PROJECT
FRESH

by

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APPROVAL

of a thesis submitted by

Matthew David Aune

This thesis has been read by each member
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Brittingham, John (committee chairperson)

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ABSTRACT

Project FRESH is about creating a sustainable food system for our future. It is the goal of this project to design a large scaled environmentally controlled farm. The vision of this farm is to relieve many of the social and environmental stress that arise out of our current food systems. Furthermore this book is a compilation of research that investigates the problems and solutions that pertain to our modern food system.

The first part of the book is research that expresses the current issues that exist with our food system today. This research will state and elaborate on the problems for which Project FRESH is attempting to combat.

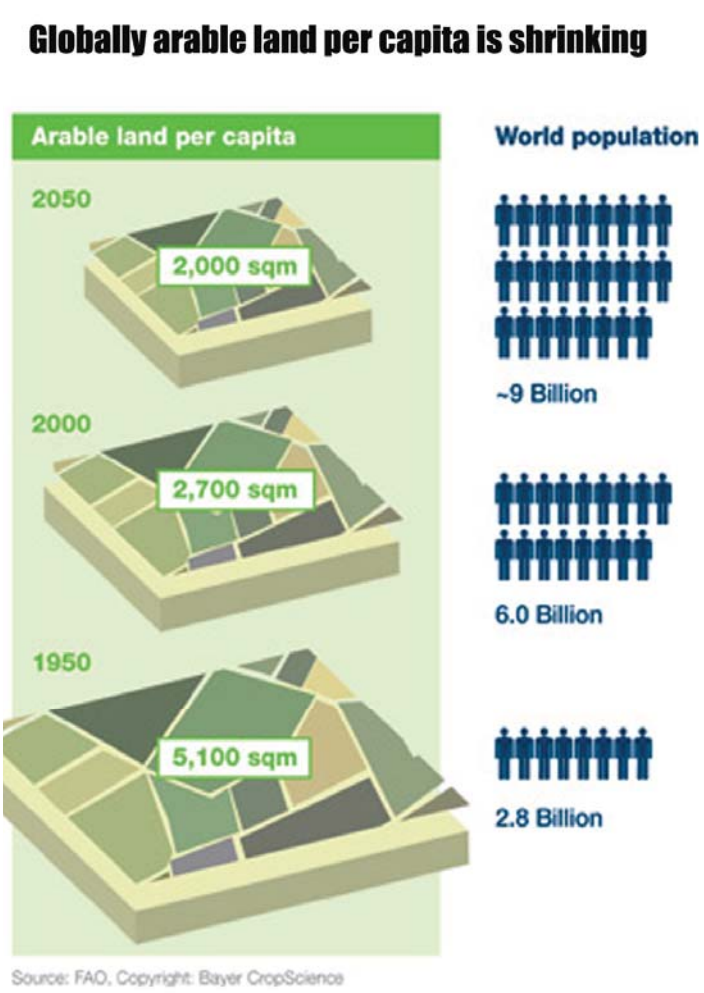
The second part of this book is the design proposal for Project FRESH. The design goal of this project is to create a fresh perspective on agriculture and its connection to the city. Creating a symbol for our future that patches agriculture back into our cities urban fabric. This symbol is to express the importances of locally grown food and its impact not only on the environment but its overall social and health benefits as well.

FRESH

Agriculture may be single most important invention of human kind. It has become a catalyst for human population growth. Agriculture has without a doubt give mankind the fuel to not only survive but to thrive and advance at a startling rate. It took the unsophisticated hunter gatherer and turned him/her into a sophisticated city dweller in around 10,000 years.(1) Yet the production of agriculture has come with many consequences. As you will soon find out, our current agricultural practices cannot sustain our future needs.

FOOD FOR THOUGHT

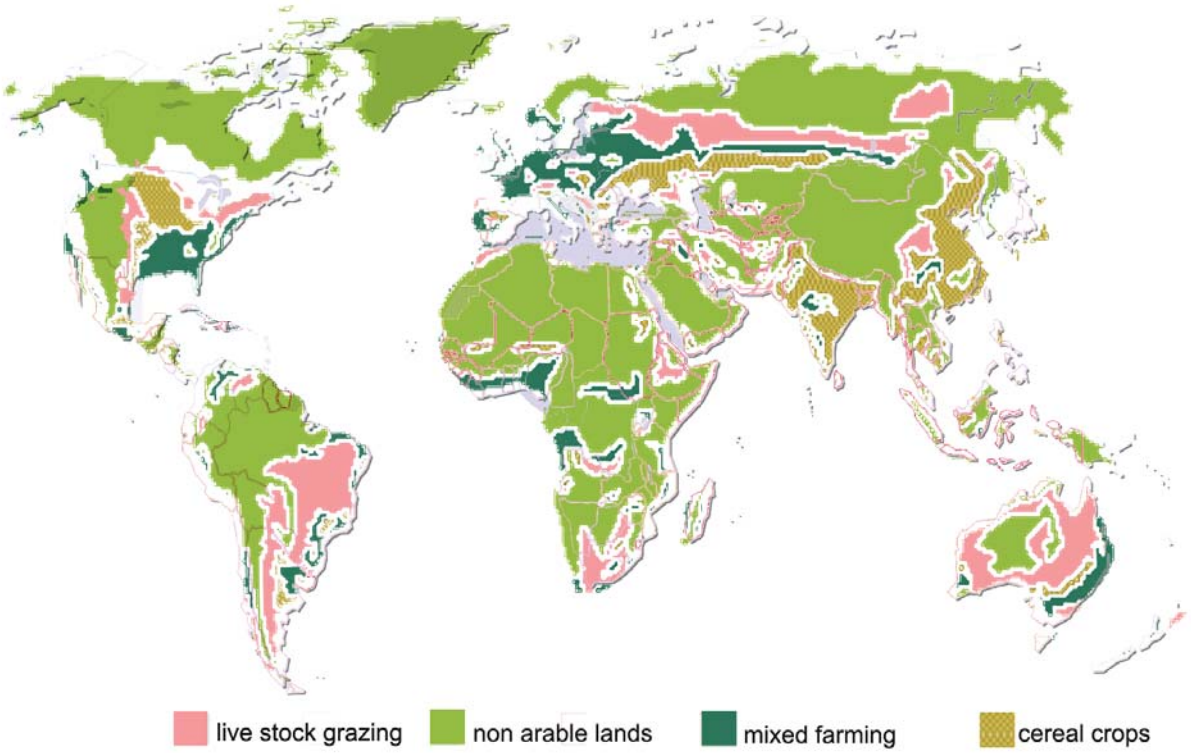
Agriculture has historically taken a toll on our environment. For example, it didn't take mankind long to compromise his/her earliest farmlands on the floodplains of the fertile crescent between the Euphrates and Tigris rivers around 10,000 years ago.(1) These lands were depleted because of poor land management and over irrigation that lead to devastating erosion. Agriculture still suffers from many of the same problems that it did over 10,000 years ago. Although technologies have advanced and new means and methods have been applied; farming still has many inadequacies pertaining to environmental impacts. Today, our farming practices are still causing massive soil erosion issues, the loss of trees due to logging and slash burning (that aid in carbon sequestration), the use of chemical fertilizers (that leach into water tables), agricultural runoff which is the combination of the above problems that pertain to water system contamination, and the overall embodied energy it takes to farm today is staggering.(1) These issues with farming today are causing global impacts because of the shear amount of farmland needed to sustain our current population. There are around 800 million hectares put aside for soil based farming world wide (fig 1.1) , this is roughly 38 percent of the earth's dry land. (2) This large amount of farm land has reorganized, reduced, and compromised many natural ecosystems along with putting a huge strain on water resources



worldwide (fig 1.2). Along with the inherent destructive force of agriculture, there is the inevitable growth of the human population. This growth will not only put a enormous strain on the existing farm land but with an estimated population growth around 9 billion people by 2050 there will simply not be enough farm land to support this large population.(1) Furthermore the current agricultural systems that sustains our everyday life's must be reconsidered. A solutions is needed, this solutions must not only provide commodities (food,jobs) but give back to the environment as well. Yet before this solution can be realized we must first understand the problems that plague us today.

fig 1.1

Existing Agricultural Zones

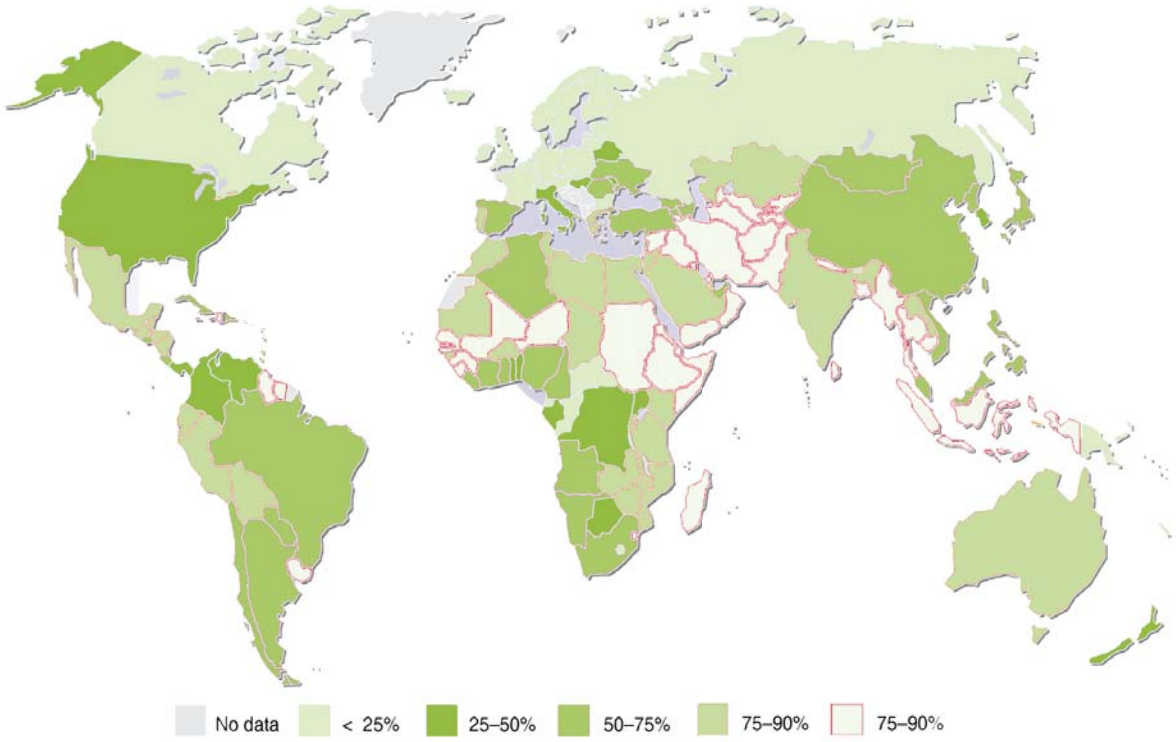


SOURCE: FAO, Aquastat, 2007

IAASTD/Ketill Berger, UNEP/GRID-Arendal

fig 1.2

proportion of water withdrawal for agriculture 2001



SOURCE: FAO, Aquastat, 2007

IAASTD:Ketill Berger, UNEP/GRID-Arendal

TODAY'S FOOD

Today much of the world buys food at supermarkets; eating strawberries from Australia, grapes from Chile, green beans from Kenya and drinking bottled water from Canada.(7). This traveling food creates much more of an impact than one would think: the environmental and social impacts increases with each mile food travels.(7)

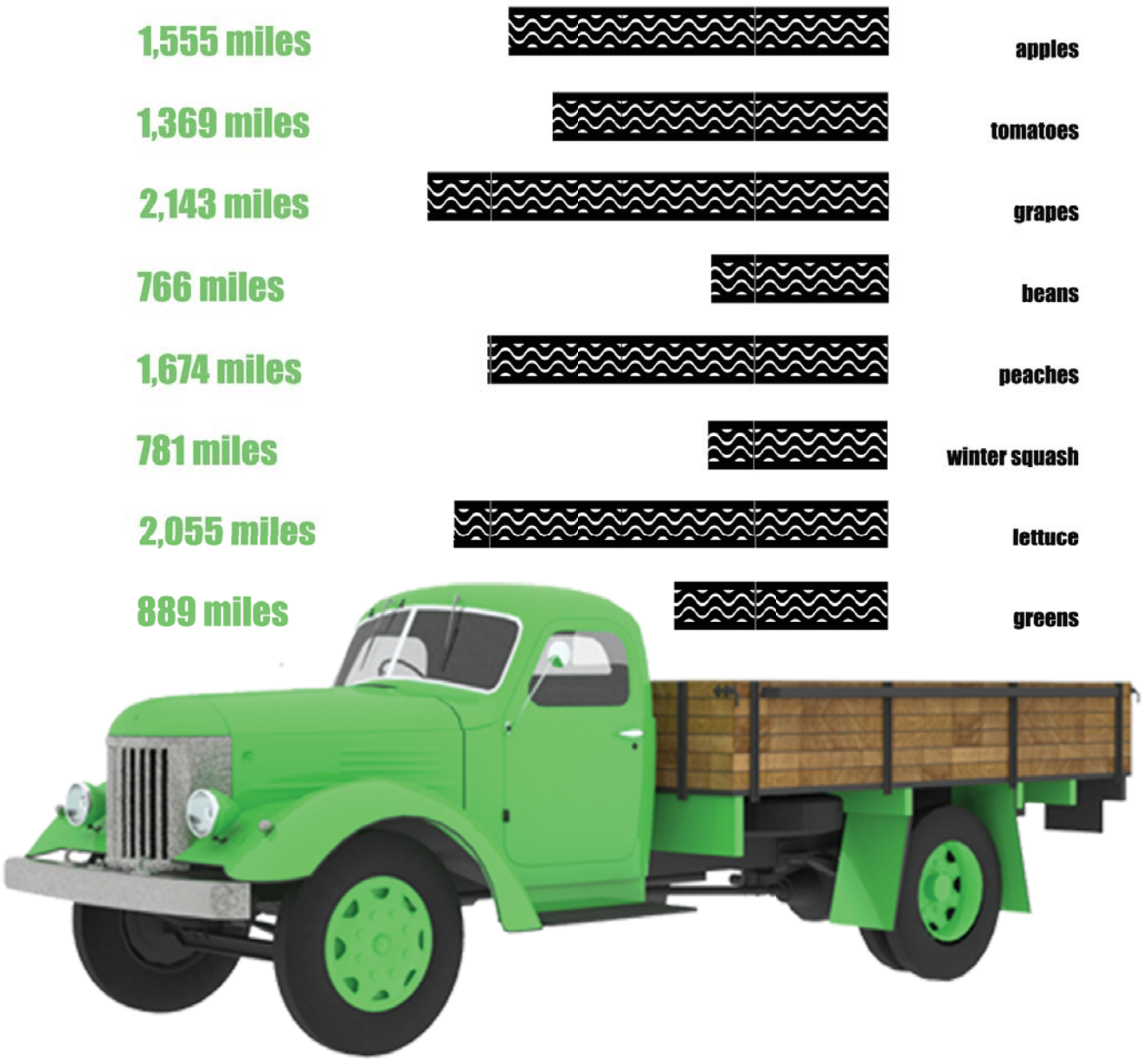
As food makes its journey to a local supermarket it not only has an environmental impact in the way of transportation, but this traveling food directly affects the manner in which the food is grown.(7) The globalization of food has forced farmers to put more pressure on crop land. For example, an increase in irrigation and large amounts of pesticides and other agro chemicals have added to pollution and is sucking our planet's fresh water dry.

In addition, the distancing of our food causes a psychological distancing between the consumer and the producer. This distancing renders the consumer incapable of understanding the implications of their food buying decisions.(7) This misunderstanding leads to further abuses to the landscape and to the farmers. This abuse may not be as acceptable if it were occurring closer to home.

As this investigation of traveling food continues it will examine some of the environmental and social impacts food presents as it makes its way around the glo be.

TODAY'S FOOD

AVERAGE DISTANCE FOOD TRAVELS



Food leaves foot prints as it travels. Aside from the inherent impact of agriculture on the landscape, the transportation of food is one of today's most recognizable problems.

The first and most important issue of traveling food is the environmental impact. These environmental impacts are not only in the form of embodied energy, but the nature of our global superstore has put extra and unnecessary strain on the local farming environments. (7) For example large farming regions have been converted into large industrialized cash crops. These cash crops must be highly productive to keep up with world wide demands, which inevitably lead to heavy fertilizing and pesticide use. This chemical abuse not only leaches into the near by water supply, but can make the crops vulnerable to disease and pests, which can quickly become immune to agro chemical use.(7) Large cash crops also take away from the local traditional farming that was in place to feed local people with a wide variety of foods. It is this decentralization of our food that has become one of the biggest issues in agriculture. This decentralization has increased the impact of the transportation of our food; it has become a large environmental problem in today's world. It has been calculated that the average meal in America travels over 1,500 miles from farm to table.(8) Why is this number so scary?

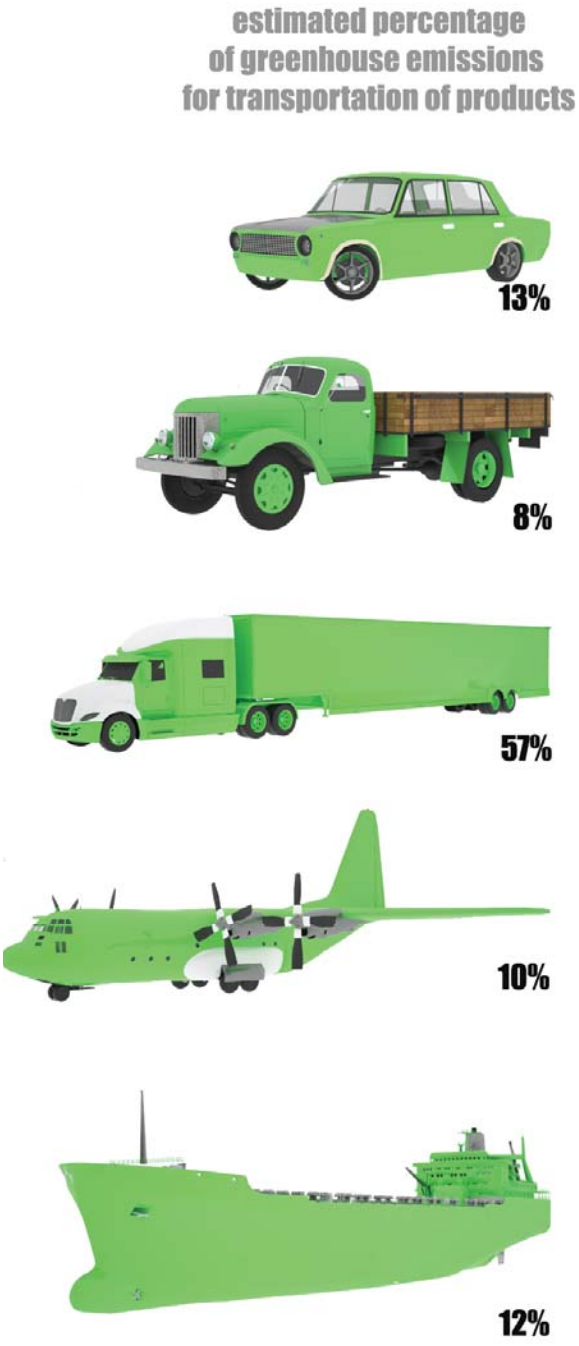
Foremost, the amount of fossil fuels that are used to transport

THE EMBODIED ENERGY OF BREAD FROM FARM TO RETAIL CENTER. A DETAILED BREAK DOWN OF THE FUEL COST OF A STANDARD WHITE LOAF OF BREAD. FERTILIZERS AND TRANSPORT ACCOUNT FOR NEARLY 38 PERCENT OF THE TOTAL EMBODIED ENERGY.

food is astronomical. This fuel is burned in trucks, trains, planes, boats and any other food transportation vehicles. These vehicles emit many of the green house gasses that may be causing our climate to change. This diversity of travel makes it difficult to make exact calculations of the fuels and embodied energy that transportation accumulates, but it is understandably exorbitant. It is estimated, too, that we place over 10kcal energy into the transportation of our food while only receiving 1kal energy from the food itself, and over 38 percent of most products embodied energy is chewed up in the transportation and transportation related issues. (8) Because food travels so far, it is completely unsustainable. For example much of the food we

consume today is transported by planes. These planes are close to 40 percent more damaging than sea freight.(7) However, it is the transportation of food by heavy truck that is the most wasteful and damaging. Even though much of our food comes from overseas, the problem of traveling food is much closer to home. The distance that food has to travel causes many other environmental problems other than just the damage done by the burning of the fossil fuels. Because food has to travel so far the processing, packaging, and chemical use has increased, in turn impacting the environment even further.

Processing food is not only an unhealthy alternative but an environmental unfriendly way to produce food. Processing

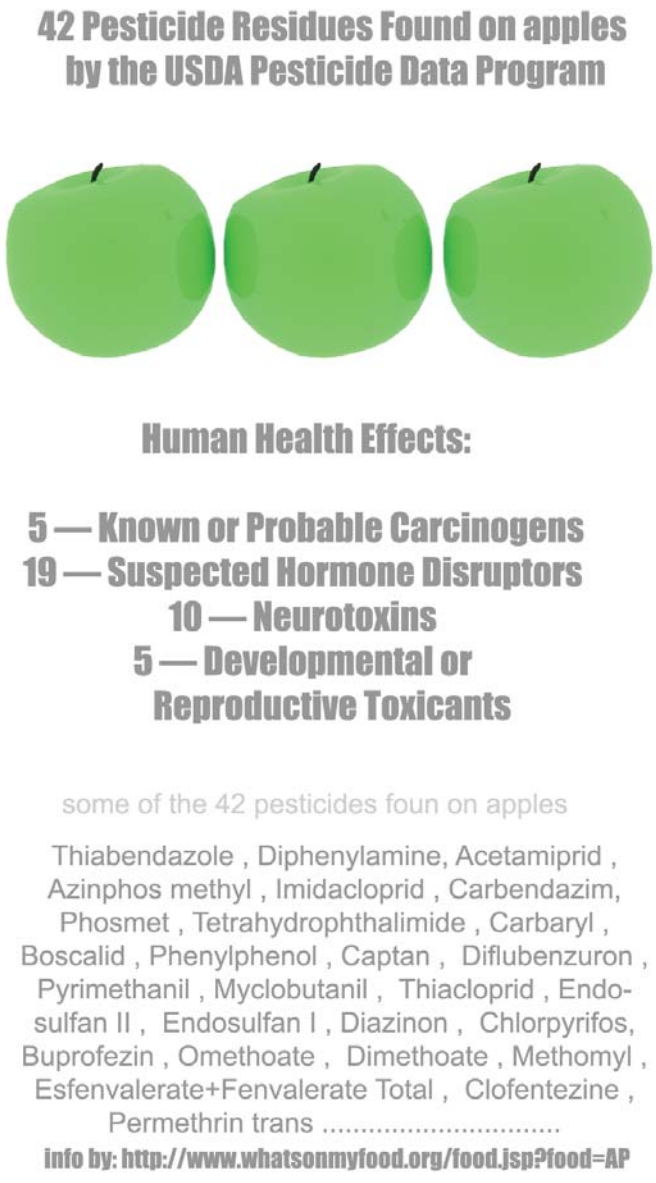


food is very energy intensive. It is estimated to take ten times the energy to process the raw ingredients than to grow the raw ingredients. Processed food will more often than not travel much further than most foods. This is because all of the ingredients to process the food are first shipped to the plant and then shipped back out to supermarkets. This processing has become popular because food needs to a have a long shelf life and most importantly survive the long journey as it makes its way to our stores. Another important and wasteful part of processing food is the packing of that food.(7)

Packaging allows food to travel longer distances as well as adding marketing value to sell the product. Yet packing is a very wasteful by product of traveling food. There are as many as four different layers to packaging. Layer one, the packaging on the food it self. Layer two, comes in the form of cases or boxes. Layer three, transportation packaging such as crates, and layer four, the bags or boxes used to carry the product home.(7) This packaging creates an astounding amount of waste. Waste Online reported that households in the UK accumulated enough packaging waste to outweigh around 245 jumbo jets. And yet, this vast amount of packaging still does not protect many food products completely on their long journey.

Pesticides and agro chemicals are often times needed to extend the life of food.(7)
Pesticide and agro chemicals are just another issue with traveling food. Not only are they needed to keep production at a high rate, they are applied after the harvest to preserve the food during transportation.(7) These chemicals not only pollute our water supplies they can contaminate our food directly. Many produce labels urge people to peel and or wash the product thoroughly before eating. In addition, health issues linked to pesticides range from birth defects and childhood brain cancer in the very young to Parkinson's' Disease in the elderly. There are a variety of other cancers, developmental and neurological disorders, reproductive and hormonal system disruptions, linked to pesticides. (9)

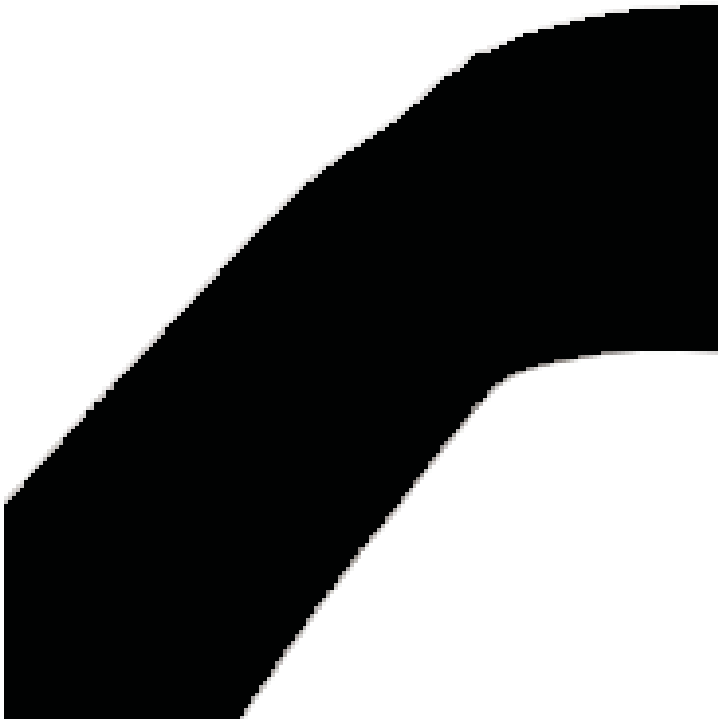
A second issue with traveling food is the social disconnectedness of people and their food. This disconnect is what has led to many of the environmental problems stated earlier. Many consumers really have no understanding of where their food comes from or of the people who cultivate it.(7) This was not always the case. When the U.S. was an agrarian nation, food production was either subsistence based, or people traded goods for food. This created a direct and personal relationships between people and their food.(10) However, as our culture and economy has become larger and more specialized; professionals like butchers, bakers, and brew-



ers, buy produce from farmers and then sell it to consumers--moving the consumer and the farmer a little farther apart. This social removal obviously has not decreased. In farming this removal is easy to see. Slowly the small independent family farms would be replaced with family corporations, which would eventually be replaced with large corporately controlled production based farms.(10) The small corner grocery stores were replaced by regional supermarkets that would eventually evolve into national and world wide chain super-centers. (10) This separation between producer and consumer is important because it is at the root of many of today's problems not only with food but many other goods.

Many consumers have no clue where their Big Mac or home cooked Thanksgiving Dinner came from or what their shopping decisions in the supermarket have on their communities and the world. Many farmers are frustrated because they have to destroy or hinder the productivity of their land as well as put a great deal of strain on the natural environment just to keep food cheap and readily available.(10) These farmers also feel they must value economic and consumers requirements before just about anything else--before their morals, families, communities, and the landscape they hold dear. The agricultural community wants to coexist with nature, not destroy it. Yet they cannot in our competitive, overpopulated and disconnected world.

So as our food travels the globe it slowly compromises it. A solution is needed, a solution that connects us back with our food. This solution would need to bring food closer to home and eliminate many of the environmental issues that plague our agriculture today.



As our world grows smaller and smaller each day so does the room for our food production. Some would say conservation and they would be correct. Yet there are many who would say that is not enough. We need more than conservation we need an alternative. Project FRESH is that alternative. FRESH has long term viability for food production as well it creates a positive environmental impact. Taking agriculture once again to improve mans situation not add to it. FRESH is a new perspective on agriculture for our future.


FRESH

project FRESH

Project FRESH is a project that intent is to create a sustainable food system for our future. The goal of this project is to design a large scale community farm system. The vision of this farm system is to relieve many of the social and environmental stresses that arise out of our current food systems.

The design goal of this project is to create a fresh perspective on agriculture and its connection to the city. Creating a symbol for our future that patches agriculture back into our cities urban fabric. This symbol is to express the importance of locally grown food and its impact not only on the environment but its overall social and health benefits as well.

This goal will be met by creating programmatic elements that will create a synergy between local educational and cultural institutions. For this reason project FRESH will be located on the Montana State University campus in Bozeman, MT. This site provides a great deal of proximity's that this system requires. These proximity's are very important to this project. These proximity's include accesses to a great deal of parking, the students and professors that will be operating and maintaining the farm, potential agriculture test sites, is adjacent to the only other tall buildings in the city of Bozeman and most importantly the campus provides a ready consumer of large quantities of produce.

This multi-faceted and synergistic program will be implemented through phases. The reason for this phasing expresses the acknowledgment that Project FRESH is not a silver bullet so-

GOALS

Creation of new jobs

Year round crop production

Food is grown organically

Returns farm land to native land

Functions off the grid

Reduces fossil fuel consumption

(transportation, tractors, fertilizer)

Better control over quality of food

Creates a cultural center

Cleans black and grey water

Produce potable water through

evapotranspiration

Uses up to 90% less water

lution. It will take many phases and collaborations to make it a reality. By phasing this project we can begin to enhance existing farmers markets and community supported agriculture programs or CSA's while still working towards a more radical and necessary solution for our future.

Phase One-
will focus on the local and rapidly increasing desire for farmer's market's and CSA programs. These programs are not only wanted in Bozeman, they are a nation wide desire that must be taped into if we are to start this new farm system. CSA's and farmer's markets are an integral step towards creating a sustainable food system. This is why phase one of FRESH will create a new venue for Bozeman's farmers markets. This venue will not only be a simple

12,500 sq ft semi-conditioned space with an 13,000 sq ft programmed exterior space the. Furthermore it will include many of the programmatic elements needed to expand the ideals of a sustainable food system. It will also be the new preparation and distribution home of an existing local CSA program run at MSU. Towne's Harvest Garden is a program that is run by faculty and students. This group is all about raising awareness about local foods and encourages sustainable lifestyles on campus and in the community. The main goals of this pavilion and its formal and programmatic responses were derived from working with this group. Those goals and responses are thus.

EDUCATING THE PUBLIC ABOUT THE IMPORTANCE OF LOCAL FOOD.

This educational component will be facilitated by elements of the pavilion. Starting with the structural elements of the pavilion. These elements not only hold the building up they provide places for passive educational strategies like, posters and signs. This structure also designates and organizes the spaces for the food growers and the buyers. Active strategies will also be part of this education. For example the pavilion will act as a test frame for solar, thermal, and any other performance based panel. This on site display will allow the public to learn and see what the impacts of these sustainable systems can have on the environment. This frame also becomes a testing place for commercial and campus education based research. This first phase will also have test sites designated to researching low tech farming and

gardening strategies. These sites will allow the public and the students working in them to learn about these strategies and how to implement them. Another important part of educating the public is teaching them how to prepare and make healthy food choices.
In response to this there will be an indoor space with cooking and demonstration capabilities.

CREATE A PLACE FOR THE PREPARATION, PROCESSING, STORAGE, AND DISTRIBUTION OF LOCAL PRODUCE.

A place for the preparation, storage, and distribution of local produce is a very important programmatic element of this project. This allow's the growers to produce more food than they could previously. In the past the growers only had the ability to grow relatively an amount of food that they could sell in a week end at the farmers market. FRESH will now allow those growers to produce more because of the processing and storage facility. This facility will allow for an increased amount of local food to be produced and stored for consumption. Inevitably the hope would be that because of this program it would become more profitable for these growers to grow local food, this in turn increasing local food consumption and decreasing the amount of food shipped to Bozeman. This program will include a 1000 sq ft cold storage unit, a 7,800 sq ft large flexible space used for the preparation, processing, and distribution of local produce.

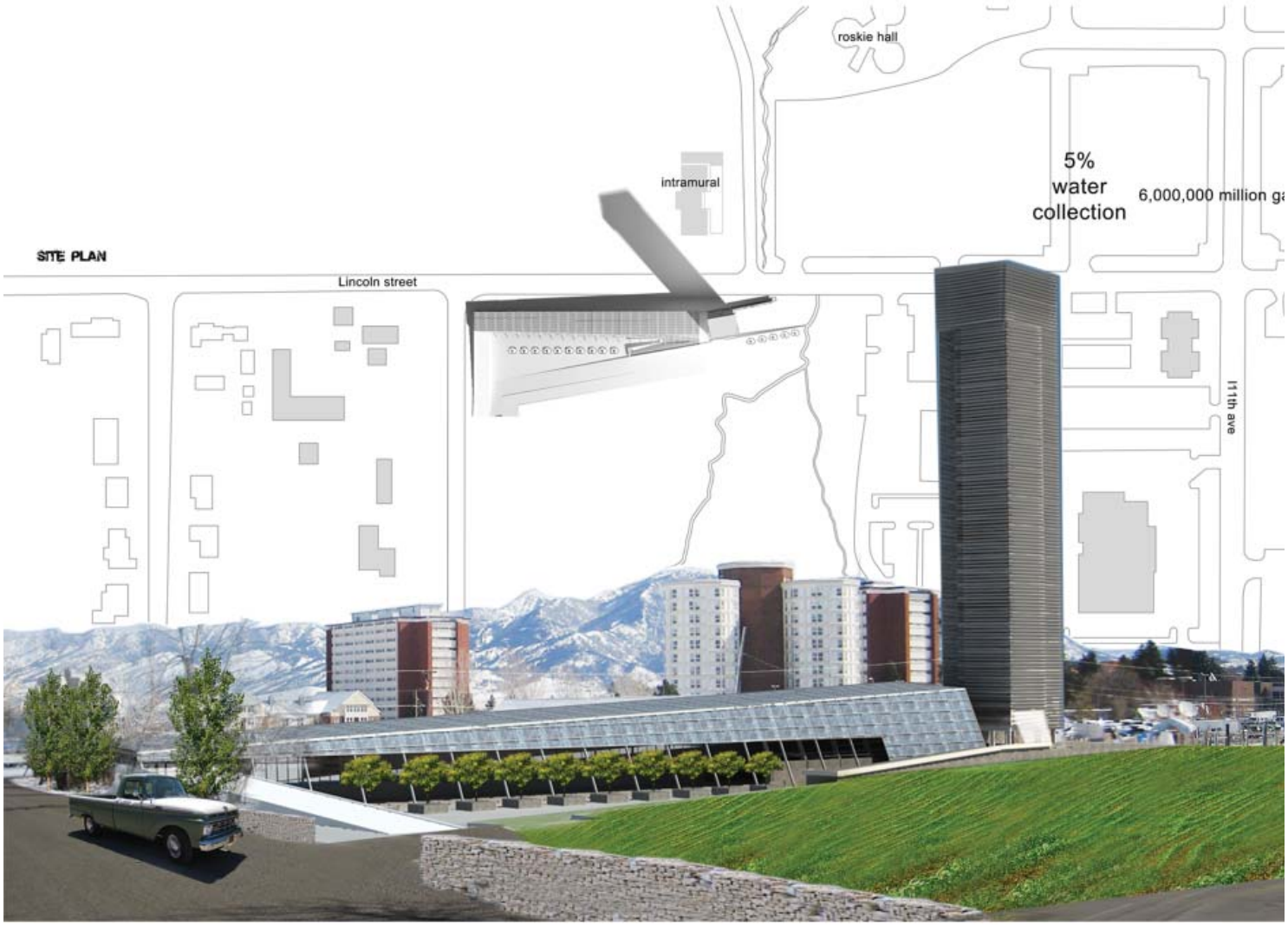
Phase Two-
of project FRESH creates a new and contemporary place

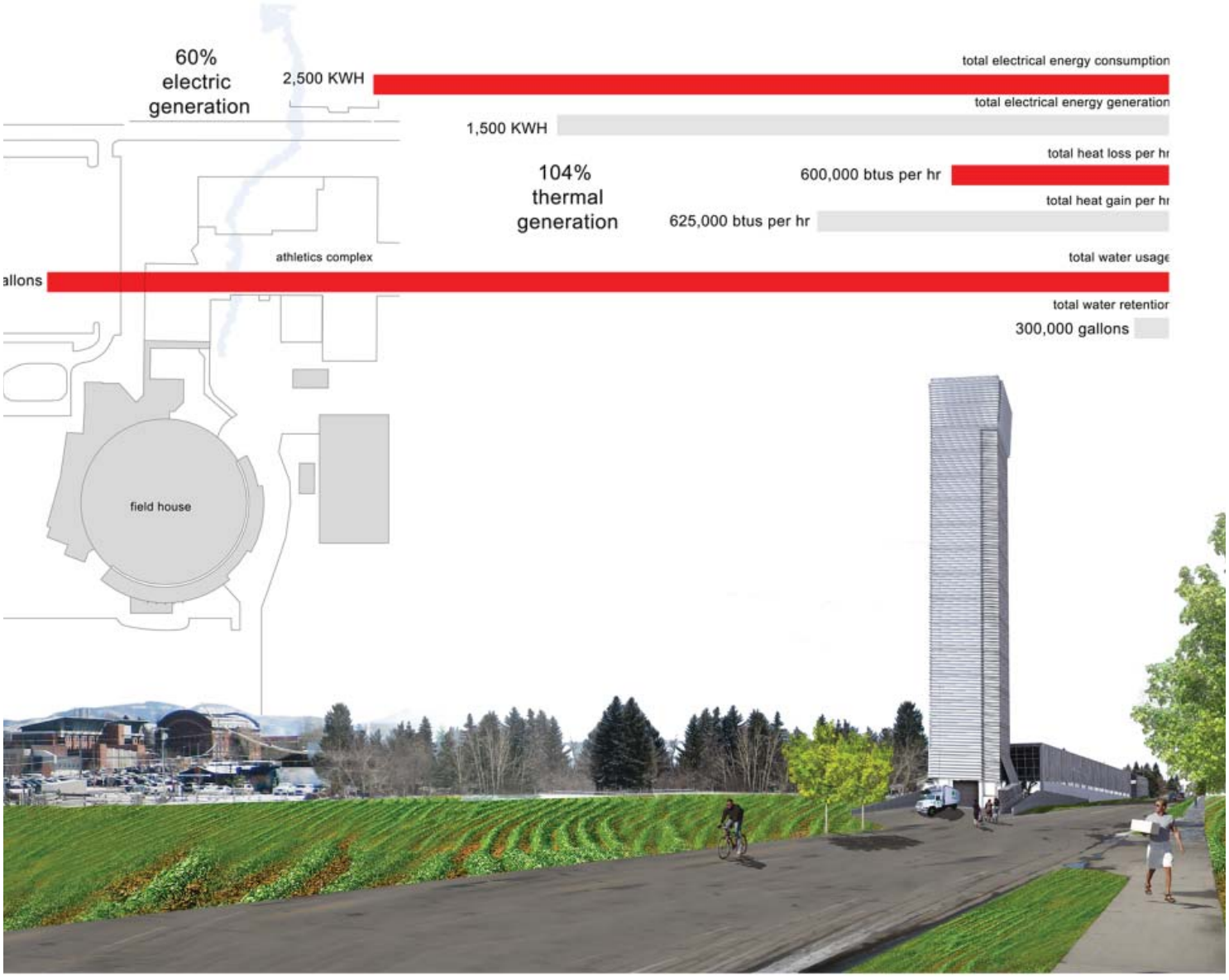
for the advancement of agricultural and building technologies. This phase will create a synergy between the existing want and need for local food production, and environmental responsibility with the technological research that Montana State University can provide to make that goal a reality. This step towards a sustainable food system combines not only current practices but will research advanced solutions as well. Programmatically this phase will encompass a myriad of spaces. These spaces will include a 4,500 sq ft large laboratory , where students and professors will study subjects like plant genetics, hydroponic techniques, alternative energy sources, and many other exciting new technologies. Around 1,000 sq. ft. of administration and office space will also be provided for the individuals who will run these laboratories and production spaces. Coinciding with the research component, this phase will have an extended educational component. This component will comprise of 2,000 sq ft of exhibition space. This space will be used to present not only the findings of phase two but provide a stage to showcase the importance of project FRESH and local foods systems. Phase Two will not only create a connection to our food system and our environment, but will create new and exciting jobs. Learning opportunities will be extended to students from varying departments. This phase will also be reinforced by phase one, for phase one already set in the frame work for testing spaces for both building technologies and agricultural test beds. Inevitably Phase Two will spawn the technologies and understanding to make the

end goal of this project(a large scaled community farm system) a more probable reality.

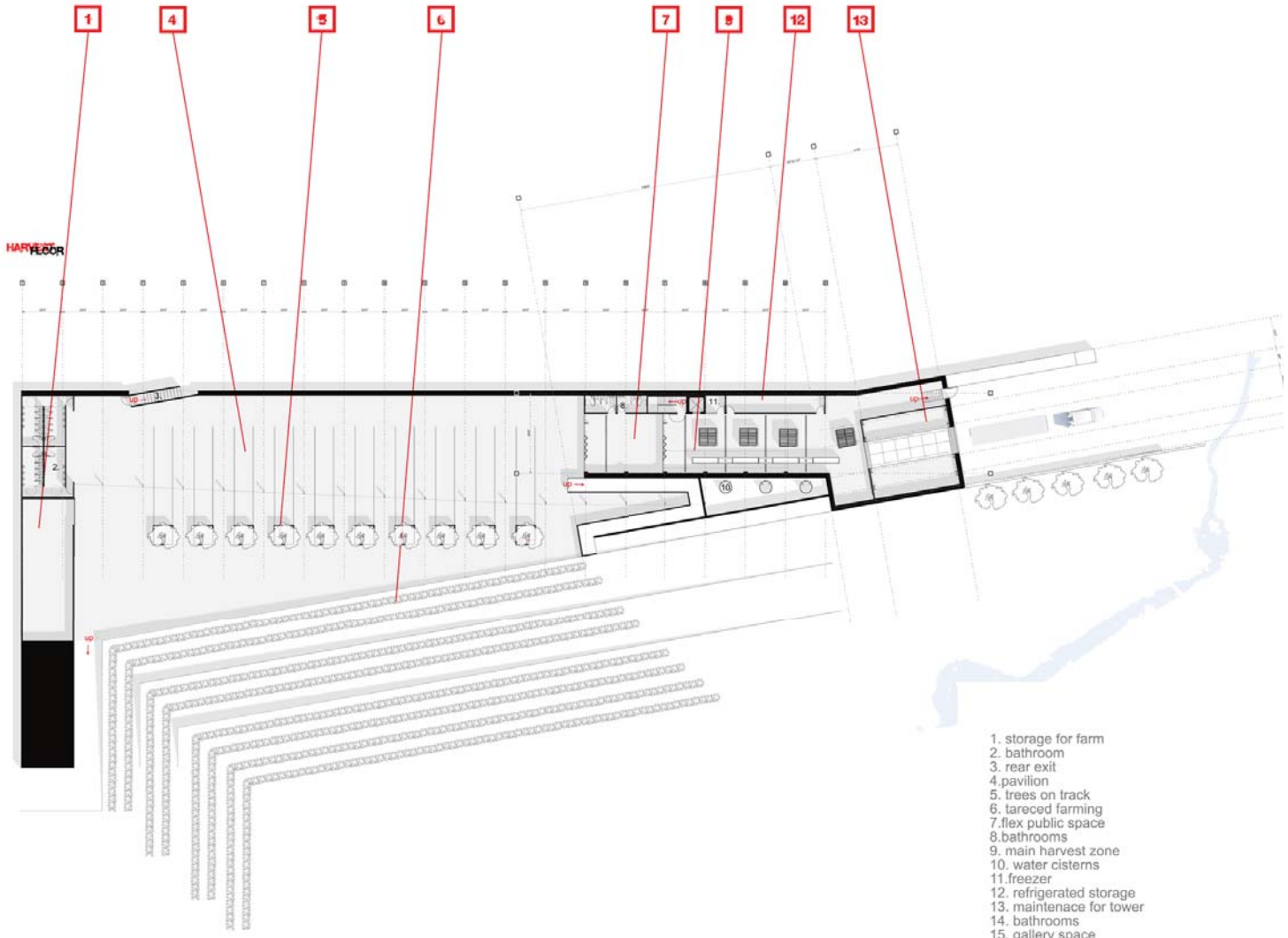
Phase Three-
is the combination of the first two phases. This phase in connection with the pervious phases will epitomize the idea of a sustainable food system. Although it will not be at a scale that can feed the entire city, it will without a doubt make a substantial impact both locally and globally. This phase is the implementation of the large scale environmentally controlled vertical farm. This farm is a prototype system that works at a great deal of scales but the it is not hard to see the great benefits that project FRESH will have.
For example, we could expect to see year round crop production, significantly less water use, and a cultural impact that would not only enhance the social structure but the health of Bozeman as well. Furthermore, if Project FRESH were to be successfully carried out it could become the model for our future. Creating a prototype that could become a cultural catalyst for sustainable food, enhancing the health of cities, lowering the environmental impact of food and eventually be used as a conservation tool that could give back horizontal farmland to long lost ecosystems.

DESIGN RESPONSE



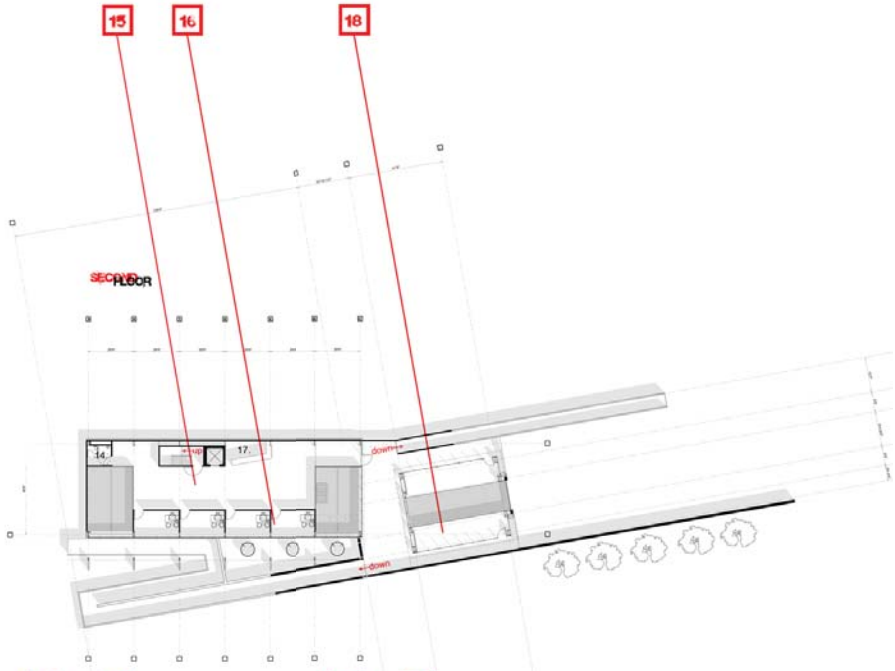

60%
electric
generation
2,500 KWH
total electrical energy consumption
total electrical energy generation
1,500 KWH
total heat loss per hr
104%
thermal
generation
600,000 btus per hr
total heat gain per hr
625,000 btus per hr
athletics complex
total water usage
allons
total water retentior
300,000 gallons
field house

FLOOR PLANS



1. storage for farm
2. bathroom
3. rear exit
4.pavilion
5. trees on track
6. tareced farming
7.flex public space
8.bathrooms
9. main harvest zone
10. water cisterns
11.freezer
12. refrigerated storage
13. maintenace for tower
14. bathrooms
15. gallery space
16. offices
17. reception desk
18. maintenance for tower
19. bathroom
20. storage
21. main lab space
22. grow rooms
23. grow pods
24. fire escape
25. lift
26. composit wall
27. water tanks
28. lift top
29. vertical turbines
30. maintenance space

FLOOR PLANS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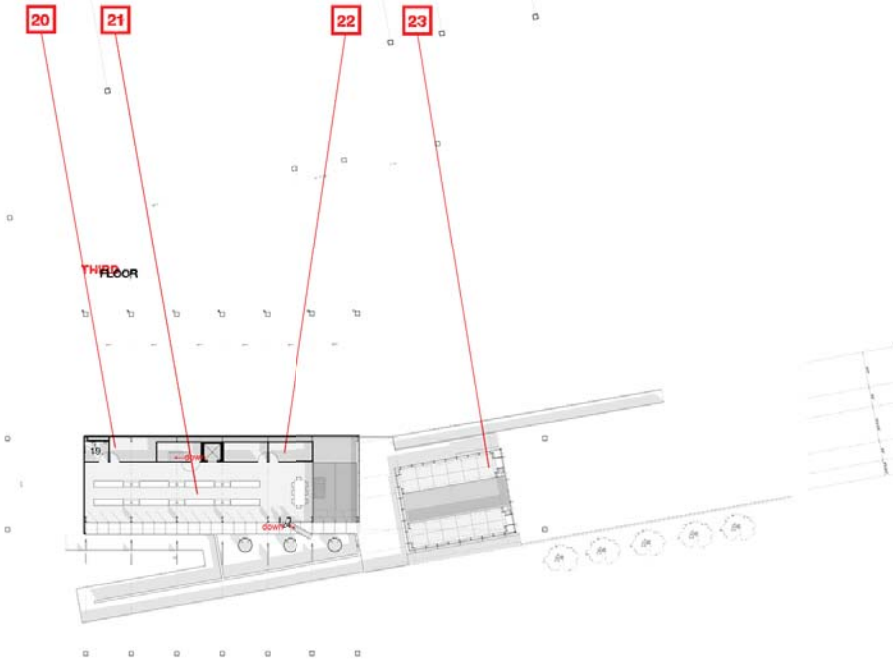
16
18
SECOND FLOOR
14
17
down
down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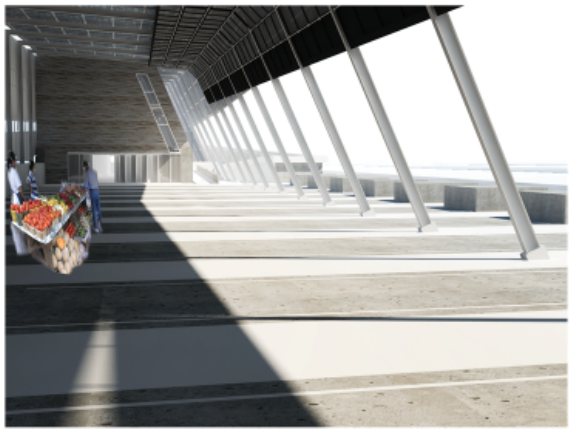
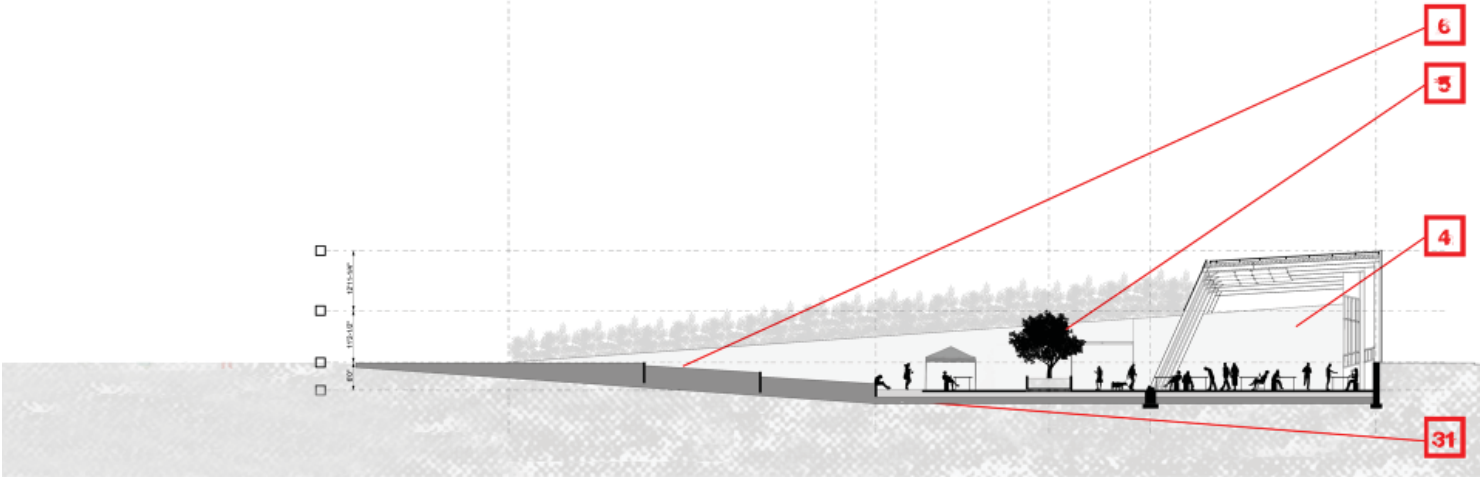
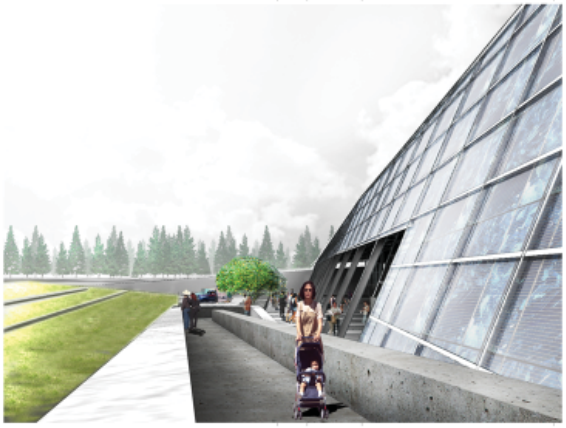
21
22
23
THIRD FLOOR
19
down

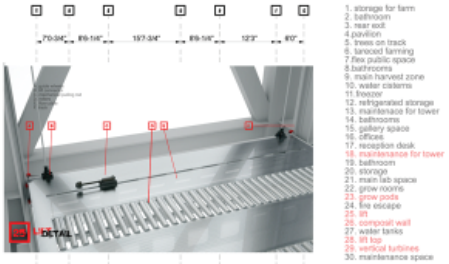
SECTIONS
&
PERSPECTIVES

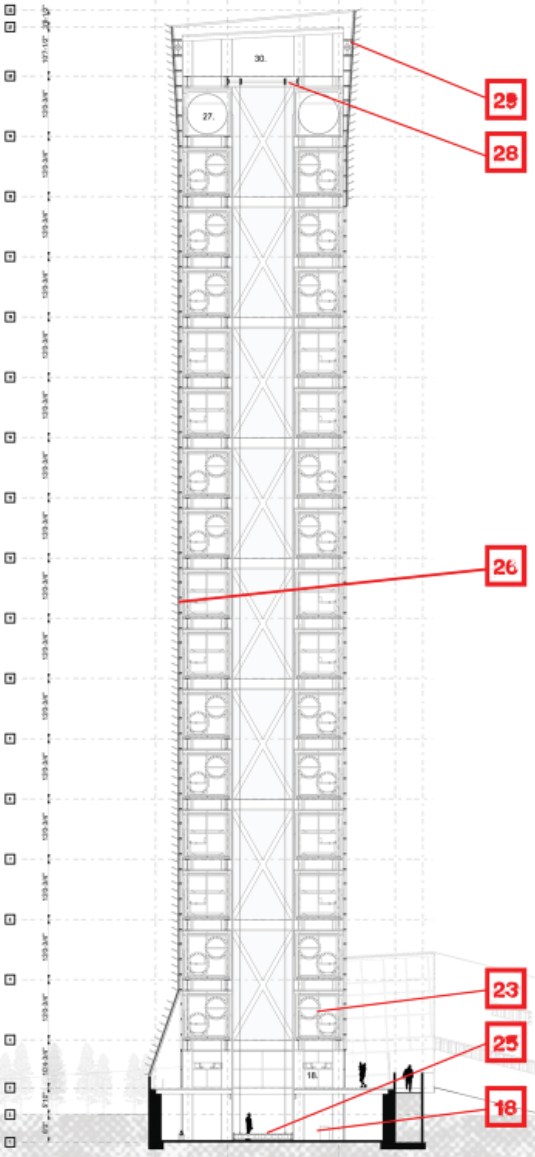


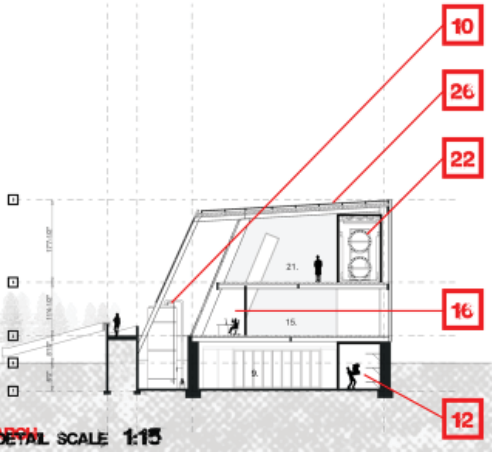


SECTIONS
&
PERSPECTIVES





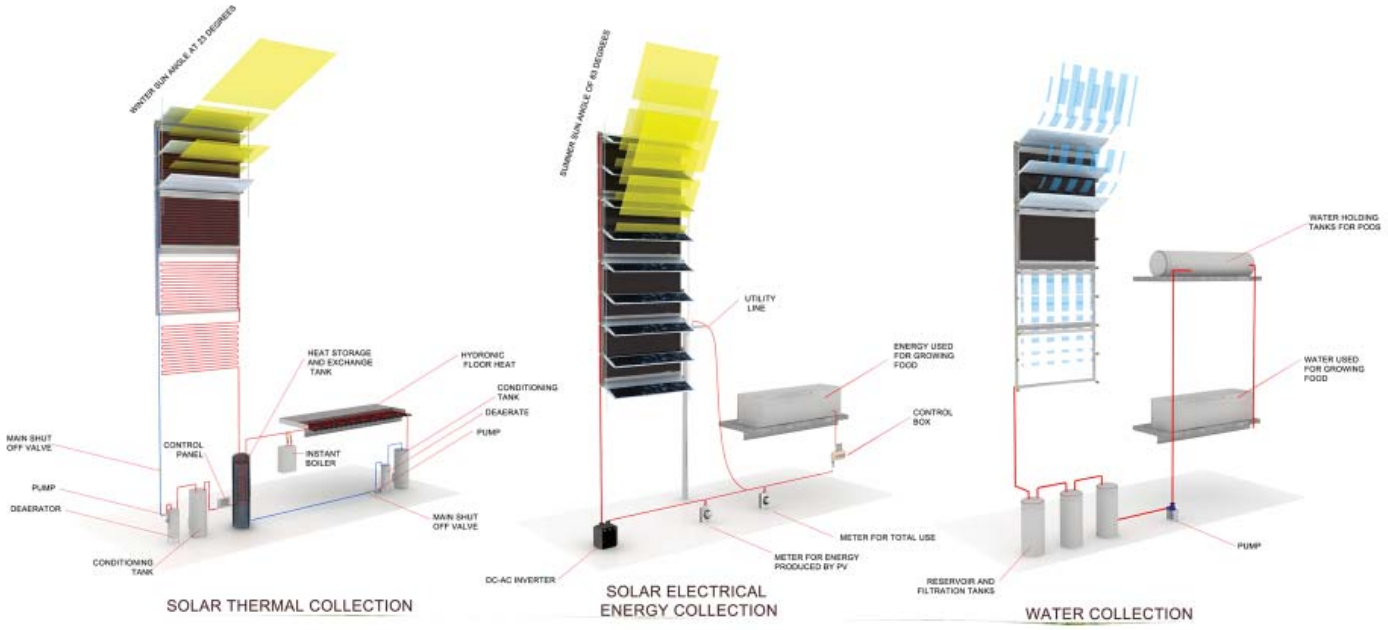




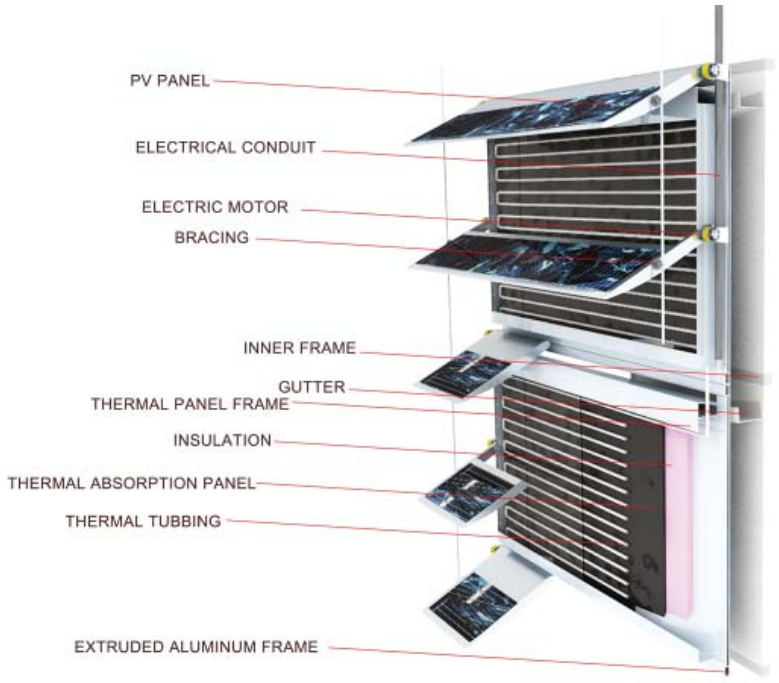
RESEARCH DETAIL SCALE 1:15

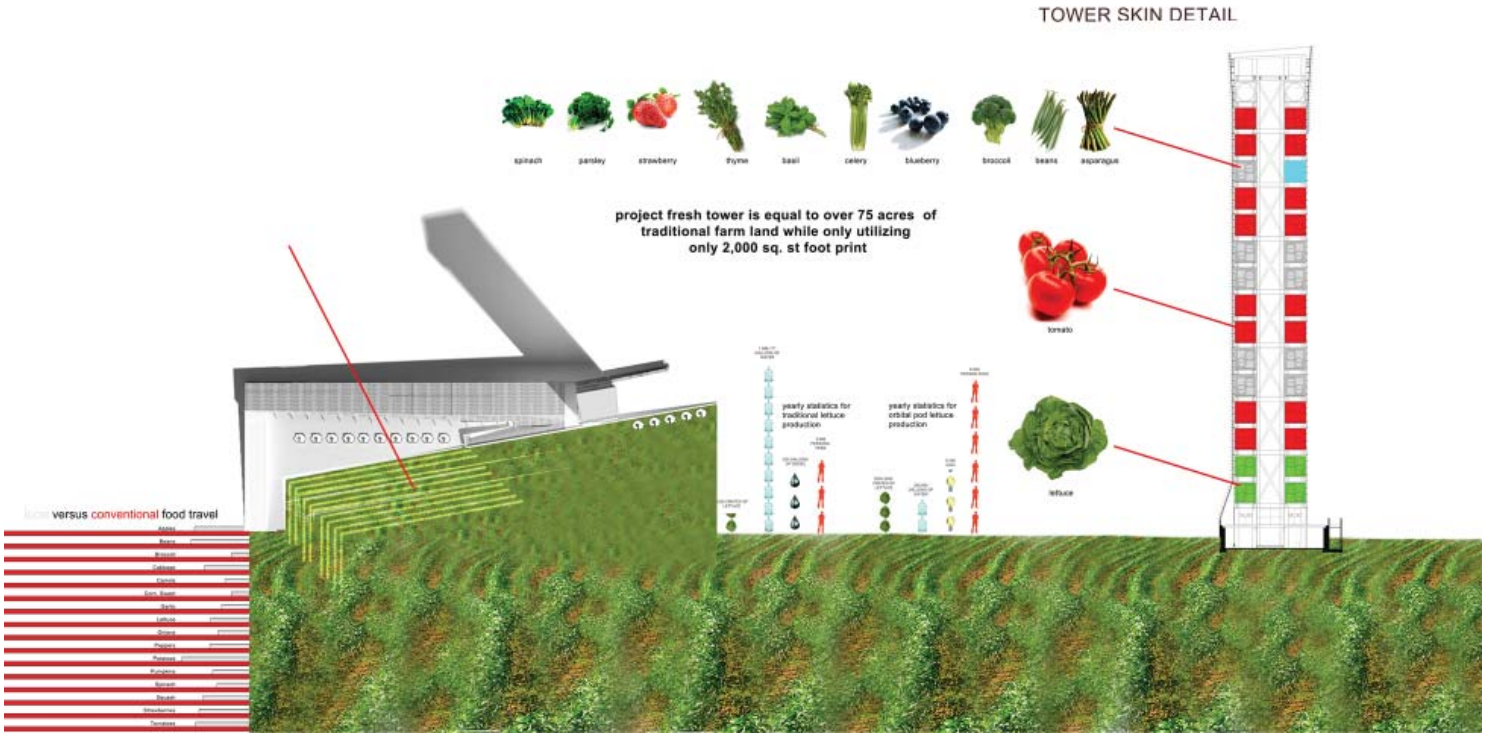
TOWER DETAIL SCALE 1:15

WALL SYSTEM
&
FARM LOGICS

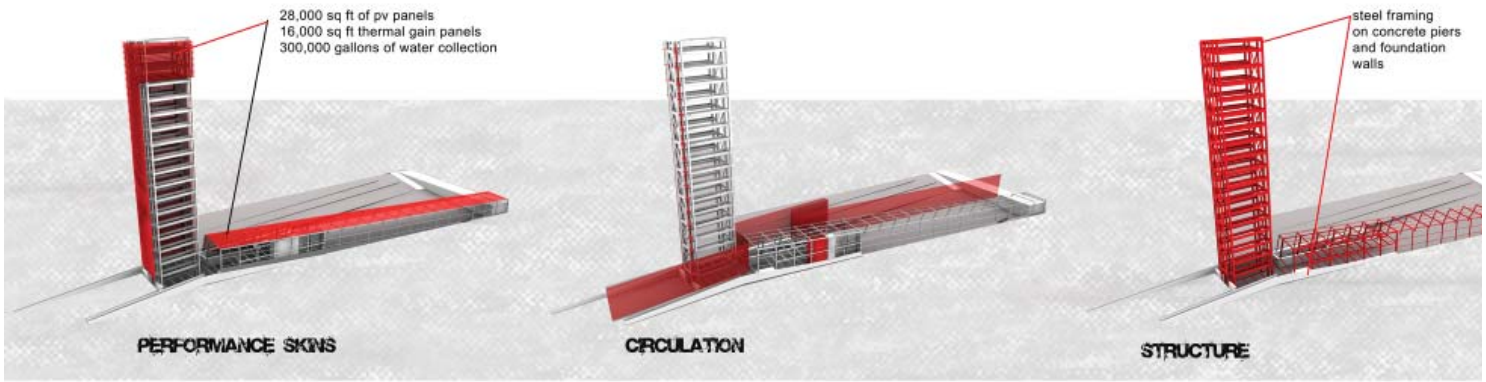


WALL SYSTEM
&
FARM LOGICS

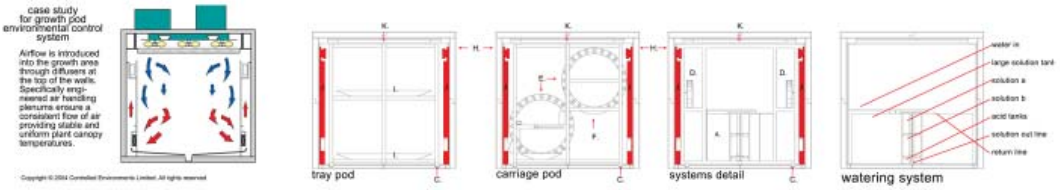


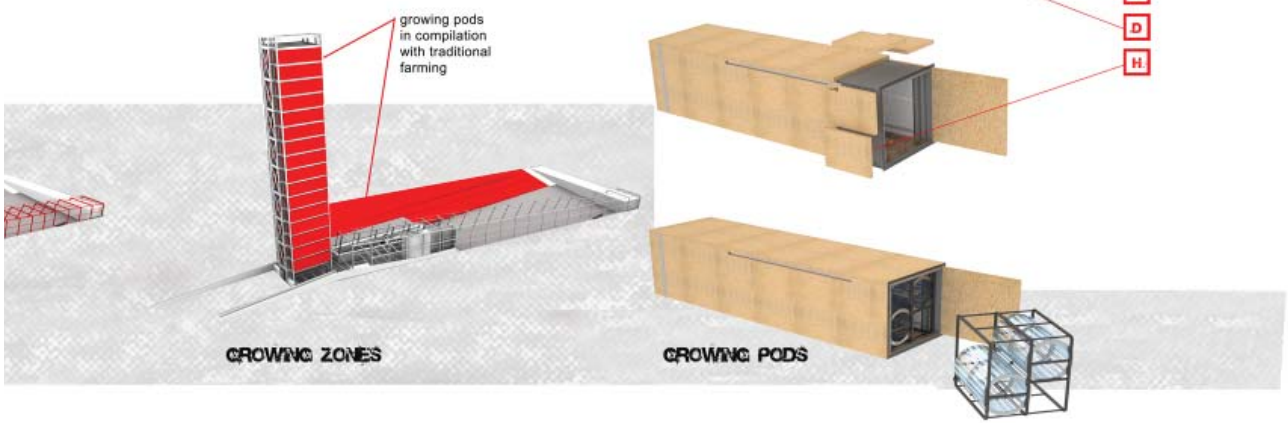


SYSTEMS
&
GROWING POD



SYSTEMS
&
GROWING POD





FRESH: Site

Project FRESH will be sited on southern side of Montana State University campus. This site has been chosen because of its proximity.

Proximity to a great deal of parking that can support the market.

Proximity to students and professors.

Proximity to the current campus organized CSA's.

Proximity to a distribution source for the produce. (MSU food services and Town and Country.)

Proximity to the only other tall buildings in Bozeman's urban landscape.

This site is 692 ft in length running east to west, and 1312 ft in length running north to south. The Area of the site is 907,904 sq ft.

FRESH: Site

FRESH: Code

The code analysis for Project FRESH is not completed for this stage of the book. Yet this project will include the following basic code sections.

305.1 Educational Group E. Educational Group E occupancy includes, among others, the use of a building or structure, or a portion thereof, by six or more persons at any one time for educational purposes through the 12th grade. Religious educational rooms and religious auditoriums, which are accessory to places of religious worship in accordance with Section 303.1 and have occupant loads of less than 100, shall be classified as A-3 occupancies.

306.1 Factory Industrial Group F. Factory Industrial Group F occupancy includes, among others, the use of a building or structure, or a portion thereof, for assembling, disassembling, fabricating, finishing, manufacturing, packaging, repair or processing operations that are not classified as a Group H hazardous or Group S storage occupancy.

--306.2 Factory Industrial F-1 Moderate-hazard Occupancy. Factory industrial uses which are not classified as Factory Industrial F-2 Low Hazard shall be classified as F-1 Moderate Hazard.

309.1 Mercantile Group M. Mercantile Group M occupancy includes, among others, the use of a building or structure or a portion thereof, for the display and sale of merchandise and involves stocks of goods, wares or merchandise incidental to such purposes and accessible to the public.

311.1 Storage Group S. Storage Group S occupancy includes, among others, the use of a building or structure, or a portion thereof, for storage that is not classified as a hazardous occupancy.

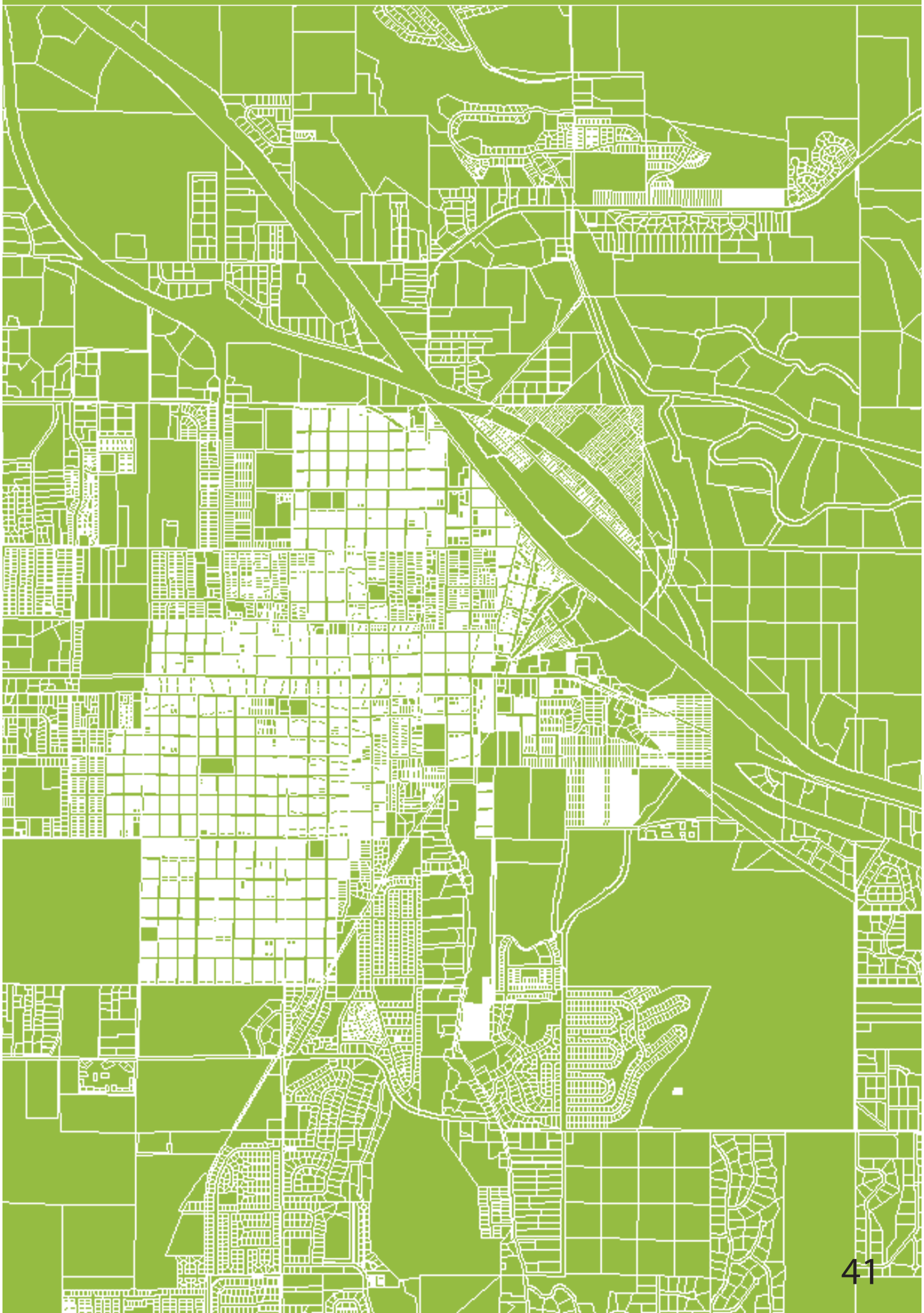
--311.2 Moderate-hazard storage, Group S-1

SECTION 312
UTILITY AND MISCELLANEOUS GROUP U

312.1 General. Buildings and structures of an accessory character and miscellaneous structures not classified in any specific occupancy shall be constructed, equipped and maintained to conform to the requirements of this code commensurate with the fire and life hazard incidental to their occupancy. Group U shall include, but not be limited to, the following:

Agricultural buildings
Aircraft hangars, accessory to a one- or two-family
residence (see Section 412.5)
Barns
Carports
Fences more than 6 feet (1829 mm) high
Grain silos, accessory to a residential occupancy
Greenhouses
Livestock shelters
Private garages
Retaining walls
Sheds
Stables
Tanks
Towers

To better understand the impacts of our food situation we must first choose a place to research intensively. This local research will help us better understand the viability of this farm. By looking at demographics, diet, local agriculture, and the origin of food for the greater Bozeman area, we may start to understand what the impacts and values of this farm may have locally and globally. Taking this small comunitty and using as a model so that we may better understand how to solve our food woes.



FRESH: Site analysis

Just like much of the world, Bozeman, MT, is at the will of this global food system. A system which as stated earlier has become a system unable to sustain itself. One might think that Bozeman and much of Montana would rely greatly on local agriculture for it's food since it is one of Montana's greatest resources. This is a huge misconception, because of the globalization of our food it has become more profitable to export our crops than to process them locally. In fact, Montana has no local large scale processing for any produce or grain based products. The current food model for Montana is quite the opposite of what it could be and what it once was in the 1950's. Currently Montana imports 96% of its food supply making it one of the states with the largest percentage of imported food.(11) Yet that percentage is deceptive, because Montana also is only one tenth of one percent of the United States food market. This number is very important when trying to understand why our local community doesn't see any of its product. Montana is out competed for its own food by other states making it a remote node in the greater food system. The remote nature of Montana, more specifically the Bozeman area, in relation to our global food market, makes it a good site to test the viability of a self sustaining large scaled environmentally controlled farm. This is do to the fact that is has relatively no impact on the food market and the distance that food has to travel is much higher than many other

FRESH: Site analysis

states. So if much of Montana was taken out of the global food grid with a network of large scale environmentally controlled farms it would have a relatively small impact on the current food industry but an astounding environmental impact globally and locally. Furthermore by exploring Bozeman as one of these nodes, by researching the demographics, economy, and environmental impacts, it will reveal the tools to better understand the impacts and needs of project FRESH; not only on the landscape but on the people and the local economy as well.

demographics

population	2001	2002	2003	2004	2005	2006	2007	2008
Gallatin County	70,170	71,967	74,689	77,408	80,671	84,370	87,243	89,824
Belgrade	6,414	6,746	7,046	7,298	7,336	7,631	8,036	8,185
Bozeman	29,261	30,372	31,919	33,663	35,089	37,038	38,037	39,442
Manhattan	1,428	1,438	1,480	1,519	1,511	1,555	1,539	1,622
Three Forks	1,761	1,789	1,853	1,919	1,903	1,923	1,915	1,928
West Yellowstone	1,193	1,216	1,241	1,262	1,260	1,281	1,433	1,511

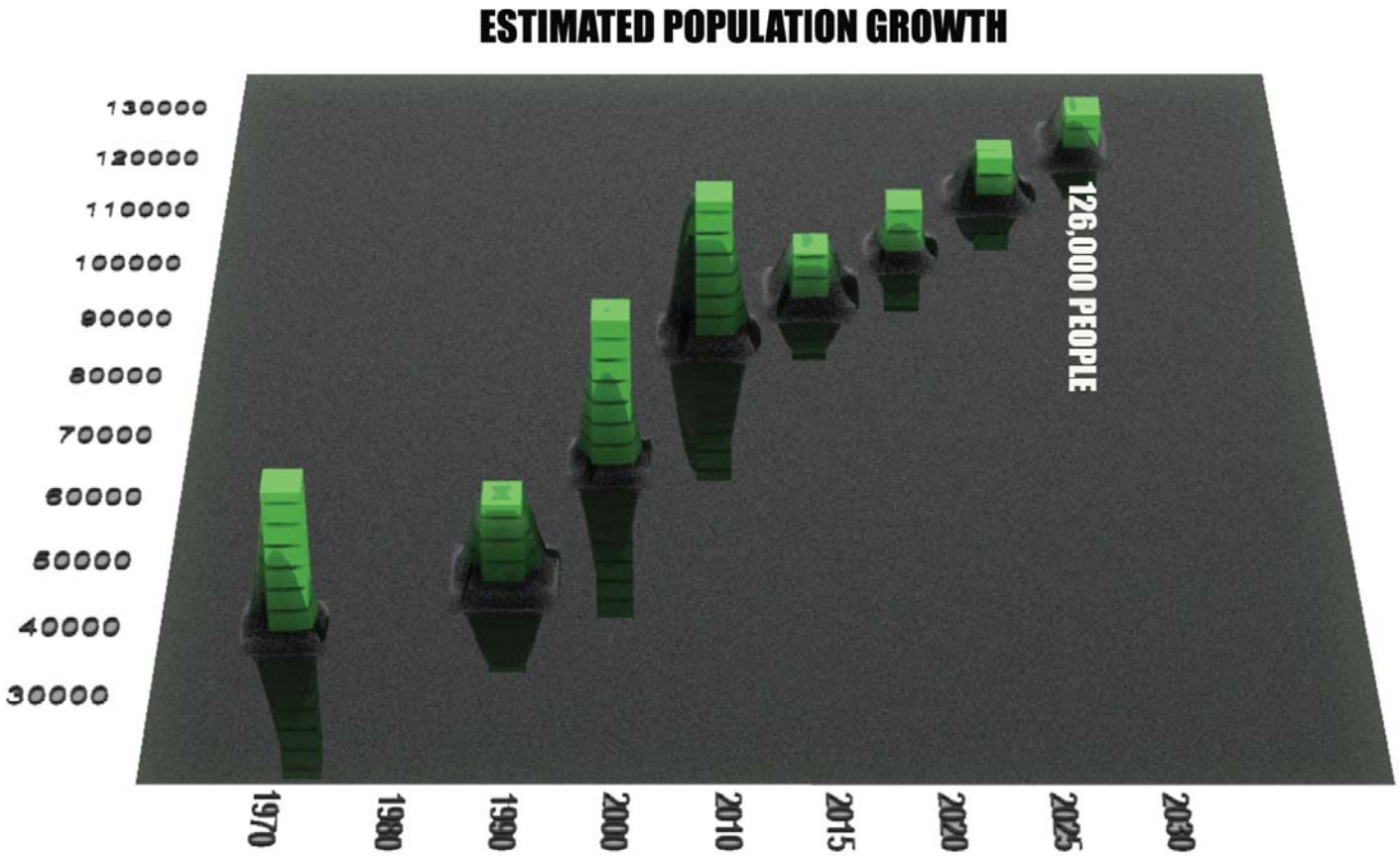
demographics

age	Median Age	Under 5	18 and over	65 and over
Gallatin County	32.4	6,085	66,052	7,830
Belgrade	29.1	502	4,024	347
Bozeman	27.2	2,227	29,756	2,496
Manhattan	38.1	82	1,024	183
Three Forks	37.5	118	1,238	259
West Yellowstone	37	64	913	62

demographics

population change	Bozeman	Change	Gallatin Co.	Change
1900	3,419	-	9,553	-
1910	5,107	+49.4%	14,079	+47.4%
1920	6,183	+21.1%	15,864	+12.7%
1930	6,855	+10.9%	16,124	+1.6%
1940	8,665	+26.4%	18,269	+13.3%
1950	11,325	+30.7%	21,902	+19.9%
1960	13,361	+18.0%	26,045	+18.9%
1970	18,670	+39.7%	32,505	+24.8%
1980	21,645	+15.9%	42,895	+31.9%
1990	22,660	+4.7%	50,463	+17.7%
2000	27,509	+21.8%	67,831	+34.4%
2008	39,442	+32.0%	89,824	+32.4%

demographics



12. Prospera Business Network

economy

2008 employment	Number of Establish ments	Average Annual Employment	Average Weekly Wages
Government (msu)	102	7,374	$761
Retail Trade	572	7,275	$477
Construction	1,101	5,146	$786
Food/ Accom.	360	5,587	$267
Health/social care	343	3,587	$708
Pro./tech. Services	729	3,422	$1,057
Manufacturing	197	2,577	$710
Other Services	361	1,511	$485
Wholesale Trade	201	1,401	$793
Finace/Insurance	219	1,259	$974
Arts/Entertainment	139	1,276	$408
Information	86	650	$750
Education	63	537	$320
Agriculture/fishing /hunting/ forestry	71	432	$520

FRESH: Site analysis

economy

20 largest employers	number of employees
Albertson's	250-499
Daily Chronicle	100-249
Deaconess Hosp.	1000+
Food Co-OP	100-249
Costco	100-249
First Security Bank	100-249
JTL Group	100-249
Kenyon Noble	100-249
Laidlaw Transit	100-249
Martel Construction	100-249

employers	number of employees
McDonald's	100-249
Murdoch's	100-249
On site management	100-249
Ressler	100-249
RightNow Technologies	250-499
Riverside Country Club	100-249
Simkins-Hallin	100-249
Wal-Mart	250-499
Williams Plumbing	100-249
Zbot Enterprises	250-499

FRESH: Site analysis

economy

Current Local Food Stores	Location
Albertsons	Bozeman
Big sky Packaging	Bozeman
Co-Op	Bozeman
Costco	Bozeman
Heebs Grocery	Bozeman
Joes Parkway	Bozeman
Martys Market	Bozeman
Montana Harvest	Bozeman
Valley Foods	Bozeman
Rosauers	Bozeman
Safeway	Bozeman
Shaklee Distributor	Bozeman
Smith's	Bozeman
Town & Country	Bozeman

	Location
Albertsons	Belgrade
L & F Food Farm	Belgrade
Lee & Dad's	Belgrade
Market Place	Belgrade
Albertson's	Livingston
Dynamic Food Solutions	Livingston
Amsterdam General Store	Manhattan
Big Sky Growers Llc	Manhattan
Madison Foods	Ennis
C & P Grocery	Big Sky
Country Market	Big Sky
RET GROCERIES	Three Forks
Food Roundup	West Yellowstone
IGA	Bozeman

FRESH: Site analysis

economy

Current Bozman food locations

agriculture

State fact sheet

Over 3 billion dollars was spent importing food for Montana's 15 % of that was on produce.

In 1950, 70% of the food Montanans ate was grown in Montana

Through the 1930's, food processing was our state's number one employer

Montana's farmers markets grew from 5 in 1990 to over 30 today.

36% of Montana's economy is based on agriculture, more than mining, gas and oil combined.

According to the Montana Cattlemen's Association, Montana is losing about 250 ranches a year

For every dollar spent on a loaf of bread, the typical U.S. wheat farmer now gets just 6 cents

American Farmland Trust reports that 5 million acres of important farm and ranch lands in Montana are under pressure from development.

There was nearly a 200% increase in emergency food provided through the Montana Food Bank Network from 2000 to 2003

In 2003, Montana had an estimated expenditure of $175 million due to adult obesity-related medical costs.

The University of Montana-Missoula purchases safflower oil, beef, bread, dairy products, and fruits and vegetables from Montana producers.

13. http://www.growmontana.ncat.org/docs/GMTshortfactsheet2.pdf

agriculture

Gallatin Co. fact sheet

Number of farms in Gallatin Co.
1,071
Number of acres of Farm
776,868 acres
Percentage of land being Farmed
43%
Dollars generated from live-stock
36.2 million
Acres of irrigated land
2,86371
Dollars generated from Crops
28.7 million
Average Farm labor employ-ment
1,919 persons
Average annual wage
$14,741
Rank of Gallatin County in Montana's potato production
1

agriculture

Montana foods by season

YEAR ROUND	WINTER	SPRING
BEEF, BUFFALO, CHICKEN, TURKEY, EGGS, PORK, LAMB, FISH, MILK, CHEESE, YOGURT, BARLEY, WHEAT, BUCKWHEAT, RYE, FLAX, SPELT, TORTILLAS, KAMUT, PINTO BEANS, LENTILS, GARBANZO BEEN, AUSTRIAN, WINTER PEAS, SUNFLOWER SEED, SPROUTS, HERBS, HONEY, SUGAR, BEER, WINE,	BEETS, CARROTS, GARLIC, MUSHROOMS, ONION, PARSNIPS, POTATOES, SHALLOTS, WINTER SQUASH,	BROCCOLI, CABBAGE, CAULIFLOWER CHARD COLLARDS, KALE, LETTUCE, MORELS, MUSHROOMS, MUSTARD, GREENS, PEAS, RHUBARBS SPINACH.

agriculture

LOCAL CSA FOOD CROPS

BEANS, BEATS, BROCCOLI, BRUSSELS SPROUTS, CABBAGE, CARROTS, CAULIFLOWER, SWISS CHARD, SWEET CORNS, CUCUMBERS, EGGPLANT, SALAD GREENS, KALES KOHLRABI, LEEKS, ARUGULA, CANTALOUPE, HONEYDEW MELONS, ONIONS, PARSNIPS, PEAS, PEPPERS, POTATOES, PUMPKINS, RADISHES, SPINACH, SQUASH, TOMATOES, TOMATILLOS, WATERMELON

SUMMER

APRICOTS, BASIL, BEETS, BLACKBERRIES, BROCCOLI, CARROTS, CABBAGE, CANTALOUPE, CAULIFLOWER, CHARD, FLATHEAD CHERRIES, COLLARDS, CORN, CUCUMBERS EGGPLANT, GARLIC, GRAPES, HUCKLEBERRIES, KALE, LETTUCE MUSHROOMS, MUSTARD GREENS, PEAS, PEPPERS, RADISHES, RASE BERRIES, RHUBARB, RUTABAGAS SCALLIONS, SPINACH, STRAWBERRIES, SUMMER SQUASH, TOMATILLOS, TOMATOES, TURNIPS, WATERMELON

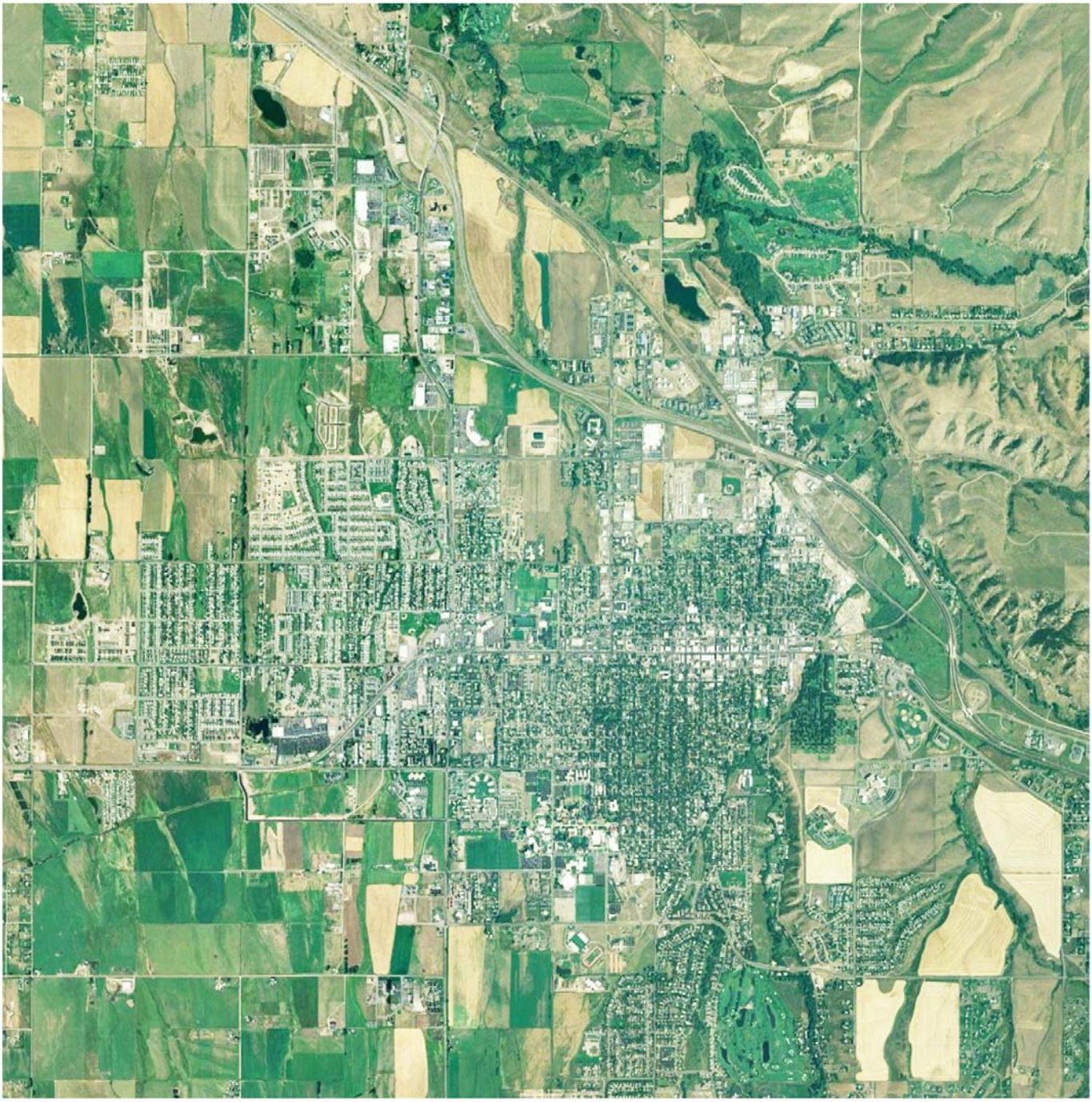
FALL

APPLES, BASIL, BEETS, BLACKBERRIES, BROCCOLI, CARROTS, CABBAGE, CANTALOUPE, CAULIFLOWER, CHARD, FLATHEAD CHERRIES, COLLARDS, CORN, EGGPLANT, GARLIC, GRAPES, HUCKLEBERRIES, KALE, LEEKS, LETTUCE MUSHROOMS, MUSTARD GREENS, ONIONS, PEAS, PEARS, PEPPERS, POTATOES, PUMPKIN, RADISHES, RASPBERRIES, RHUBARB, RUTABAGAS SCALLIONS, SHALLOTS, SPINACH, STRAWBERRIES, SUMMER SQUASH, SWEET POTATOES, TOMATILLOS, TOMATOES, TURNIPS, WINTER SQUASH, WATERMELON

maps

Population of gallating county 2010
89,824
Projected population of Gal. Co. 2030
126,020
T**otal area of Gallatin Co.**
1,682,048 acres (2628 sq miles)
water area of Gallatin Co.
16,500 acres (25 sq miles)
L**and area if Gallatin Co.**
1,665,548 acres (2603 sq miles)
Pop. Density of Gallatin Co.
29.1 persons per sq mile
Projected pop. density of Gallatin Co.
76.83 person per sq mile
Approximate area of private land
888,000 acres (1378 sq miles)
Approximate area of public land
800,000 acres (1250 sq miles)

maps



Bozeman Aerial

climate

Temp-Precp.	Average high in °F	Average low in °F	Av. precipitation inch
January	33	14	0.83
February	39	18	0.71
March	46	24	1.42
April	56	31	2.05
May	65	39	3.23
June	74	46	2.83
July	82	52	1.46
August	82	51	1.5
September	71	42	1.81
October	59	33	1.61
November	42	22	1.1
December	34	15	0.79

15.Western Regional Climate Center

climate

Temp-Precp.	Avg Heating Degree Days	Avg Cooling Degree Days	Avg Growing Degree Days
January	0	0	0
February	28	0	0
March	257	0	9
April	567	0	36
May	926	10	198
June	1243	46	375
July	1341	304	769
August	1002	110	547
September	969	33	242
October	756	0	34
November	460	0	0
December	228	0	0

15.Western Regional Climate Center

CASE STUDIES

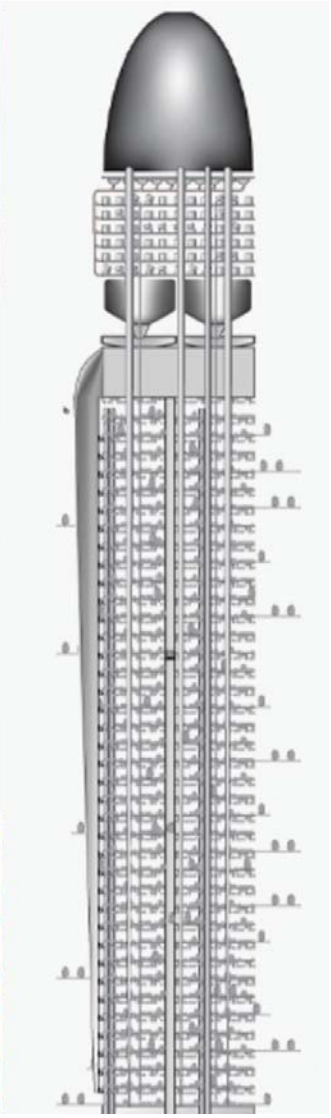
MVRDV's pig city may be one of the best examples of a hypothetical farming project. It takes into account every aspect of this project yet it focuses directly on pigs. Their project as stated below took the incredible task of changing current norm of pig farming and turned it vertical.

"About

In 2000, pork was the most consumed form of meat at 80 billion kg per year. Recent animal diseases such as Swine Fever and Foot and Mouth disease are raising serious questions about pork production and consumption. It is evident that the current pork industry cannot proceed in the same way without causing many casualties.

Two opposing reactions can be imagined. Either we change our consumption pattern and become instant vegetarians or we change the production methods and demand biological farming.

Let us assume that we remain pork-eaters. Do we then have enough space



for biological pig farming?

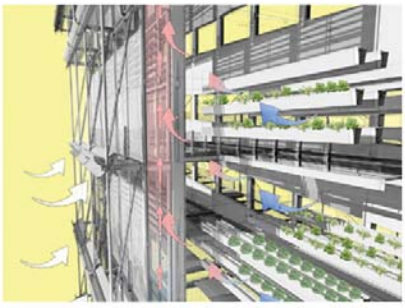
With a production of 16,5 million tons of pork, The Netherlands is the chief exporter of pork within the European Union. In 1999, 15.2 million pigs and 15.5 million humans officially inhabited The Netherlands. One pig needs an area of 664 m2, including current food processing: composed of 50% intensive grain production and 50% industrial by-products.

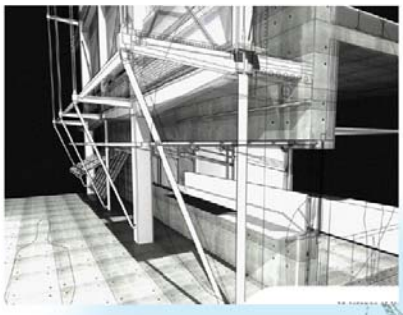
In the case of organic farming, pigs would be fed with 100% grain, leading to a required 130% more field surface due to the reduced grain production. This would cause a demand of 1726 m2 per pig, including the organic food processing. This would mean that there would be only 774 m2 per person left for other activities. In other words, 75 % of the Netherlands would be dedicated to pigs.

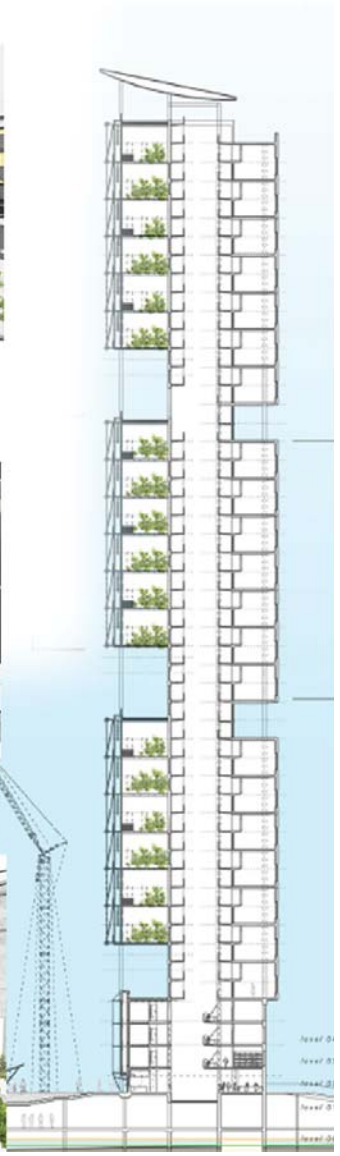
Can we combine organic farming with a further concentration of the production-activities so that there will be enough space for other activities? Is it possible to compact all the pig production within concentrated farms, therefore avoiding unnecessary transportation and distribution, and thereby reducing the spread of diseases? Can we through concentrated farming, create the economical critical mass to allow for a communal slaughterhouse,
a self-sufficient fertiliser recycler and a central food core, so as to solve the various problems found in the pig-industry?”

CASE STUDIES

The Waimond project is one of the best examples of the vertical farm projects that have been done to date. This projects uses a well thought out and sophisticated program to try and combat a great deal of issues .







"Due to the nature of the fragile ground plane, the public face of the vertical farm will sit on a raised plateau/ plinth. Other buildings that occupy this plinth will be dedicated to specific buildings that are damaged and made un-inhabitable from the ingress in water. Hence the proposal is that housing accommodations and a local primary school will be decanted and occupy the plateau along with the vertical farm to form a 'Commune" of buildings. The housing a accommodation will be pre-made modular type dwelling that are made off site and can be delivered and erected on-site. as and when is is required depending on the extremity of the water rise, via permanent on-site cranes that also act as observation towers for the public.

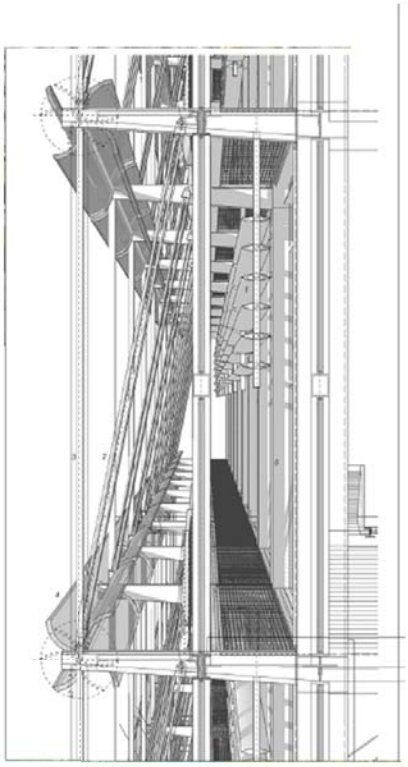
At the heart of this plinth will be an event space, which the school housing and VF will look into. This event space will be made available for the trade and consumption of food that is grown in the vertical farm during evening and weekends, and also a play area during the day on a daily basis for

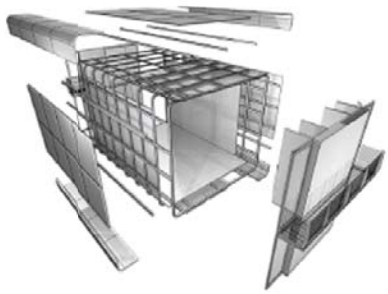
the primary school.

The lowers levels of the tower are dedicated to the celebration and educational aspects of food. This well include dinning spaces and mare permanent stall for the trading and consumption of food, when the event space is not in use. The primary school will also use this a a dedicated dining facility. The base of the rower also incudes a library, study spaces and laboratories for the students and staff of the University.

The rest of the tower is dedicated to the growing and preparation of vegetables and crops, as well as accommodation units for the students/ workforce that are working/studying within the tower.

The souther half of the tower is dedicated to growing areas, to take advantage of the southern orientation. Whilst the northern half of the tower will accommodate the washing, packing and storing of crops, as will as the accommodation units for the occupiers of the building. The accommodation units will also be pre-fabricated and made off site, and ‘fitted’ onto the tower as crop production increases within the tower due to the increase demand and inhabitants in the housing accommodation lower don on the raised plateau.”





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