create a fact-based hypothesis, answering your research question.

## Research Agenda Template

Date	Stage	Method	Activities	Analysis	Products
Aug 1 2019, – Sep 1, 2019	I, Empiric data	Quantitative, survey	Survey (n= 30) within the community of Big Sandy, including multiple-choice, and likert-scale questions; randomized sample; experimental and control group	One-way ANOVA Parameters: XXX	One chart per parameter; document: interpretation of charts