AGRARIA
An agrarian vision

by

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I hereby declare that I am the sole author of this thesis.

This is a true copy of the thesis,
including any required final revisions,
as accepted by my examiners.

I understand that my thesis may be made
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ABSTRACT

This thesis is concerned with reconnecting people to the land. It has been developed as a reaction to the current environmental crises concerning peak oil, urban sprawl, and the ongoing opposition between humans and the natural world. This thesis posits that the most direct way to reconnect people to the land is through the practice of agriculture.

The thesis is written as a manifesto. The intent is to clearly declare the role that an agrarian development can play in our society. As a manifesto, it is written with the understanding that current political and economical considerations be suspended from the context of the thesis. It is a suggestion for the re-evaluation of contemporary agriculture, a new approach to development, and a new style for living.

The thesis is broken into three sections. The first is an empirical introduction to the issues surrounding the thesis. Following this, a synopsis of readings concerning the work of a number of agricultural innovators and texts pertaining to agroecosystems are discussed. Large scale, rural based utopian precedents were studied more for their theory than for their architectural implications. The second section is the written Manifesto. The third is the design proposition of the thesis that follows the precepts outlined in the Manifesto. This design, which is a proposition for a new large-scale, hybrid urban/rural form of settlement, is named AGRARIA.

This thesis is not meant to be a 'back-to-the-land' regressive social movement, but rather it suggests that current development of our arable land could be more in tune with its environment and still remain productive land after development. It is a proposition for the localization of production, and direct involvement in our food system.

Following the precepts of the design proposal, a new alternative to urban sprawl can be discussed. This new typology will change the pattern of suburban development from consumptive elements into productive ones, and from isolationist environments into integrative ones. It is envisioned that this trend in development and lifestyle shall enable the spread of an agrarian ideology throughout rural areas and into urban centres.

ACKNOWLEDGEMENTS

I would like to thank my supervisor Rick Andrighetti for his endless enthusiasm, countless patience, and valued insight througout this endeavour. My thanks go out to my other committee members Val Rynimerri and John McMinn for their involvement in finalizing this thesis. I would also like to thank my mother for teaching me that there is always something to learn, and my father for showing me the value of our natural world. I would like to thank Marianna De Cola for listening for years about agriculture and having the fortitude to always be interested. For all who stood with me throughout this process:the denizens of 15 Melvegas, Jonny T, Lauren, Gordimus Rex, K-Bo, and Jolo; Fraser “Dow Index”, Court, Goran, Jonage, Erik, Mel, and Kyle; for the countless good times I thank you all.

DEDICATION

This work is dedicated to all the generations,

past, present, and future,

who have worked the land to provide for others.

INTRODUCTION

Akin to nature, human society has an inherent drive to consistently evolve. This drive leads us along the line between chaos and order, maintaining balance through our will to survive. However, we have been consistently on a path that removes us from the natural order of our world. We are distancing ourselves from one another, and from the elements of our survival, through the tools of our technology - seeking the answers to our continued existence in the artifice we have created. Spiraling further away from reliance upon our surrounding environs to provide for us, we have become dependent upon the immediate availability of externalities for our survival.

This parasitical relationship has allowed for a society seemingly free from constraint, unknowing of limitations, and indulgent in consumption. This must change if we desire to survive the impending crisis in the coming century. This is not only a crisis concerning energy, but a crisis that will disrupt our society in all aspects, shaking its very core and threatening our survival. We must shift our system of consumption to one of production. Shift from a mentality of abuse, to a mentality of care. Shift from being devourers of our world, to stewards of our Earth. We must strengthen our local environments to strengthen the global one. As a developed nation we can provide an example to foster change. Our nation needs a vision, the world needs a model. Can we not provide one that can sustain a population equally, with the basics of food and shelter available to all?

This thesis is a manifesto. It was conceived through a reaction to contemporary issues concerning urban sprawl; agricultural sustainability; and environmental degradation. The project concerns a shift in societal values towards the adoption of an agrarian ideology. The scheme outlines how development should occur on our rapidly diminishing arable lands, in order to maintain an agricultural self-sufficiency. It is a suggestion that we can maintain a balance between our built environment and the natural one; a balance that allows for each individual to be free from the concerns of food security. Utopist in its ideology, its principles are meant to filter into our existing built environment, altering the consumptive pattern of suburban and urban landscapes. This is AGRARIA. This is change.

CONTENTS

LIST OF ILLUSTRATIONS

All illustrations, maps and photographs have been produced by the author unless otherwise sourced in this list.

1.0 CONDITIONS

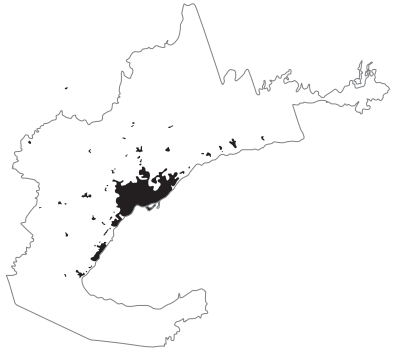
“To live in sprawl means to find oneself relatively independent of the bonds of space and time.”

-Richard Ingersoll

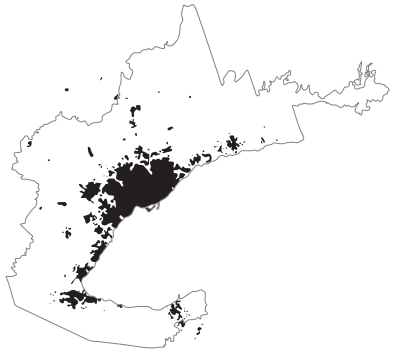
1.1 CONSUMPTIVE PATTERNING

1.02 Sequential Urban Expansion:1876

1.03 Sequential Urban Expansion:1932



1.04 Sequential Urban Expansion:1967



1.05 Sequential Urban Expansion:1992

1.06 Sequential Urban Expansion:2006

1.07 Sequential Urban Expansion:2031

Over the past fifty years our population in North America has increased through prolonged and steady growth. Due to the phenomenon of the suburban development model the urban and ecological footprints of our cities have shown unprecedented and unsustainable expansion. Though this model grew out of the socio-economic conditions specific to North America's post-war era[1] it has become the standard model of urban growth, employed widely throughout the developed and developing world.

The suburban model can typically be described as low-density, single-detached housing on large-sized lots. The zoning of suburban areas concentrates commercial venues in areas far removed form neighbourhoods. Owing to the decentralized aspect of suburbs, public transit becomes unviable and private vehicles are a necessity. A generation in society has now grown-up from out of the 'suburbs'. The new standard for living in Canada has become peri-urban. There are many factors influencing this trend; the perceived safety stigmas of city living; a lack of affordable alternatives; and a culture of ambivalence. The suburban model has ensnared the desires of society as the attractiveness and availability of its typology demarcates the 'ideal' lifestyle.

Furthermore, Richard Ingersoll argues[2] that the suburban model bears a dire social cost. He demonstrates in that the rapid spatial expansion of cities due to urban sprawl, results in the dislocation of social activities, and communal associations. Nestled in auto-accessible private

1 Wilson, Alexander. The Culture of Nature
2 Ingersoll, Richard. Sprawltown

housing developments, the suburbanite can effectively sever themselves from any social ties within a community, as no actual community exists in the first place, only a collection of individuals with a shared income bracket.

> "The modern home is so destructive, I think, because it is a generalization, a product of factory and fashion, an everyplace or a noplace. The modern house is not a response to its place, but rather to the affluence and social status of its owner."[3]

The critic James Howard Kunstler has described suburban living[4] as cruel mock-ups of an 'ideal' society devoid of economic generative elements, and social wastelands the suburbs become the new 'ghost-town'. Barren during daylight, sequestered by nightfall, the suburban home evinces a desolate environment breeding angst, alienation, and depression. Drowned in manicured seas of green, the suburbs are tragically doomed to be the areas of first social collapse. Isolated, physically and socially from one another and from the urban context at large, suburbanites eke out an existence shaped by comfort and controlled through consumerism. Slaves to conformity and conventions of half a century ago, the suburbanite exists as an economic anomaly. We are leaving dire choices for our future generations as they are born into a pre-existing economic model, whose survival depends on the exploitation of alienation and conformity.

We live in an environment built upon speed irrelative to our natural capability to absorb information. The speed of the automobile; the speed of population growth; the speed of 'the now' mentality our culture is accustomed to. This is highly apparent in the architecture of our suburban landscape, and freeway developments/ office parks, etc. They are destination points connected through speed and commerce, not places of inherent necessity to a community, and therefore they require a minimal standard of design.

> "Mobility is the key to understanding contemporary landscape design, because in the last forty years planners and builders have organized most land development around the automobile. This has had enormous effects on how most of us see the landscape. It has also changed the look and feel of the land itself. The car has encouraged - indeed, insisted on - large-scale development: houses on quarter-acre lots, giant boulevards and expressways that don't welcome bicycles or pedestrians, huge stores or plazas surrounded by massive parking lots."[5]

As urban sprawl has continued to dominate development in the post-war era, there have been massive implications for rural areas, as they are increasingly thinned of their populace, culture, and lands. Often overlooked is the impact that the loss of prime agricultural land can have on agricultural productivity. These losses place reliance upon contemporary agriculture to provide increasing yields on decreasing area of arable land. As land that once supported agricultural production is converted to land that only supports consumption, the problem is exacerbated by a further increase of population relying on this severely reduced productive area. Designed only to consume, suburbs wreak havoc amongst our arable lands.

It is estimated that one acre of land is lost to urbanization for every person added to the population[6]. According to leading agronomists, it requires a minimum of 1.2 acres of land to support the annual nutritional requirements for one person[7]. Therefore, if we were to have 36 acres and added 30 people to our population, we

3 Berry, Wendell. The Unsettling of America (p.52)
4 Kunstler, James Howard. The Geography of Nowhere
5 Wilson, Alexander. The Culture of Nature (p.91)
6 Statistics Canada. Rural and Small Town Analysis Bulletin 2005
7 Altieri, Miguel. Agroecology

would only have enough land capable to feed 5 of them. Considering that Canada's population is currently expanding at a rate of 0.88% per annum[8] (approximately 300,000 people), we would require 360,000 acres to feed them, but we would lose 300,000 acres to urbanization. This is an unbalanced formula for sustainable growth. Currently there are approximately 3.4 acres of arable land (without clear-cutting forest lands), in Canada available to every member of our population[9], meaning that we could theoretically feed an additional population 3 times our current one. However, if we calculate the rate of arable land loss due to urbanization into our equation, we would only be able to support an additional 1.5 times the current population before we run out of arable land. As it has been estimated that our population will double in less than 75 years[10], it can be argued that in approximately one generation we shall barely be able to sustain the food requirements of our own population. We must bear in mind that this only accounts for the people of our own country, not the millions worldwide who require our agricultural exports, nor the enormous amount of feed required to maintain our current livestock populations (who currently consume about 1/3 of the world's grain supply)[11]. How can we truly expect to continue our current development trend and still be able to support global food needs, if we lose the capability to supply our own needs?

We need to re-evaluate and redesign the relationship between land consumption and agricultural productivity if we hope to maintain a stable food environment. However, in order to shift to a secure and sustainable food supply, we not only need to change our overly consumptive pattern of development, but we also need to reassess our contemporary agricultural methodology. The next chapter shall look at the methodology of our current agricultural system and its viability in terms of environmental sustainability and food security.

8 Statistics Canada

9 Data provided through Statistics Canada. Area of Farmland divided by Canadian Population

10 Statistics Canada

11 FAO Statistics

“That we should have an agriculture based as much on petroleum as on the soil - that we need petroleum exactly as much as we need food and must have it before we can eat - may seem absurd. It is absurd. It is nevertheless true.”

-Wendell Berry

1.2 AGRICULTURAL DEGRADATION

Like all businesses, agriculture, is controlled by the mechanisms of supply and demand. Unlike other commodities however, agriculture, has the advantageous position that its products are a necessity. This being said, the industrialization of agriculture allowed for remarkable advancements in crop yield; farm labour; and food distribution; radically altering the methodologies of agriculture. We have reaped the benefits of an industrial agricultural system for almost a generation now, all the while becoming further reliant upon technological solutions to uphold our food system. Unfortunately, we are entering a period where the industrialization of agriculture is likely to be its failure. The root of the problem is that our system of production is heavily reliant upon high fossil-fuel inputs to maintain and sustain what has recently become decreasing yield. We are artificially supporting a system that is in collapse.

Due to technological advancements that began in the post-war period, the scale of farming has drastically increased. From the introduction of large-scale farm machinery to the development of chemical fertilizers, a new system of agriculture has allowed the abilities of one farmer to accomplish what would once have taken ten. This has led to the decline of the family farm, the large-scale exodus from rural areas, and the dominance of single-operator manufactured monocultures.

> “If you think commercial vegetables are nature’s own, you are in for a big surprise. These vegetables are a watery chemical

> concoction of nitrogen, phosphorous, and potash, with a little help from the seed. And that is just how they taste. And commercial chicken eggs (you can call them eggs if you like) are nothing more than a mixture of synthetic feed, chemicals, and hormones. This is not a product of nature but a man made synthetic in the shape of an egg. The farmer who produces vegetables and eggs of this kind, I call a manufacturer."[1]

From the very beginning of the annual growing cycle, the farmer is dependent upon fossil fuel inputs. As the majority of contemporary farms cover huge acreage, machinery is required for a farmer to maintain productivity. These machines, being rather large in scale, require significant amounts of diesel fuel in order to operate.

Beginning in early spring, the field is fertilized in order for the crops to secure the nutrients that they need for growth. These fertilizers have been designed by agribusiness agronomists to ensure a plant receives proper nutrients regardless of what type of soil it is planted in. Farmers, who are required to maintain specific yields, typically apply more fertilizer than is required to ensure that their crops will survive. However, any nutrient from the fertilizer that is not utilized by the crop leaches through the soil and can enter water systems. A common occurrence is the leaching of nitrogen from the over-application of synthetic nitrogen fertilizers. This results in the nitrification of water tables, rivers, streams, and lakes, causing significant imbalances in aquatic ecosystems.

The soil is then prepared for the reception of the seed through the tillage of the land. Tilling prepares the soil for sowing by turning over weeds, breaking up compacted soil, aerating the earth, and mixing in the previously applied fertilizer. Intensive tilling, which is now conventional practice, can cause significant soil degradation, as it promotes a higher rate of soil loss due to wind and water erosion. Such practices can cause a loss approximately 5-10 tons of topsoil per hectare every year[2]. As only 1 ton of soil per hectare can be created per year using current practices, we are losing our valuable soil resources rapidly[3]. Without a significant layer of topsoil, the only feasible way to grow plants is through artificial inputs.

When the soil has been prepared, the seed is planted. As with all of the previous stages, this is done with the assistance of machinery. As the crop begins to grow, more fertilizer may occasionally be applied, along with other chemical applications in the forms of herbicides and pesticides. The herbicides are designed to remove any weeds that may hinder the growth of the crop. However, as there are many varieties of weeds, the formulas are typically designed to kill any plant other than the specific crop itself. Pesticides are employed to protect the crop from insect attack and infestation. Some crops have been genetically engineered to be more receptive to certain pesticides and herbicides. Examples of these are Monsanto's Roundup Ready® seeds, engineered for usage with their agricultural-strength Roundup® herbicides[4]. The application of these chemicals not only affects surface plants, but also the millions upon millions of microorganisms that reside in soil[5]. In essence, herbicide and pesticide use, sterilizes the soil and removes its natural capability to sustain life, which in turn now requires the further application of fertilizer. The chemical growth cycle is closed, and the economic security of agribusiness is assured.

At the final stage of the growing cycle, the crop must be harvested. Again the cycle is maintained, as large machinery required compacts soil, making the process of tillage once again

1 Fukuoka, Masanobu - The One-Straw Revolution (p.94)

2 Gleissman, Stephen R. - Agroecology

3 Ibid.

4 www.monsanto.ca

5 Carson, Rachel - Silent Spring

a necessity. Each stage of production on-farm is imbued with fossil fuel inputs. Beyond the production of food itself, are requirements within our globalized food system for the processing, packaging, storage, marketing, and transportation of these agricultural products.

The other resultant of this industrialized agricultural methodology is the support of monoculture cropping systems. Our global food system has increasingly consolidated production into a few commercially viable varieties, rather than the thousands upon thousands of alternative species available worldwide. Consumer demand, market control, trade agreements, and global food conglomerates all contribute to this situation.

> "The appropriate agricultural technology would therefore be diverse; it would aspire to diversity; it would enable the diversification of economies, methods, and species to conform to the diverse kinds of land. It would always use plants and animals together. It would be as attentive to decay as to growth, to maintenance as to production. It would return all wastes to the soil, control erosion, and conserve water. To enable care and devotion and to safeguard the local communities and cultures of agriculture, it would use the land in small holdings. It would aspire to make each farm so far as possible the source of its own operating energy, by the use of human energy, work animals, methane, wind or water or solar power. The mechanical aspect of the technology would serve to harness or enhance the energy available on the farm. It would not be permitted to replace such energies with imported fuels, replace people, or to replace or reduce human skills."[6]

It is not only within the methodologies of agriculture that diversity poses a threat, but the survival of agricultures is threatened as well. Within ecosystems biodiversity helps to ensure the health of natural systems. The same can be said of agroecosystems. The more diverse and 'natural' they are the more successful they are in preventing widespread disease and disaster. As we lose valuable native species to the monocultures of corporate agricultures, biodiversity suffers, crop health deteriorates, and the system becomes reliant once again upon externalities for survival.

Our agricultural methodologies fall prey to commercial interests of narrowed focus, rather than to the diverse interests of the people. It is this narrowing of focus that keeps industrial agriculture as the model for all agricultural production, a system that profits the few, while laying waste to local lands, destroying local economies, and deteriorating rural cultures. We have enjoyed an era of cheap food reliant upon cheap non-renewable energy. Our exploitative methodology of production has degraded nature's inherent ability to provide. We have, through externalities, been able to artificially support a food system that even now cannot provide stable yields. How can we place our reliance, let alone our faith, in a system that innately contains its own seed of collapse? It is time to evaluate our ideals of production, and our relationship to our food. One such relationship is the developed desire and subsequent need for food and food products which are imported to local foodsheds. This condition is one that requires further discussion which is the focus of the next section.

6 Berry, Wendell - The Unsettling of America (p.89-90)

“If we do have a food crisis it will not be caused by the insufficiency of nature’s productive power, but by the extravagance of human desire..”

-Masanobu Fukuoka

1.3 ETERNAL SEASON

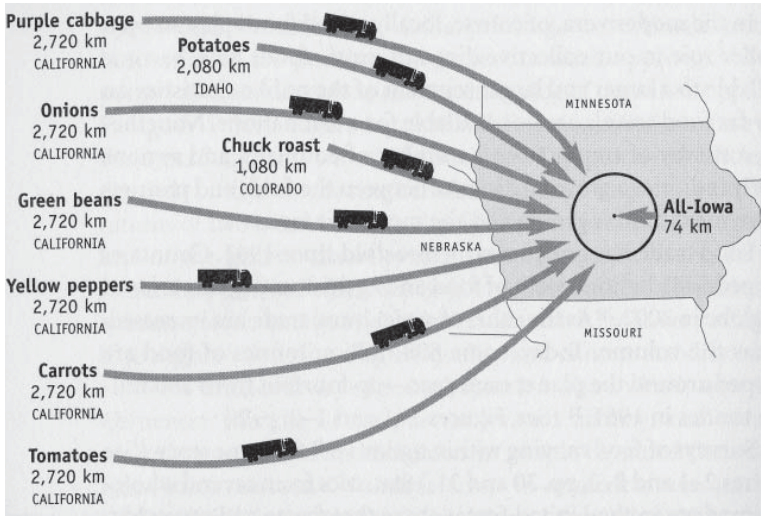
We are no longer tied to our land out of our necessity for food sustenance. It has been widely acknowledged that the average meal may travel approximately 1500 km[1] from field to table. Our society has become accustomed to the easy gratification of its gastronomic desires. Developments in agricultural technologies, distribution methodologies, and globalized trade systems have created the notion of an Eternal Season. This notion has instilled the desire for food products unavailable locally removing the considerations of place in regards to food security. As we have developed reliance upon the Eternal Season, a homogenized food machine has been created, undermining local agricultures, economies, and food cultures.

The primary cause driving the idea of an Eternal Season is the growth in global trade of food and food products. Through the importation of items which are 'out-of-season' we have developed a dependency on a globalized food network. This network allows for produce to be shipped cheaply[2] from countries with continual growing seasons. Our dependency on this network is strictly from the desires we have developed towards the enjoyment of unseasonable fruits and vegetables in the inclement months. An unfortunate occurrence is that even when local produce is available, imported items still have a high profile in local food stores due to the economics of the system.

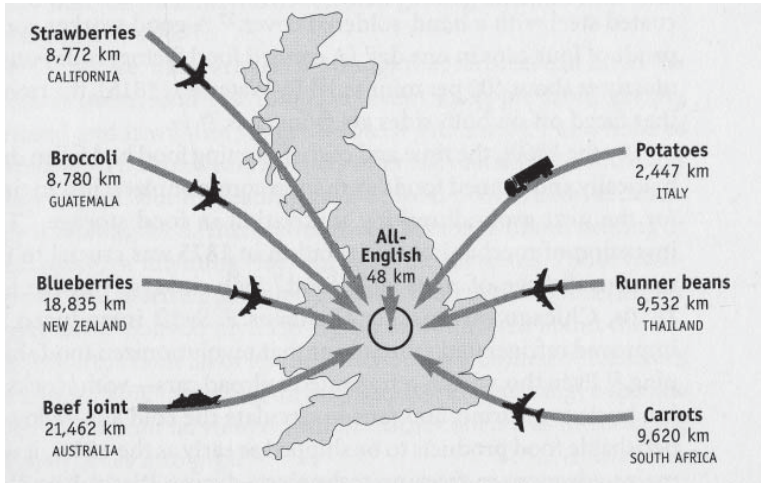
Traditional diets, something which formerly was dictated by locality, has shifted

1 Pfeiffer, Dale Allen - Eating Fossil Fuels

2 Due to the current era of cheap fossil energy.



1.10 Local Versus Imported Ingredients: Iowa



1.11 Local Versus Imported Ingredients: England

focus as food is now imported from a world away; occasionally even created by the whims of food scientists. A person in Toronto, can savour the repasts of the Orient one day, the robust fares of Northern Europe another, or feast on the delicacies of the Middle East the next, each meal complimented with slices of a "fresh" tomato, or orange in the dregs of winter.

> "The industrialization of agriculture - which included the development of supermarkets - also led to the homogenization of the seasons as summer produce (or some semblance of it) began to appear in winter as well."[3]

The variety and scarcity relevant to the seasons has changed into a continual availability of not only vernacular foods, but has provided the consumer with food not available in his/her region. Not only does this create a market where dependency on foreign items becomes the norm, even during seasons of localized production, but it changes the native diet of a region. Local cuisine is diminishing rapidly, and in some locales has vanished completely. This is not to imply that a certain amount of imported food is not necessary or beneficial to cultures with short growing seasons, rather that the issue lies in the increasing dependency upon imported items that could be supplied much closer to the demand. This import dependency supports the methodologies of industrialized agriculture. "The consumer's willingness to pay high prices for food produced out of season has also contributed to the increased use of artificial growing methods and chemicals."[4]

The notion that a product which looks good must inherently be good for us has been ingrained into our social conscious by the

3 Wilson, Alexander - The Culture of Nature (p.32)
4 Fukuoka, Masanobu - The One-Straw Revolution (p.85)

media surrounding food culture. This in turn allows the process involved in creating these products to become secondary and inconsequential to the consumer. Consumer desire and demand for 'image' products assists the growth of industrial chemical agricultures.

> "The consumer demands large, shiny, unblemished produce of a regular shape. To satisfy these desires, agricultural chemicals which were not used five or six years ago have come rapidly into use."[5]

By developing a desire for a mass homogeny to food products, agribusiness shapes the market and is able to dictate a particular agricultural methodology. Control has been removed from the producer and placed in the hands of global corporations. This removes the producer from the context of his locality. Food is produced for profits not for people.

There has been a change in the way that our contemporary culture views its food. This change has wrought the idea that our connection to food has become that of mere commodity, something that is meant only for consumption. Through an increasingly homogenized diet produced by the industrial food system, and maintained through consumer convenience, a valuable aspect of cultures is eroding.

> "The last important change wrought by the Western diet is not, strictly speaking, ecological. But the industrialization of our food that we call the Western diet is systematically destroying traditional food cultures. Before the modern food era - and before nutritionism - people relied for guidance about what to eat on their national or regional cultures. We think of culture as a set of beliefs and practices to help mediate our relationship to other people, but of course culture (at least before the rise of science) has also played a critical role in helping mediate people's relationship to nature. Eating is a big part of that relationship, cultures have had a great deal to say about what and how and why and when and how much we should eat."[6]

As Jules Pretty (Professor of Environment and Society at the University of Essex) argues, not only are we affected by the food systems we support, but the land is as well:

> "We are also shaped by our systems of food production, as they, in turn, shape nature, and rely upon its resources for success. We are affected by what we know about these systems - whether we approve or disapprove, whether the food system is local or distant. We are, of course, fundamentally shaped by the food itself. Without food, we are clearly nothing. It is not a lifestyle add-on or a fashion statement. The choices we make about food affect both us, intrinsically, and nature, extrinsically. We make one set of choices, and we end up with a diet-related disease and a damaged environment. We make another set, and we eat healthily, and sustain nature through sustainable systems of food production. In truth, it is not such a simple dichotomy as this. But once we accept the idea of the fundamental nature of this connection, then we start to see options for personal, collective and global recovery.
>
> The connection is philosophical, spiritual and physical. We are buying a system of production when we purchase food. In effect, we eat the view and consume the landscape. Clearly, the more we consume of one thing, the more likely it is to be produced. But if the system of production has negative side effects, and cares not about the resources upon which it relies, then we have taken a path leading, ultimately, to disaster. On the other hand, if our choices mean more food comes from systems

5 Fukuoka (p.85)

6 Pollan, Micheal - New York Times (Excerpt from Unhappy Meals)

> of agricultural production that increase the stock of nature, that improve the environment while at the same time producing the food, then this is a different path - a path towards sustainability. We must now shape this new path. We will, by walking it, also change ourselves. We will adapt and evolve, and new connections will be established."[7]

As our physical, psychological, and spiritual connections to our food system become further removed from their original source, food becomes a commodity rather than an essential element within cultures. The cultural shift in regards to our notions of food has changed what was once a social concern to what is now merely a concern of commodity production. A consumptive mentality further weakens the connection that we have between the production of our food, and the enjoyment that can be derived from it. "If we make the growing of food a drudgery, which is what "agribusiness" does make of it, then we also make a drudgery of eating and living."[8]

> "Food is something we have in our genes to care about, and we have been severed from that caring for too long. If we could once again regard the act of growing food as a sacred, biological act that connects us to all living creatures, perhaps we would clamor for a system of farming that builds communities, maintains balanced pest populations, keeps soil out of rivers, and doesn't traffic in chemicals that are alien to our tissues." [9]

A shift in our ideals towards food culture, and subsequently our systems of food production and distribution must occur. The vast distances food travels in order to satisfy our desires needs to be revised with an emphasis on locality stressed whenever possible. The value of food as a cultural artifact must receive due recognition. Without addressing these fundamental flaws within our food culture we will have a difficult time in achieving a sustainable food system. Already there is a looming food crisis; a crisis that has currently begun in developing nations; a crisis that our consumptive patterning, adherence to industrial agricultures, and our unseasonable desires are accountable for. We shall look further into this crisis in the following section.

7 Pretty, Jules - Agri-Culture (p.11)
8 Berry, Wendell - The Unsettling of America (p.138)
9 Benyus, Jane - Biomimicry (p.57)


obey

“We’ve got a train wreck coming that’s going to be greater than anything we’ve ever seen in agriculture.”

-Tom Buis

Head of the U.S. National Farmer’s Union

1.4 GLOBAL INSECURITY

Prices are rising ...

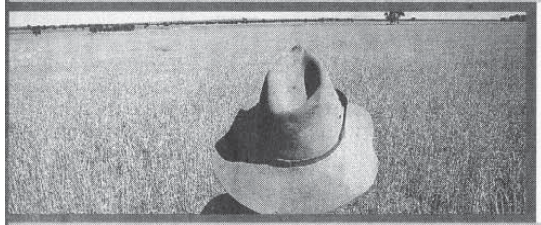
A combination of high oil and fuel prices, rising demand for food, the use of farmland and crops for biofuels, bad weather and speculation on futures markets have pushed up food prices.

CAUSES

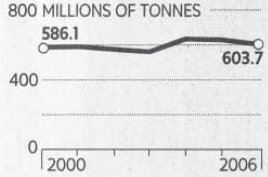
WHEAT INVESTMENT*

HOT MONEY

Global investment funds saw the potential for profits in commodities outstripping the potential of the stock market, and started diving into oil in 2002, followed by metals and then grains. This move was fuelled by falling interest rates – which make fixed-income investments less attractive – and a weak dollar, which tends to drive up the price of dollar-denominated commodities such as grains. Speculative investment in these markets has pushed prices of corn, soybeans, wheat and rice to new highs.

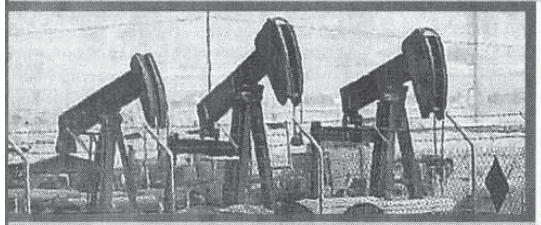


WHEAT PRODUCTION



HIGH AND DRY

Unfavourable weather, particularly in Australia, a major wheat exporter, has wreaked havoc on crops. Governments and private grain dealers used to hold large inventories in case a bad harvest created a sudden shortage. But over the years, these inventories have dwindled on the belief that countries suffering crop failures could import the food they needed. That left the world food balance vulnerable to a crisis affecting many countries at once.

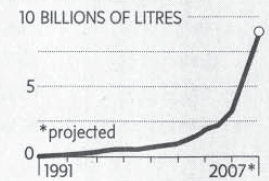


CRUDE OIL

CRUDE AWAKENING

With oil now above $100 a barrel, energy prices have become a major factor driving up agricultural costs. A lot of fuel goes into producing fertilizer, running tractors and, not least, transporting farm products to consumers. Oil prices are being driven higher in part by the growth in major, emerging economies, including China and India. Directly and indirectly, these rising economic powers are competing with other countries for scarce resources, including oil and farmland, driving up prices for raw materials.

BIOFUEL PRODUCTION

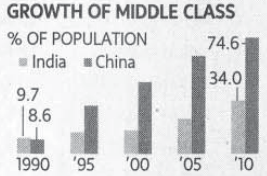


BLAME BIOFUELS

Spurred by fears over global warming and the drive for energy independence, countries have moved aggressively to promote the production of ethanol made from corn. That means more land is being used to grow biofuel feedstock, and used less to grow food. The United States is using subsidies to realize a mandate to produce 34 billion litres of ethanol, made from corn, this year and 38 billion litres in 2009.

◄ Ethanol represents 90% of biofuel production

GROWTH OF MIDDLE CLASS



RISING MIDDLE CLASS

A growing number of people in emerging economies now find themselves wealthy enough to start eating a more varied diet. Not only are consumers in places such as India and China eating more meals, their diets have changed with an increasing demand for meat. Arable land diverted to producing feed for animals reduces land available to grow crops for humans. Producing a kilo of meat takes many times the number of acres required to produce a kilo of rice.

1.13 Prices are rising...

In any static complex system the more stages there are, the greater the opportunity for failure. The fact that failure could, and does occur within our food system is frightening, for failure can mean widespread disease, famine, or even death. The reason behind this is the massive scale of the system, which is indicative of its global nature. We currently have many expectations of our food; we expect that it will not harm us; we expect the availability and variety of food; and we expect the low cost of food to be a standard of our lifestyle. All of these expectations, or reliances, are increasingly threatened due to the scale of our food system. There is an ever-expanding health risk associated with our food. Shortages of staple foods are being noted worldwide. The price of food is reliant upon many factors outside of our control, examples such as inclement weather, or speculation on futures markets only give a partial picture. As our food system has grown increasingly larger - so too has its instability.

With the current scale of our food networks, tracking the source of potential or occurring threats is a monumental endeavour. Too many cooks in the kitchen, has concocted a recipe for disaster.

> "In a highly centralized and industrialized food-supply system there can be no small disaster. Whether it be a production "error" or a corn blight, the disaster is not foreseen until it exists; it is not recognized until it is widespread. By contrast, a highly diversified, small-farm agriculture combined with local marketing is literally crisscrossed with margins, and these margins work both to allow and encourage care and to contain damage."[1]

If we look at recent health crises linked to food, we note that many can be linked to the sheer scale of the system. Factory farming contributes to the rapid spread and development of animal borne-disease[2]. Even organics, a popular totem of health, can become harmful when a stage in the system fails[3]. In this case the failure was reportedly linked to improper storage. Our continuing solution to these threats has been to further uphold the industrial system of food production, applying patchwork scientific methods and remedies to secure food safety. Animal health within close-quartered environments is maintained by injecting livestock with antibiotics, and hormones[4]. Harmful bacteria, such as Ecoli, which can be introduced through the processing, packaging, and storage procedures is guarded against by the irradiation of meat[5] (in the United States) and recently leaf vegetables[6]. Chemical preservatives are added to processed foods in order to prolong their shelf-life[7]. Recently it was discovered that a chemical commonly used in food packaging, contributes directly to cancer[8]. Vegetables are artificially ripened with ethylene gas so they appear fresh upon purchase, after being picked prematurely and transported long distances. All these measures are taken to ensure that our food supply is safe from harmful elements, attractive to consumers, and reduced to formulaic methodologies, however, we still do not know many of the long-term health effects

1 Berry, Wendell - The Unsettling of America (p.223)
2 CBC - Passionate Eye "Frankensteer" (06/04/2007)
3 "Organic Food Goes Global but at what Cost?" - The Globe and Mail (05/05/2008)
4 Pollan, Michael - An Omnivore's Dilemma
5 The Fatal Harvest Reader
6 "Irradiation is the most effective way to kill bacteria lurking in salad greens" - The Globe and Mail (04/15/2008)
7 The Fatal Harvest Reader
8 "Bisphenol A can alter genes, study finds" - The Globe and Mail (04/18/2008)

these processes may cause.

As we strive to feed a growing world population - we wage a constant war against nature to provide increased yields to satisfy world demand. The Green Revolution of agriculture promised to be a boon to the agricultural productivity and to free the world from hunger. Its industrialized approach to agriculture provided huge yields and massive surplus during its initial development. As years wore on however, production levels peaked and in some instances began to decline[9]. Although it has managed to keep pace with world population has unfortunately turned out to be a major obstacle in satisfying local demands in developing nations.

> "The Green Revolution of the 1960s "converted" whole nations from a relatively healthful, native-derived crop diet to one of foreign-bred wheat, rice, corn, oats, and so on. Everywhere, farmers have abandoned local plants that were hardy, disease resistant, and well-suited to their climate, and are instead growing plants imported from other regions, plants dependent on chemical and petroleum companies for their yields."[10]

With new technologies and methodologies introduced to agricultural production in developing nations, there was a shift from the growth of staple crops to feed a local populace, to the production of cash or seasonal crops to fill foreign desires. At the same time, developed nations dumped surplus staple foods into foreign markets destroying the market viability of local crops[11]. In the past countries would hold this surplus in stock for the possibility of years when there would be a poor harvest[12]. With the development of world demand and trade, these surpluses are now sent globally to flood foreign markets. Farmers have become denied the opportunity to feed themselves or their benefit economically from local markets[13]. Not only does this create a market where dependency on foreign items becomes the norm, even during seasons of localized production, but it also changes the native diet of a region. This is not to imply that a certain amount of imported food is not necessary or beneficial to cultures with short growing seasons, rather that the issue lies in the increasing dependency upon imported items that could be sourced locally.

Global warming has been blamed for the increase in frequency and devastation of natural disasters we have seen in the past few years. Prolonged drought has led to the devastating yields of Australia's wheat crops[14]. The UN has predicted that a few degrees increase in temperature, will have a devastating effect on food production in many parts of the world. Countries whose capacity for food production is already unstable could lose their already limited capability of growing their own food, relying further upon importations from abroad. These disasters wreak havoc on staple food supplies which, already stressed, are in increasing demand as world population continues to grow.

Another cause of concern for further world food shortages is a direct result of our hunger for energy. There are now huge markets for grain based biofuels as countries attempt to lower their carbon footprint through regulations requiring the use of 'renewable' fuels. But studies indicate that the production of biofuels, particularly ethanol, results in a net energy loss[15]. Essentially it requires more energy to produce the fuel, than is actually derived from it. Farmers, aware of market demands and trends, race to convert fields of food, to fields of fuel in order to reap increased profits in the short-term.

9 Pfeiffer, Dale Allen - Eating Fossil Fuels
10 Benyus, Jane - Biomimicry (p.160)
11 Lappé, Frances Moore - Hope's Edge
12 "How the CUpboards went Bare" - The Globe and Mail (04/12/2008)
13 Lappé, Frances Moore - Hope's Edge
14 Australia is the 3rd largest exporter of wheat behind the United States and Canada
15 Pimentel, David - Food, Energy, and Society

An additional cause to the increasing prices is an emerging desire for a Western diet in developing countries. A diet that is founded on wheat, and heavy in meat protein - which is intensive to produce, and diverts food staples from people to animals. In Canada alone we are currently importing five times as much grain as compared to ten years ago, while exporting ¼ less[16]. As we produce more grain than we consume, this change can only be accounted for through the doubling in national meat production within the same time frame. However, as we are only consuming 25% more meat as before[17], it is primarily for the export market that this change has occurred. We can confidently assume that the demand is coming from the emerging middle-class in developing countries such as China and India, who with newly acquired wealth, and huge populations, are spending more of their new found income upon their food budget.

Finally the price of oil, currently over $100 per barrel, is increasing constantly - and will inevitably continue its ascent as world demand begins to outstrip supply. As contemporary agriculture relies heavily upon fossil fuel inputs, not only for its production but its transport as well - the associated cost of food inherently rises to maintain the economic viability of agriculture.

In short, these factors are part of the cause for the dramatic rise in food prices we have seen globally. Already in developing countries, riots have erupted over the increased prices of food. Armoured convoys transport staples from fields to cities. Farmlands are guarded by armed farmers protecting them from nighttime raiders. Our globalized food system is in danger of collapse. Its structure has already begun to weaken as is evident in the food crises occurring in developing countries. World population and its associated land use is increasing under an unbalanced formula, where reliance upon global commodity has become the necessity for not only growth but survival as well. We need to shift our reliance from a system that is out of scale to our needs, and reassess the realities of our desires.

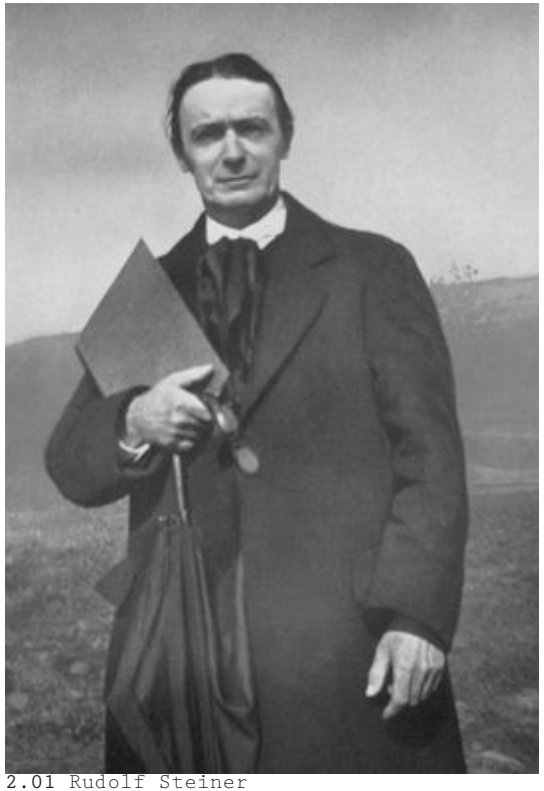
16 Statistics Canada - Agricultural Imports/Exports 2006
17 Statistics Canada - Food Statistics 2006

2.0 ALTERNATIVES

There have been numerous technological developments in agriculture, countless philosophies towards land stewardship in agriculture, and a veritable cornicopia of ideals for food production. This section provides an overview of six major contibutors to agricultural methodologies that are concerned with the sustainability and health of the land and agriculture. It is these figures who have provided exemplary examples of alternatives to our current modes of production.

2.1 FIGURES

RUDOLF STEINER



2.01 Rudolf Steiner

"From one aspect or another, all interests of human life belong to Agriculture."

METHOD: Biodynamic Agriculture

IDEOLOGY: The farm is seen as a whole organism, and therefore should be a closed, self-nourishing system.

PRINCIPLES:
- produce all manure and animal feed within farm 'organism'
- timing activities, i.e. planting in relation to movment patterns of moon and planets
- "preparations", which consist of natural materials which have been processed in specific ways, to soil, compost piles, and plants with the intention of engaging non-physical beings and elemental forces
- disease is not an isolated problem but a symptom of problems within the entire system

KEY TEXTS: Agriculture - A Course of Eight Lectures (1924)

IDEAL USE: For the cycling of vegetative and livestock wastes, to maintain plant health. To develop a closed-system within agricultural production.

SIR ALBERT HOWARD

2.02 Sir Albert Howard

“The health of soil, plant, animal and man is one and indivisible.”

METHOD: Early Organics

IDEOLOGY: The health of crops and animals is directly related to the health of the soil.

PRINCIPLES:
- raising of mixed crops
- suggests plants grown in chemically fertilized soils are lacking in health and vigour
- ’Law of Return’: what comes from the soil, must return to the soil
- ’Indore Method’ of composting

KEY TEXTS: An Agricultural Testament (1940)

IDEAL USE: To replenish and maintain soil fertility and health.

MASANOBU FUKUOKA

2.03 Masanobu Fukuoka

“The ultimate goal of farming is not the growing of crops, but the cultivation and perfection of human beings.”

METHOD: Natural Farming

IDEOLOGY: Nature can be capable of providing sustained food yields if the rules of a natural order are adhered to.

PRINCIPLES:
- no-till/cultivation of land
- no fertilizer
- no weeding
- no pesticides
- ground is always covered, either with cover a crop(i.e. white clover), or remnants of previous crop (chaff)
- each crop sown before previous one harvested
- emphasis on maintaining diversity
- natural pest management
- sowing with “seed balls”

KEY TEXTS: The One-Straw Revolution (1978)
The Road back to Nature (1987)

IDEAL USE: For natural growth of rice, barley, oats, and long-term fruit orchards.

BILL MOLLISON

METHOD: Permaculture

IDEOLOGY: A designed system utilizing the synergetic aspects of nature to develop a “permanent agriculture”.

PRINCIPLES:
- use of polycultures employing crop-rotation, multi-cropping, inter-cropping or alley cropping
- minimize waste, human labour, and energy through system design
- system evolves over time
- use of zones to organize, based on frequency of human use
- layering of system (8 layers)
  1. The canopy
  2. Low tree layer(dwarf fruit trees)
  3. Shrubs
  4. Herbaceous
  5. Rhizosphere (root crops)
  6. Soil Surface (cover crops)
  7. Vertical Layer (climbers, vines
  8. Mycosphere (fungi)
- design of land use or system that has multiple outputs
- development of edge conditions to increase productivity and useful connections

KEY TEXTS: Permaculture One (1978)
Permaculture Two (1979)

IDEAL USE: The development of permanent mixed-crop and livestock systems.

2.03 Bill Mollison

“The only ethical decision is to take responsibility for our own existence and that of our children”

WES JACKSON

2.05 Wes Jackson

“If we don’t get sustainability in agriculture first, sustainability will not happen.”

METHOD: Natural Systems Agriculture

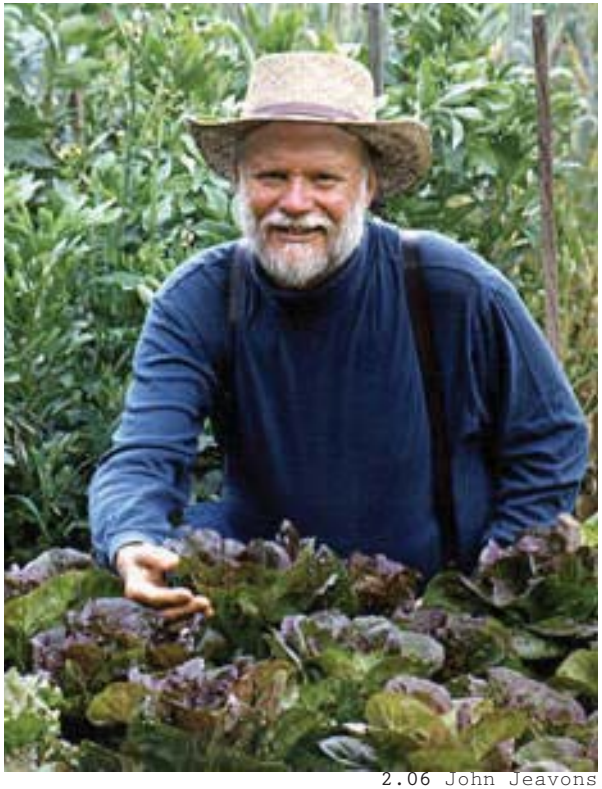
IDEOLOGY: The development of a system should maintain the ecological stability of the land while providing comparable yields to coventional agricultures.

PRINCIPLES:
- perennial polycultures
- intercropping
- maintain relationship between plants and soil to ensure soil fertility
- no-till/cultivation

KEY TEXTS: New Roots for Agriculture (1980)

IDEAL USE: For growth of wheats, sorghum or sunflowers in field crop production.

JOHN JEAVONS -'GROW BIOINTENSIVE'™



2.06 John Jeavons

"A sustainable community involves a dynamic inter-dependent relationship between each of us and the resources that sustain our lives."

METHOD: 'GROW BIOINTENSIVE'™
Biointensive Agriculture

IDEOLOGY: Application of methods to maximize the effectiveness of nature's life processes.

PRINCIPLES:
- deep soil penetration
- use of compost
- close plant spacing
- synergestic planting of crop combinations
- farming of carbon-efficient crops
- farming of calorie-efficient crops
- use of open-pollinated seeds
- whole, interrelated farming system

KEY TEXTS: How to Grow More Vegetables (1974)

IDEAL USE: For intensive, sustainable, growth of vegetables and fruits.

The following section summarizes six architectural visions. The projects, some utopic visions, some unrealized imaginings, are all united through the underlying thread of developing self-sustaining societies by the connection of the built environ with agricultural production. A short synopsis of each project outlines the ideology, and proposal, while an analysis of the population, density, and agricultural production are shown graphically for ease of comparison. (Please refer to Legend below for symbology.)

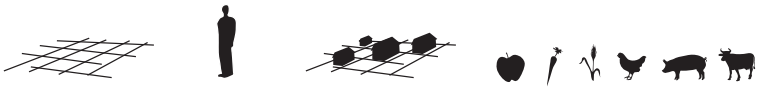
2.2 VISIONS

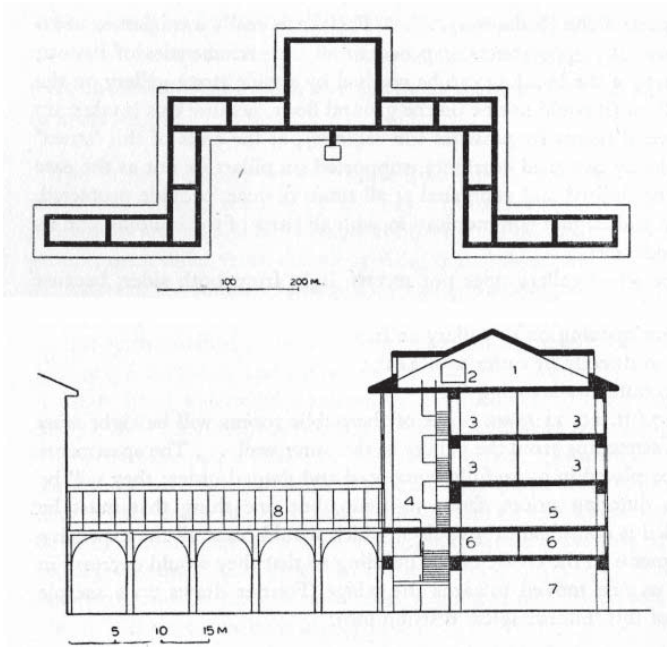
THE PHALANSTÈRE - 1808

Charles Fourier

The phalanstere was developed through Fourier's belief that a moral and just society required a concerted effort of its citizens in order to achieve a state of universal harmony. The phalanstere was envisioned as a single building complex, that would house all individuals of Fourier's new social order. This social order was comprised of 1620 individuals, who would be as varied as possible "in the passions and faculties of the members". This was to ensure that it would be easier to create a harmony between all its individuals, and their particular labours. The community was termed a Phalanx, and a collectiveness and devotion amongst its members was meant to be wrought through the shared efforts of individuals to the mutual benefit of the community. All types of agriculture work were to be included, as well as manufacturing work, and the diverse types of work in the applied sciences and arts.

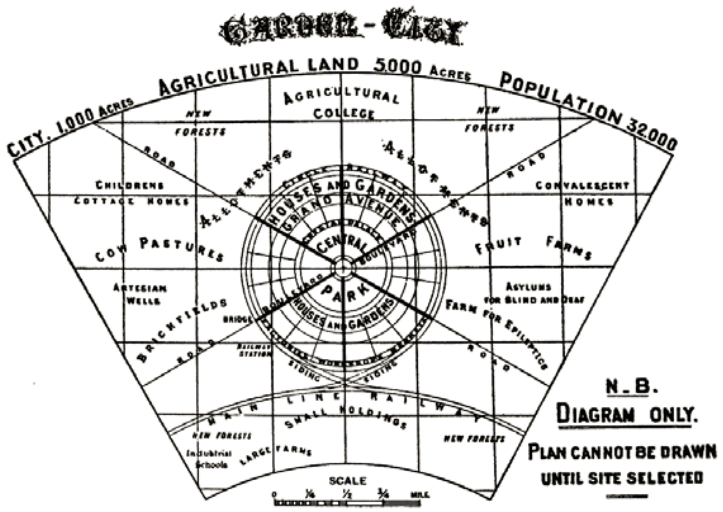
The phalanstere was to be an organized building capable of integrating ideal urban and rural features. The phalanstere was construed of three parts: a central core and two lateral wings. Interior corridors, known as Street Galleries, allowed for the internal circulation and community associations within the building. The central part, designed for quiet activities, was comprised of apartments, dining rooms, meeting rooms, libraries, and studies. One lateral wing was to house labour and noisome activities, the other contained elements for meeting with outsiders (ballrooms, halls, etc.). The community was to be located on three square miles land, with "a good stream of water should be available; the land should be hilly and suitable for a variety of crops; tehre should be a forset nearby; and the site should be fairly near a large city.



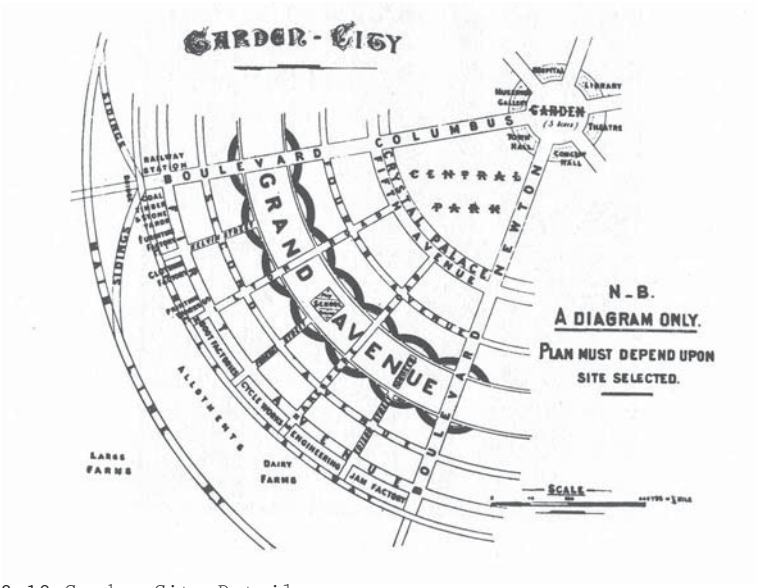


2.07 Phalanstery Plan and Section

2.08 View of a French Phalanstery



2.09 Garden City



2.10 Garden City Detail

GARDEN CITY - 1902

Ebeneezer Howard

The Garden City was a vision proposed to remedy the disparate ideals of Town and Country, that Howard deemed was paramount to creating a social tragedy. Howard envisioned a city that remained at a human scale, one with a definite size, form and boundary, that would become a balanced environment between Town and Country. This new “Town-Country” would combine the nourishing atmosphere of the open country, with the social advantages of the city. It would provide equal opportunity for both the rural and urban aspects of contemporary society. In outlaying his proposition, Howard’s scheme had three major points:

1. The land in the garden city is not parceled out into individual ownership: it must be held by the common authority under which it is developed: such increments as may arise through the growth of the garden city must be reserved for the community.

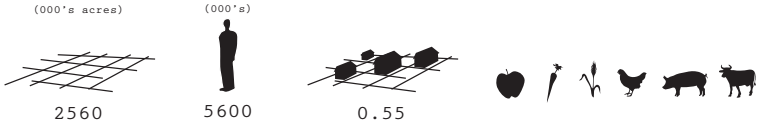
2. Controlled growth and limited population. Each garden city was to be contained by a permanent reserve of open country: to be used either for agriculture or recreation. This agricultural belt was not merely to serve as a green wall against encroachment of other communities, it was to provide opportunity for the local production of food.

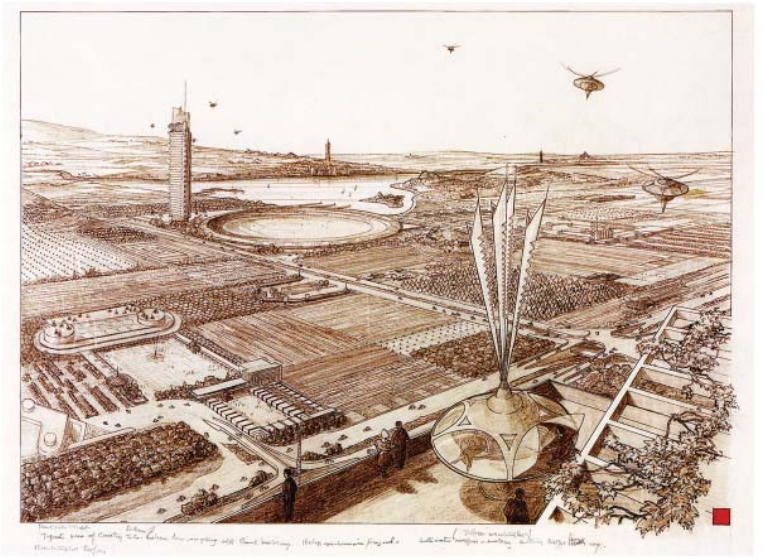
3. There was to be a functional balance in both regional relations and in internal development. In regional relations it was to be a balance between town and country; in internal development to be a balance between home, industry, and market, between political, social, and recreational functions.

BROADACRES - 1932

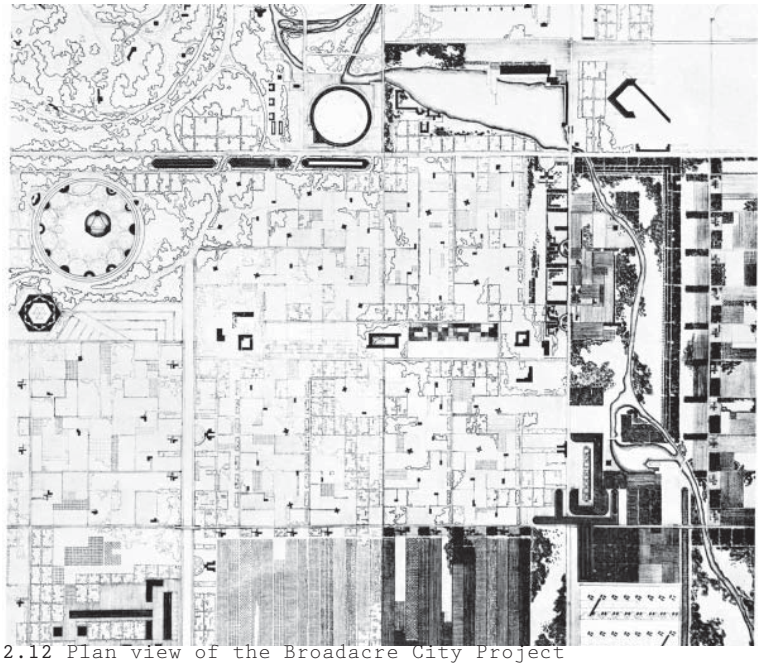
Frank Lloyd Wright

Broadacres was Wright's vision for a utopian America, that would sprawl across the nation providing each citizen with at least one tillable acre of land, and residing within a single family household. The plan is centred around an idealized combination of mechanized mobility and the homestead archetype.
Wright foresaw that with current developments in automobiles, and the highway system individuals would no longer be limited in range. The country could become a continously gridded, and settled 'city' that would be fundamentally agrarian. A continous city, Broadacres would have designated service areas, grouped by function, located at major arterial hubs. Each homeowner was to use their alloted land for agricultural or leisure purposes.
Decentralization would be core to his proposal, where each individual would be partially if not wholly responsible for their own self-sufficiency. Agriculture would be the basis to develop a new social and economic structure. A structure in which agriculture and industry could and would develop hand in hand.





2.11 Broadacres - Aerial Perspective

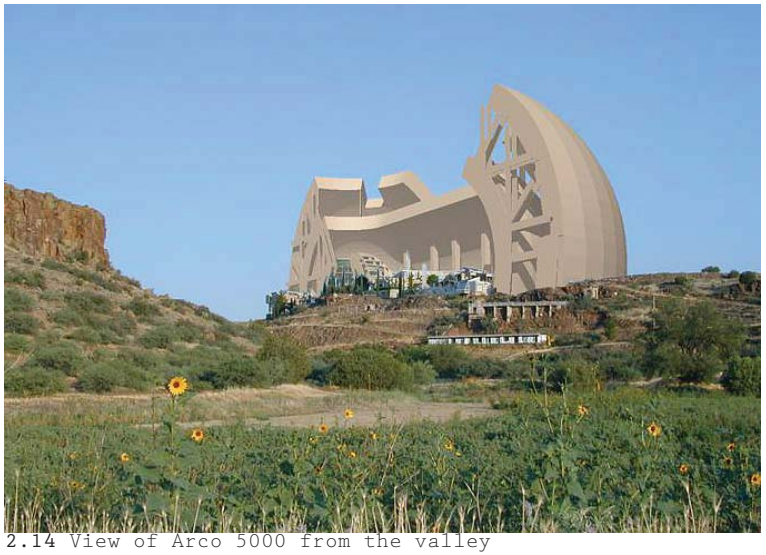


2.12 Plan view of the Broadacre City Project

ARCOSANTI - 1970

Paolo Soleri

2.13 Arcosanti 5000 Site Plan

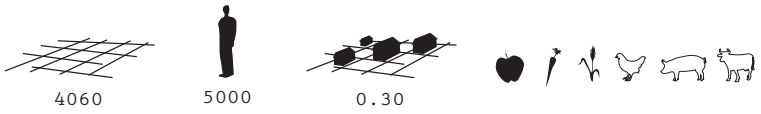


2.14 View of Arco 5000 from the valley

Derived from his concept of arcology (“the notion that the built and the living interact as organs would in a highly evolved being”), Soleri designed Arcosanti as a facility for investigating new urban patterns to demonstrate ways that urban conditions could be improved while minimizing their destructive impact on the earth. The primary aim was to present an alternative to urban disaster.

The ideal population is meant to reach around 5000 people, who will reside in the 25 acre built complex that is built upon a 4060 acre land reserve. In this complex, creative environment, apartments, businesses, production, technology, open space, studios, and educational and cultural events are all accessible, while privacy is paramount in the overall design. Greenhouses provide gardening space for public and private use, and act as solar collectors for winter heat.

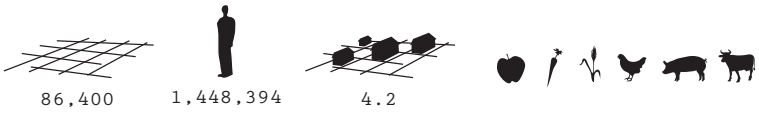
Arcosanti is intended to engage in the betterment of man’s condition and in the conservation of nature in as much as they both depend on the creation of efficient humane cities. The conservation of nature, a core principle of Soleri’s arcology, is upheld in his vision for Arcosanti as it entwines its built environment and the surrounding countryside through the integration of natural systems (i.e. solar orientation, passive heating and cooling systems etc.)

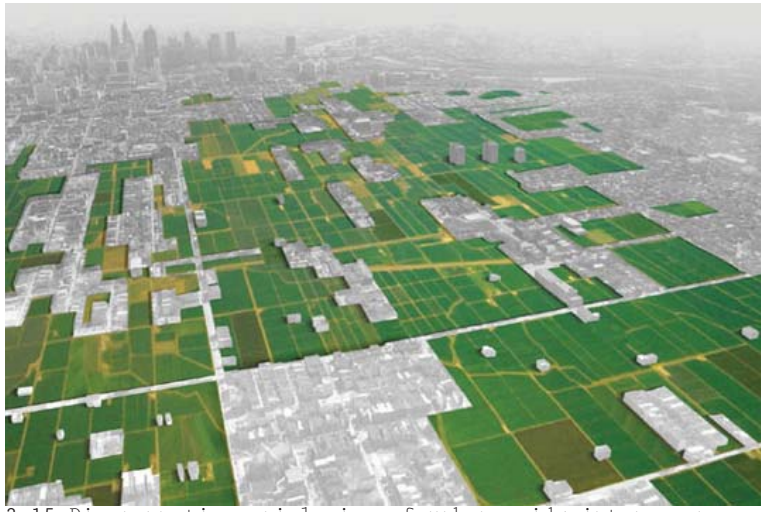


FARMADELPHIA - 2006

Front Studio

“FARMADELPHIA proposes to transform the urban environment by introducing bucolic farmlands into the city’s urban fabric. Farmadelphia adopts the extensive sprawl of overgrown lots and vacant buildings as a source of inspiration while it fortifies and reinforces the ongoing green legacy of Philadelphia. The insertion of incongruous rural elements assigns a new use for the abandoned parcels, creating a juxtaposition between farm and city that challenges its residents to revitalize their surroundings and daily lives. The conversion of vacant lots into farmlands not only provides employment in the industry of agriculture but also empowers residents to take charge of their lives and their land. Each block maintains responsibility for its own farm harvest, encouraging entrepreneurship throughout the larger community as block owners vie to sell their goods to regional specialty restaurants and shops. The creation of localized centers of activity, each related to a specific crop or harvest promotes small town relationships while strengthening an overall sense of pride and commitment in the community. The cultivation of local gardens provides an opportunity for residents to access fresh and nutritious food. The ‘Farmadeliphication’ of once decrepit buildings into farm structures advances fresh ways of seeing old structures as well as allowing for an organic transformation of history that contributes to the present day fabric. The irony of the farm and the city ceases to be a paradox as both function as one integral machine, combining the pleasure of open sky and land with the richness of city living.” -Front Studio



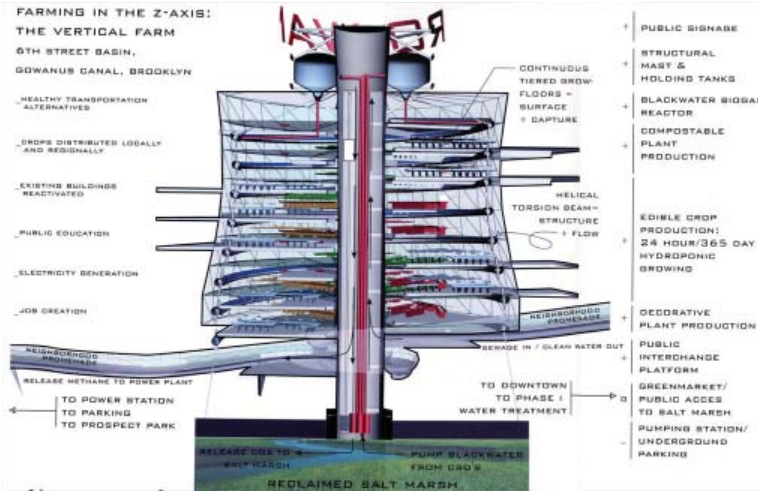


2.15 Diagrammatic aerial view of urban voids interwoven with agricultural patchwork

2.16 A field of golden wheat provides bread for the community

VERTICAL FARMS

Various



2.17 Farming in the Z-axis

2.18 Vertical Farm

2.19 Vertical Farm at night

The vertical farm is an alternative strategy to contemporary farming methods, employed within an urban context, in order to feed an increasing world population on the decreasing availability of arable land. They are centres for urban food production, engaged in the notion of sustaining cities without relying upon resources beyond their urban footprint.
Food is continuously grown year round within tall structures (around 30-storeys), with a cycling and integration of energy, water, and waste processes to ensure maximized environmental potentials. Through the internalized structure of the food production, it safegaurds crops against the severe weather events that contemporary agriculture can suffer from. It also assures the health of food from communicable disease, through its sterile, controlled environs.
The implementation of vertical farms would localize food sources, reducing the need for imports. As produce would be distributed within a local context, it would also reduce spoilage, and support local economies. The farms would provide alternative employment opportunities within the city. As production is moved from the country into the city, it would allow for the succession of current agricultural lands into mature ecosystems.

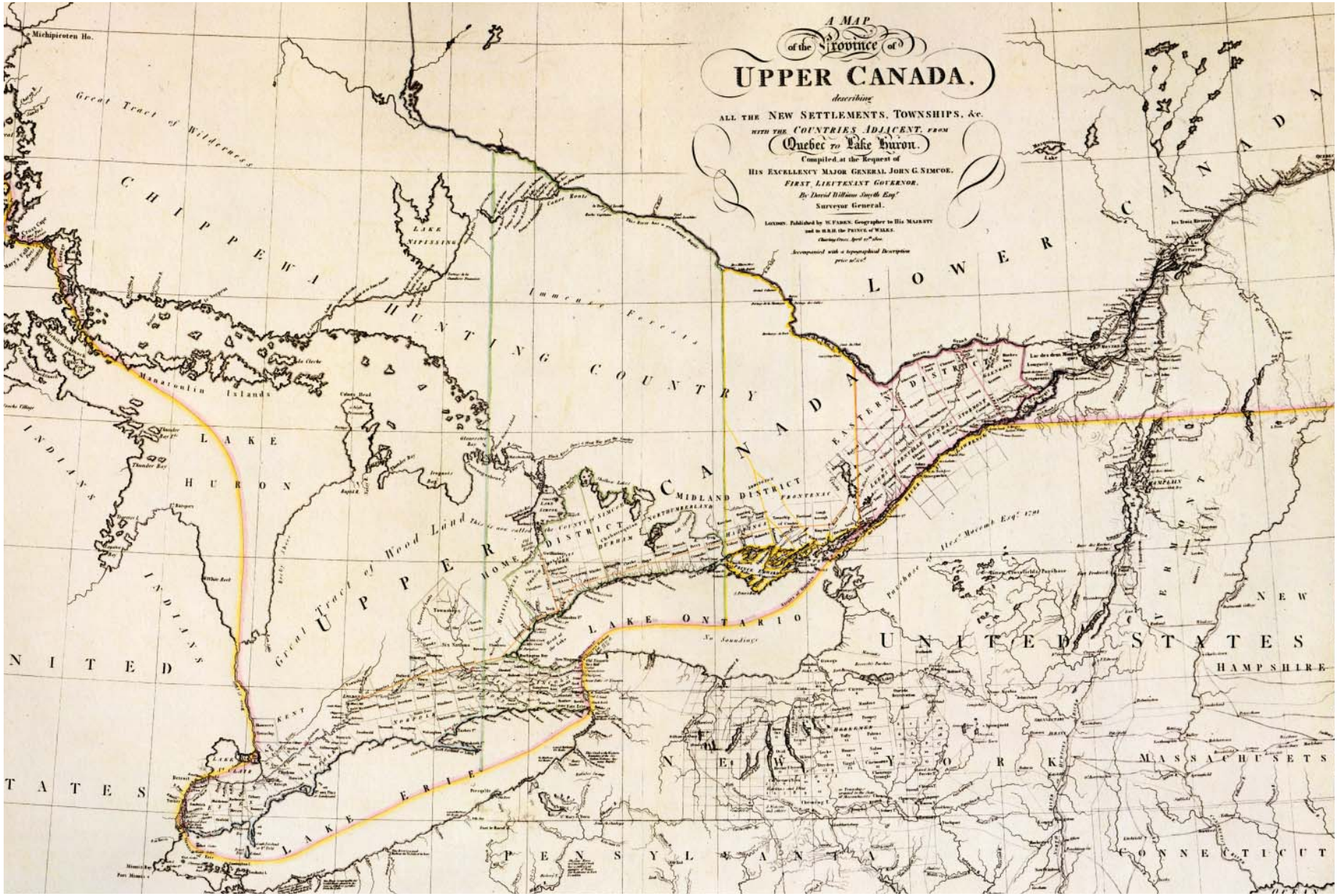
2.3 (footprint)
69 (gross area)

10,000

N/A

The original surveys and development patterns of the Canadian Frontier laid out guidelines of what was to come. In this section we shall through mapping studies, look at how Upper Canada, what is now Ontario, initially developed, delineating the pattern for future developments. From the large scale surveying of counties, and townships, to the scale of town-planning, and rural lot division, one can note to what extent these strategies have shaped our environment.

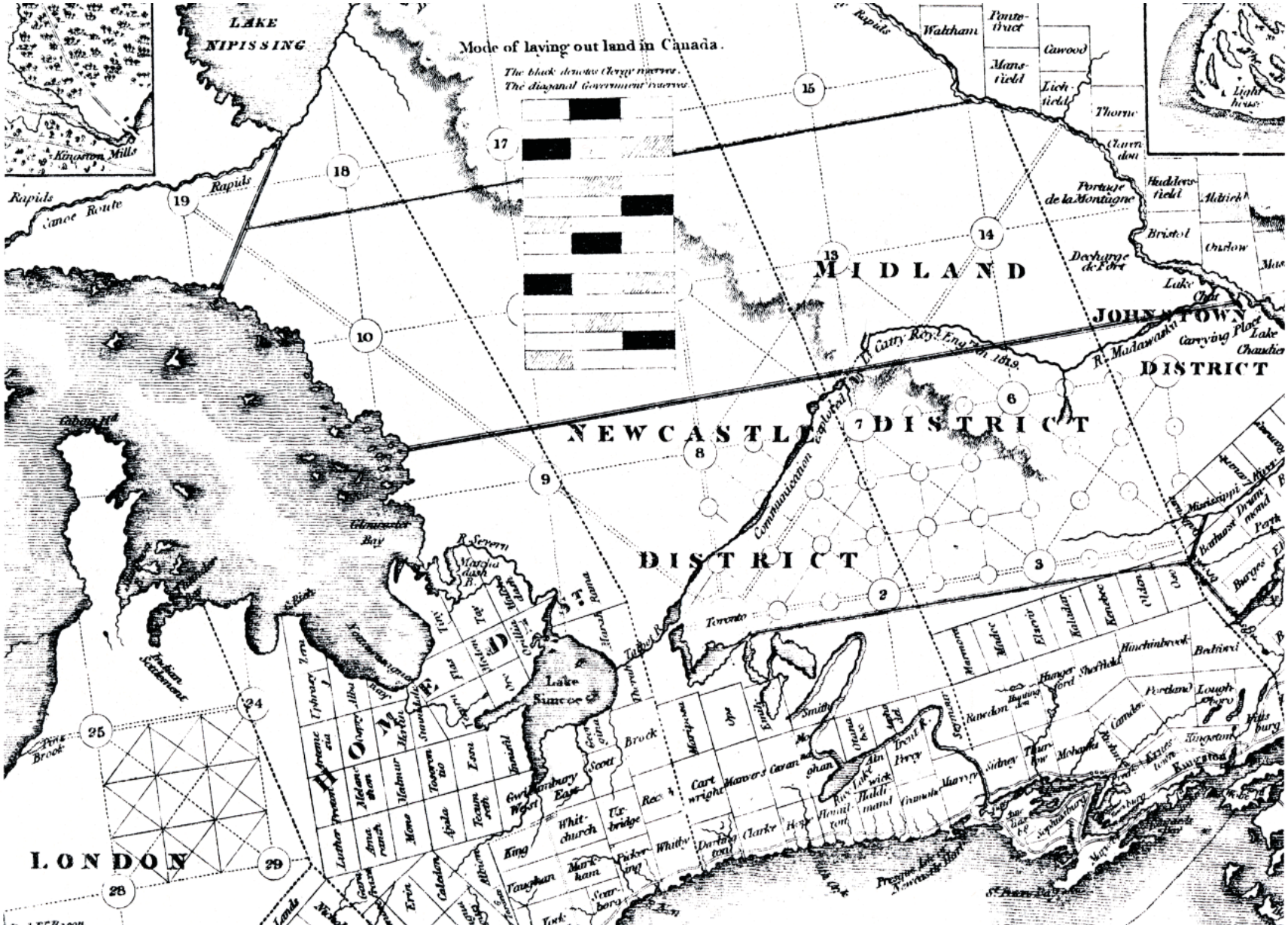
2.3 PATTERNS



2.20 1800. *A Map of the Province of Upper Canada, describing all the New Settlements, Townships, etc. with the Countries Adjacent, from Quebec to Lake Huron.* (David William Smyth)
Existing and proposed settlements, former denoted by small squares the latter by dotted squares or circles. Indian villages are shown, as well as districts, counties, and townships.

2.21 1813. *A Map of the Located Districts in the Province of Upper Canada, Describing all the New Settlements, Townships, etc. with the adjacent Frontiers.* (William Chewett)
There are now 8 districts and 24 counties. Townships have increased in number.

2.22 1821. *Map of Upper Canada.* (Robert Gourlay)
Settlement pattern of the province, actual and proposed. The unsettled area Gourlay proposed a scheme of development represented by a hexagonal grid of roads and a heirarchy of places.

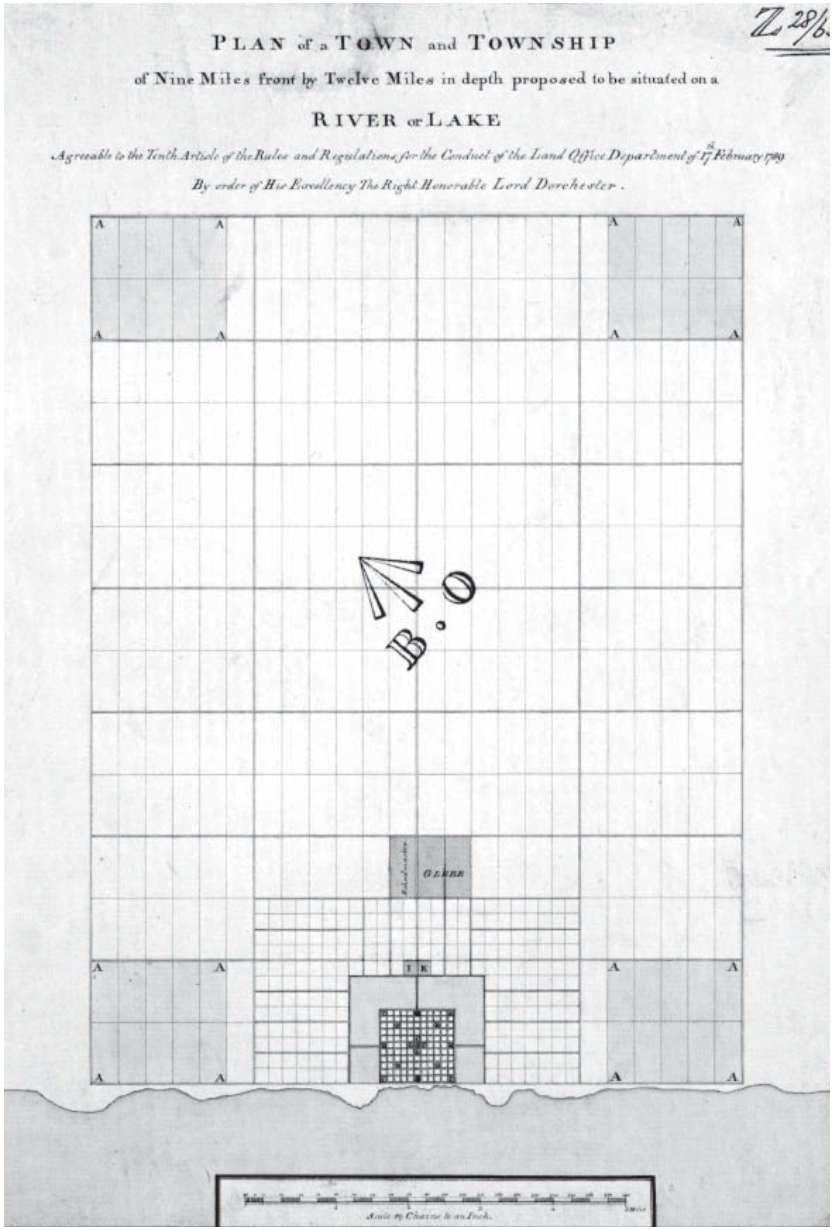


2.23 1821. *Map of Upper Canada - Detail*

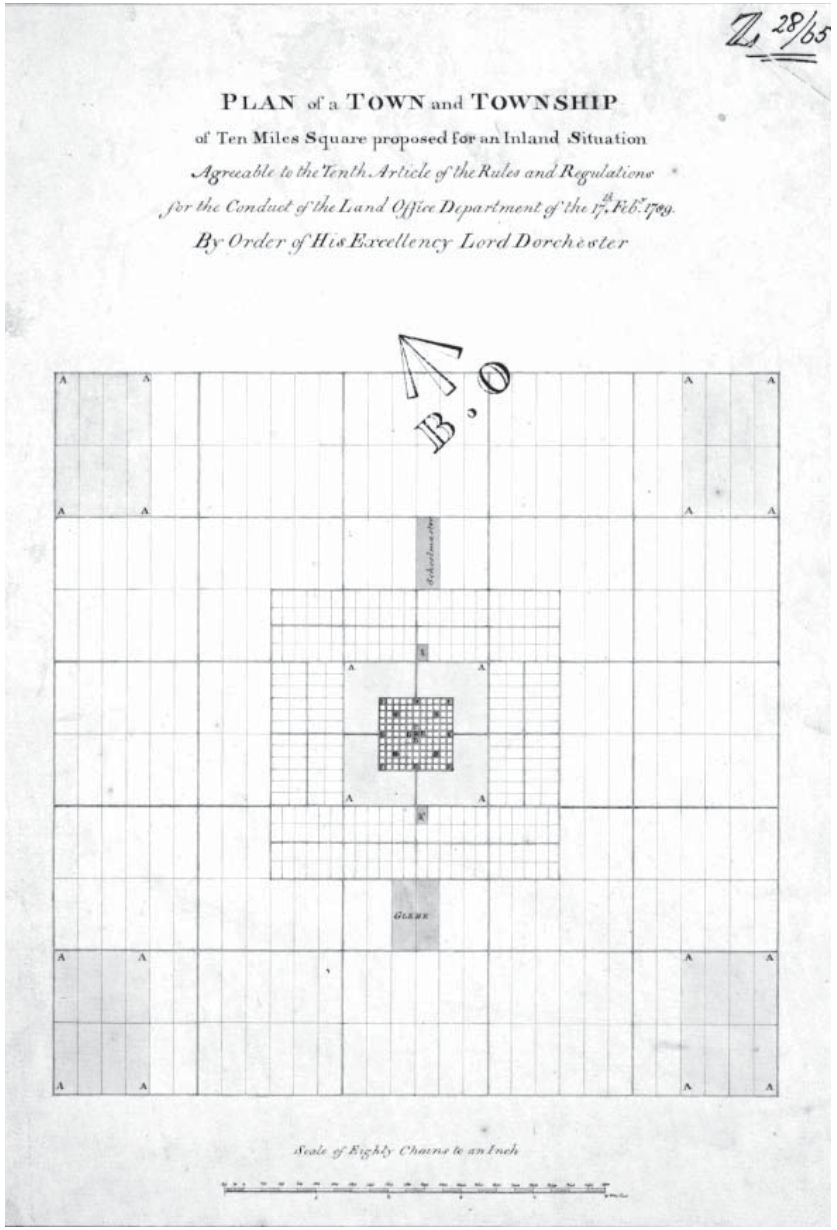
Large circle-New Capital City, smaller circle-County-towns, smallest circle-towns, double dotted lines-grand central highways, single dotted lines-county roads, lines-township roads, treble lines-canals. Major hindrance of such a plan was the variety of uses of teh land itself, for agriculture, for road building, for forestry, and for power sites. But the theoretical notions of spatial planning are little different from those that a century or more later became the basis for our present geographical 'models' for the placement of urban service centres.

2.24 1862. *Tremaine's Map of Upper Canada.* (Geo. R. Tremaine)
Shows total extent of territory occupied and prepared for occupation.

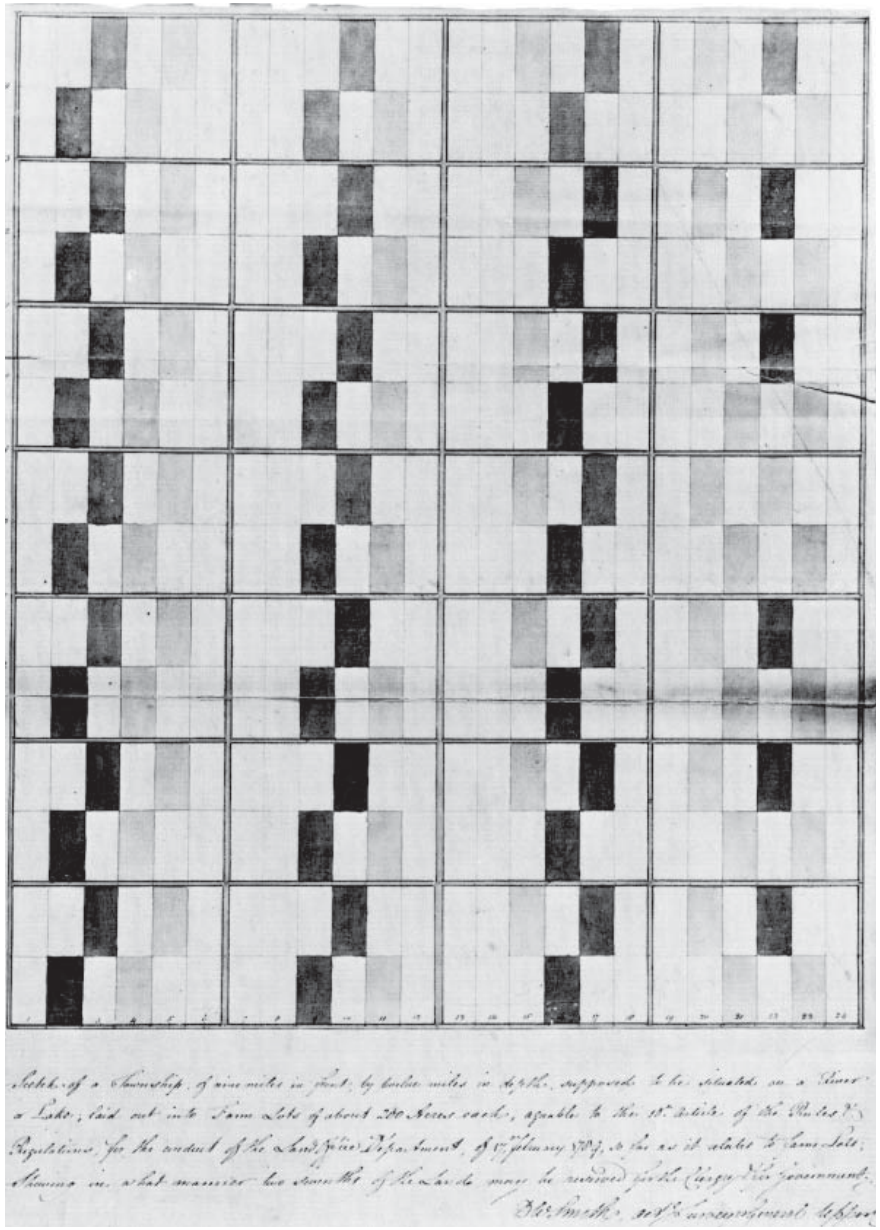
2.25 1862. *Tremaine's Map of Upper Canada -Detail* (Geo. R. Tremaine)
Illustrates the considerable cultural detail present, including a thorough naming of centres; counties and townships are shown, with subdivision into lots and concessions providing a good record of the extent and patterning of surveying; roads are classified and railways and canals are marked.



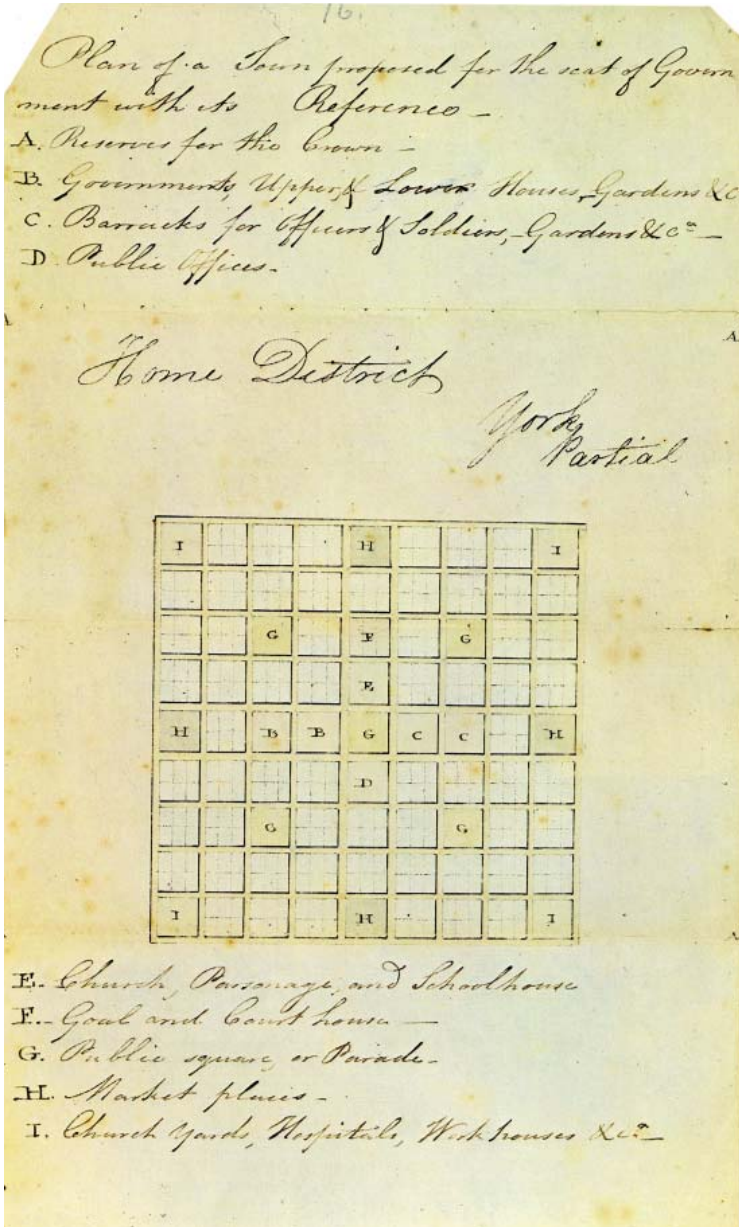
2.26 1789. *Plan of a Town and Township of Nine Miles front by Twelve Miles in depth proposed to be situated on a River or Lake.*
Lord Dorchester's attempt to standardize the size and design of the townships. Included were a townsite with town lots, a military reserve around the townsite, and park lots for town people between the reserve and the regular farm lots beyond. Other blocks of reserved land were located in the corners of the inland townships.



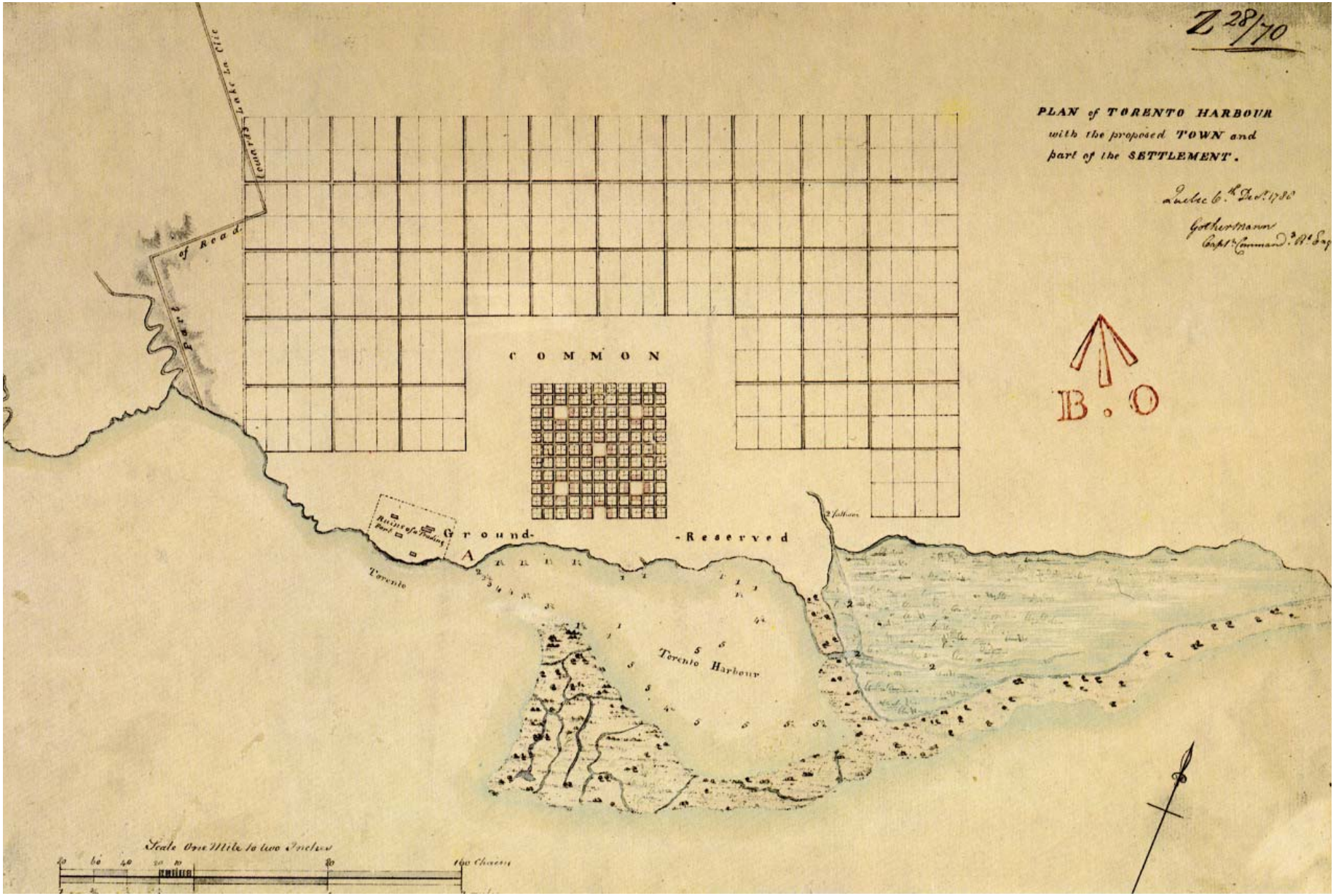
2.27 1789. *Plan of a Town and Township of Ten Miles Square proposed for an Inland Situation.*
The Dorchester townships were modified by Simcoe. The ten-miles-square township was abandoned. So was the requirement for a townsite in each township.



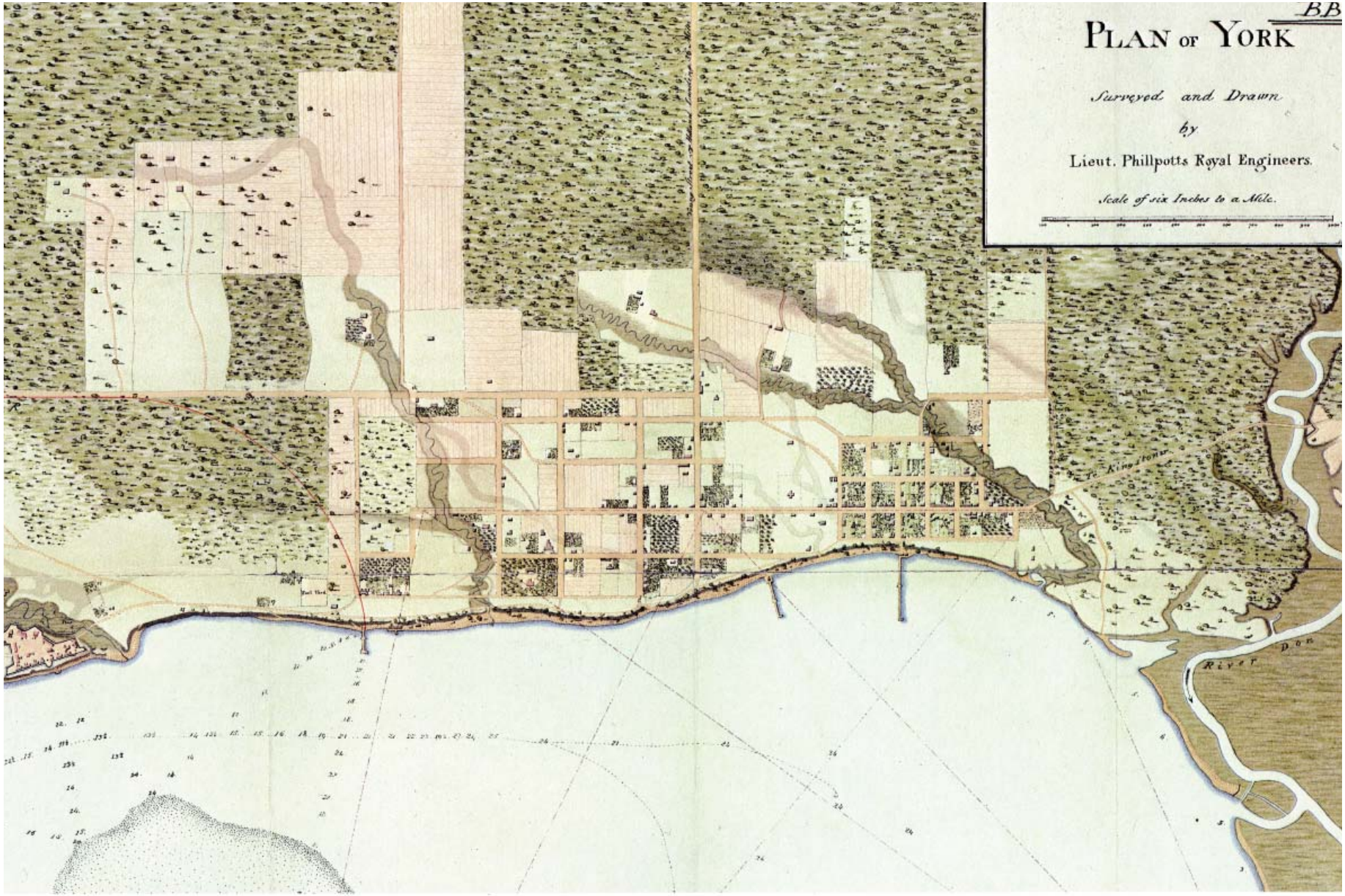
2.28 1792. *Plan of a Town and Township of Nine Miles front by Twelve Miles in depth proposed to be situated on a River or Lake, with lots of about 200 Acres each. Showing in what manner two sevenths of the Lands may be reserved for the Clergy or the Government.*



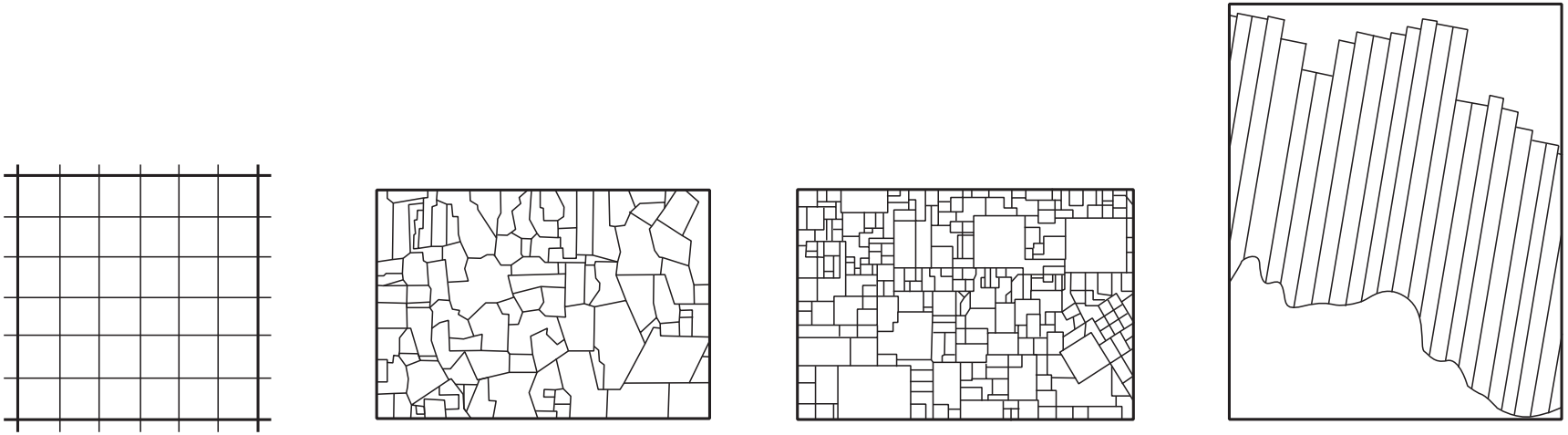
2.29 179?. *Plan of a Town proposed for the seat of Government with its Reference.* (W.Chewett)
Early proposal for Toronto. Note grid of square cells within a square plot and the central allocation of some of these internal cells to public functions; note the cluster of reserves for church, ctate, and military facing into the central punblic square. Typical GEORGIAN plan



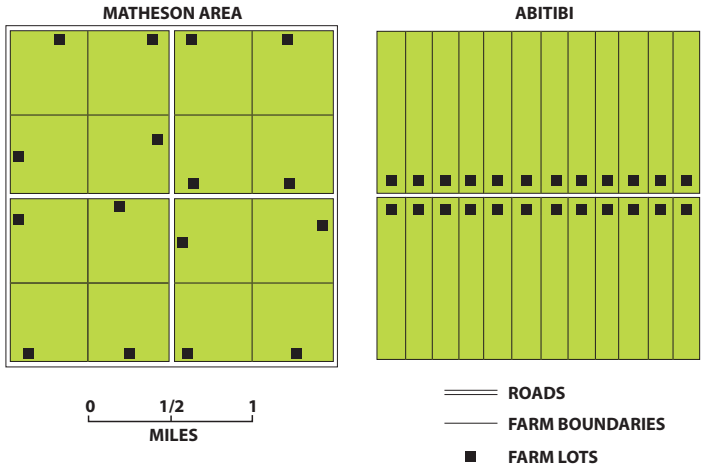
2.30 1788. *Plan of Toronto Harbour with the proposed town and part of the settlement.* (Gother Mann)
Georgian plan. One acre townlots. Commons for greenspace and perhaps cattle. The zone of large 'town parks', presumably for more spacious villas; and finally, beyond teh area covered by this verion of the map, the farm lots of the rural township. All in all, here was a perfectly ordered landscape to complement a perfectly ordered society, in which each part could be predicted and in which everyone knew his place.



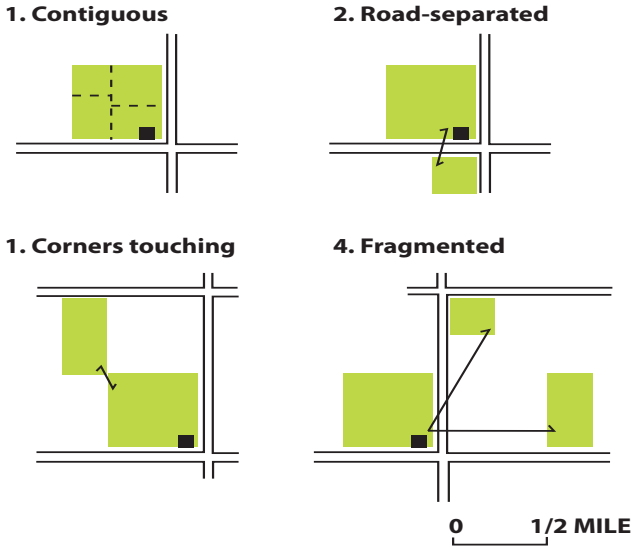
2.31 1818. *Plan of York.* (George Phillpotts)
Of note is this town of 1,000 residents with little more than 100 dwellings is the openness. Even in the original townsite, where the majority still lived and where most of the shops were concentrated, there is much green space.



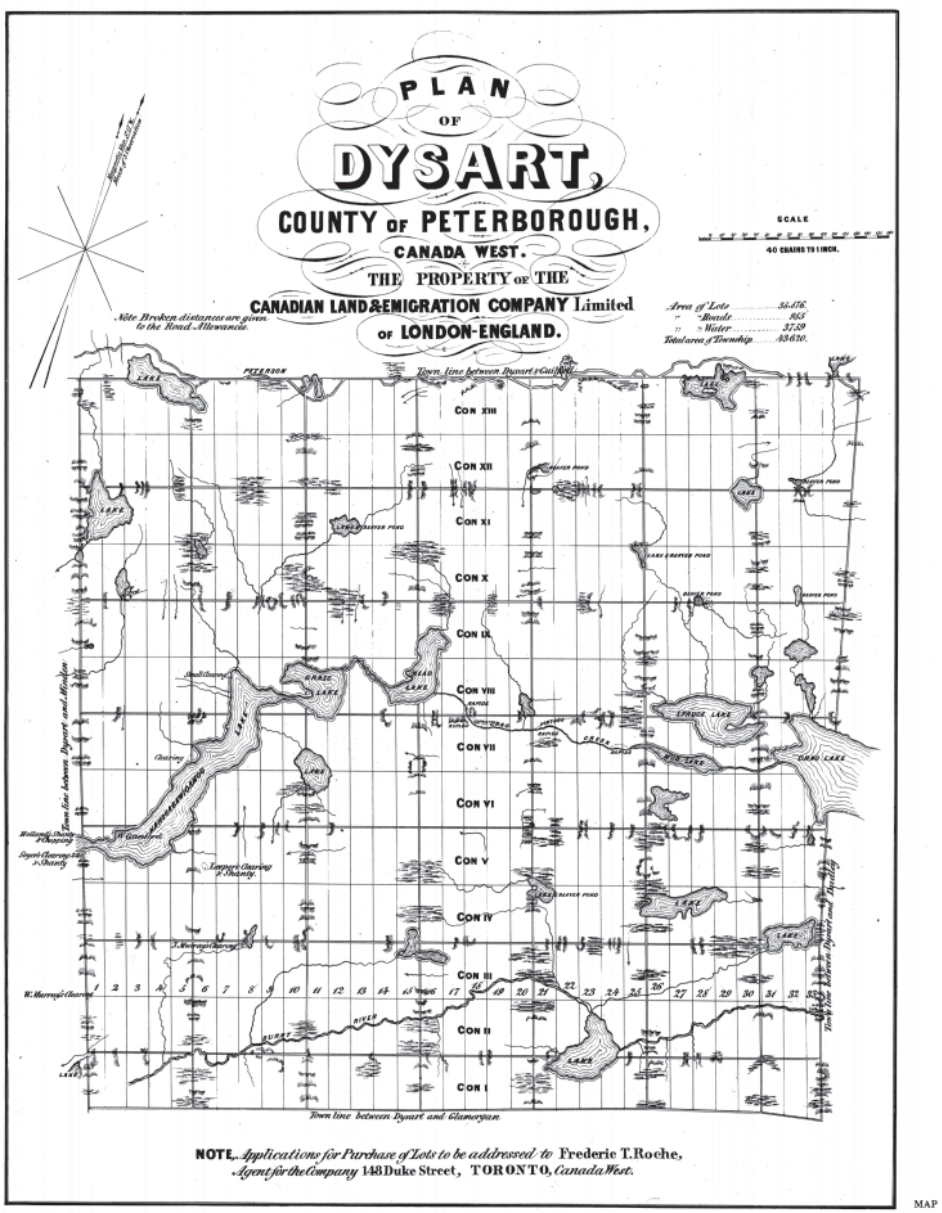
2.32 Types of Land Survey in the United States and Canada



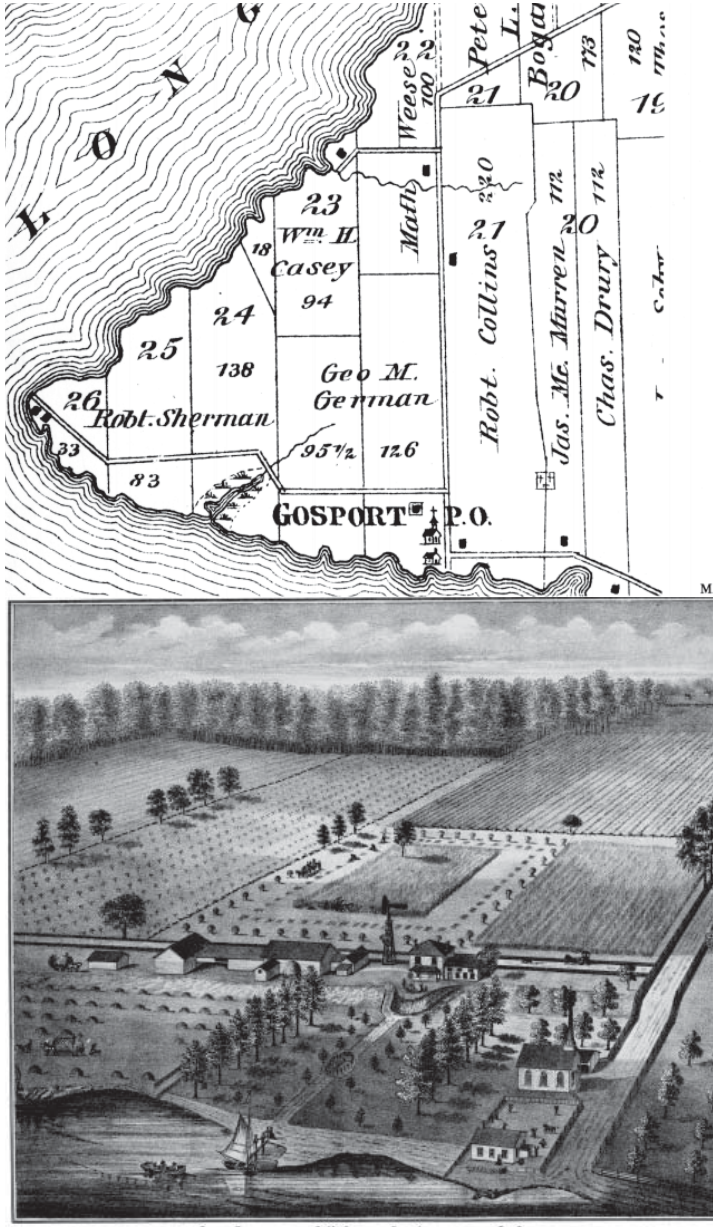
2.33 Influences of Different Survey Systems on Patterns of Rural Settlement in Ontario and Québec



2.34 Types of Farm Layouts



2.35 1862. *Plan of Dysart, County of Peterborough.* (W.C.Chewett & Co.)
Land sold to an English company, the Canadian Land and Emigration company. Township maps, like this one, were circulated throughout the British Isles to attract settlers.



2.36 1878. *North and South Fredericksburgh & Adolphustown. Plan and View* (J.H.Meacham & Co.)
Map shows the location of each house and number of acres occupied. Symbols indicate schools, churches, cemeteries, mills and industrial establishments.

The following maps illustrate settlement patterns for Southwestern Ontario and Canada. The first series of maps deals with the density of agricultural settlement in Ontario between 1791 and 1851, displaying the growth around the major centres of the era, such as Toronto, Kingston, and Niagara. Secondly, the map concerning the settlement of Canada from 1821-1941, shows the growth of Southwestern Ontario (where the most fertile land was), and the spread West as the transcontinental railroad developed.

2.4 SETTLEMENT

2.37 Settlement of Canada - 1831

2.40 Settlement of Canada - 1891

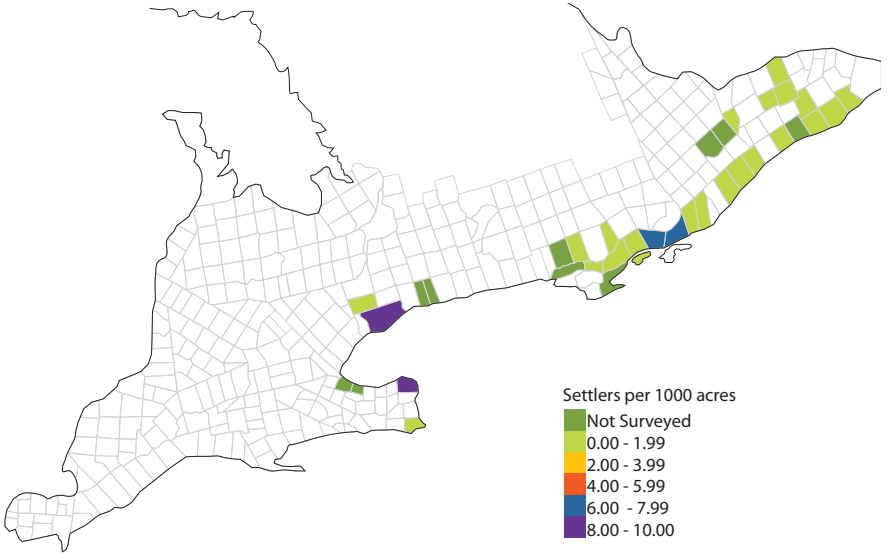
2.41 Settlement of Canada - 1901

2.38 Settlement of Canada - 1851

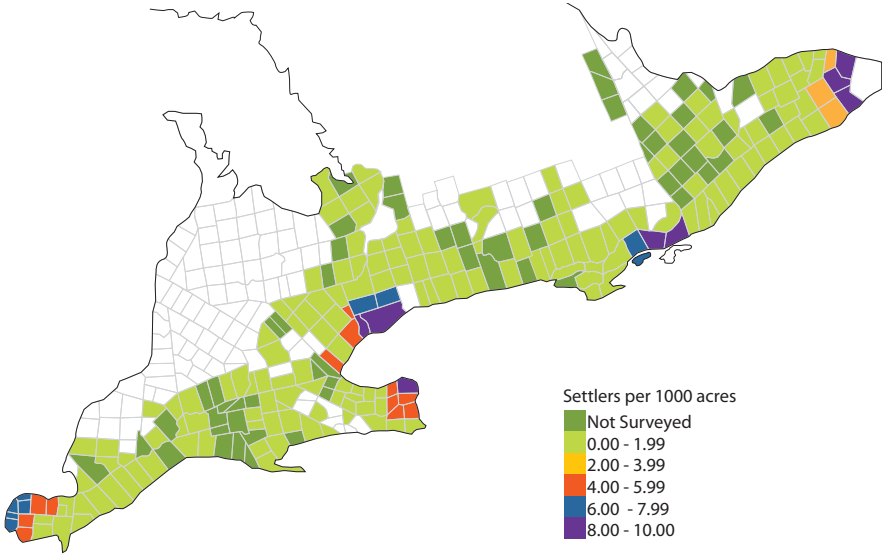
2.39 Settlement of Canada - 1871

2.42 Settlement of Canada - 1921

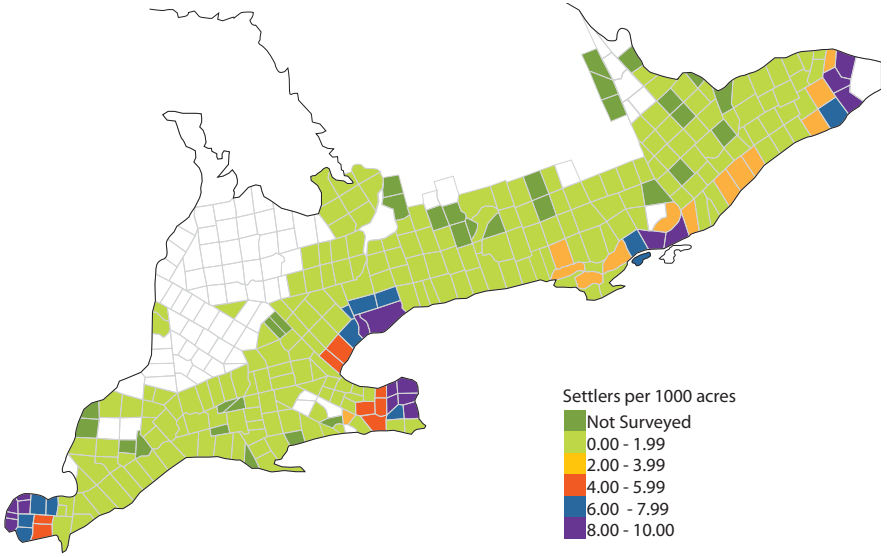
2.43 Settlement of Canada - 1941



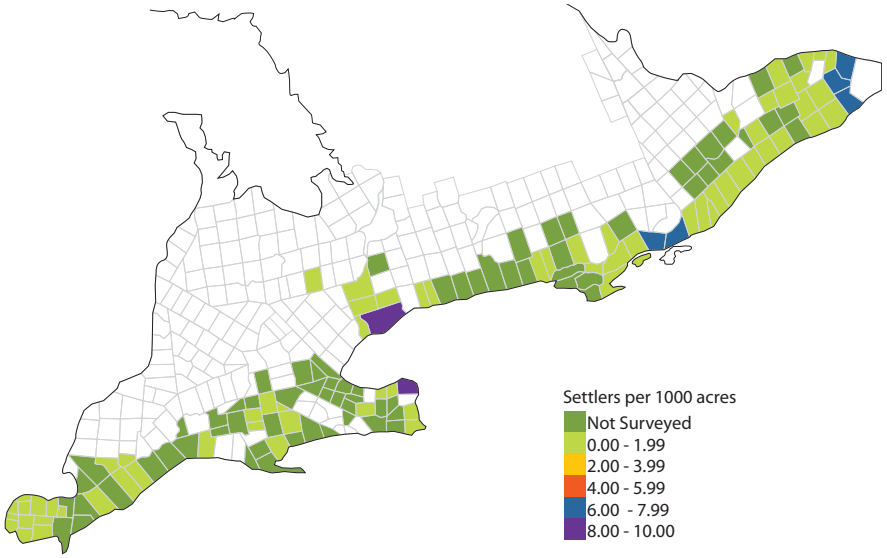
2.44 Agricultural Settlement of Upper Canada - 1791



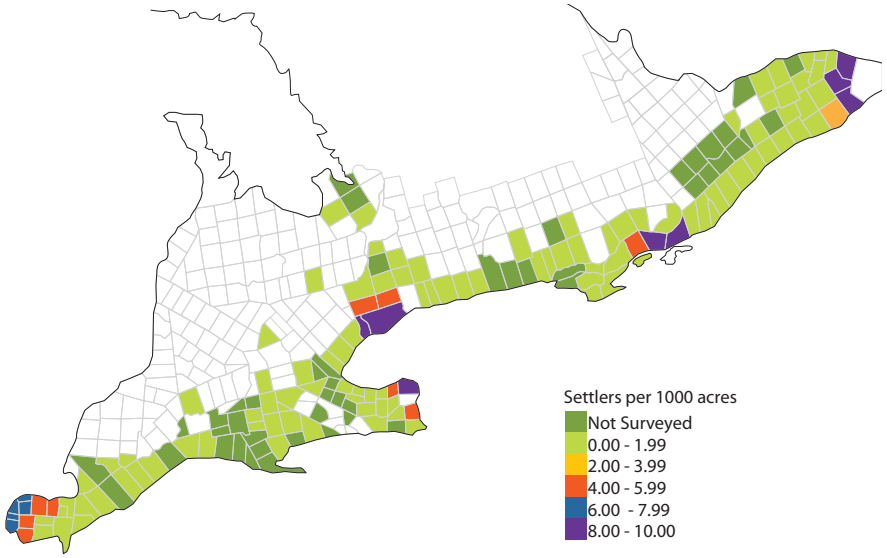
2.47 Agricultural Settlement of Upper Canada - 1821



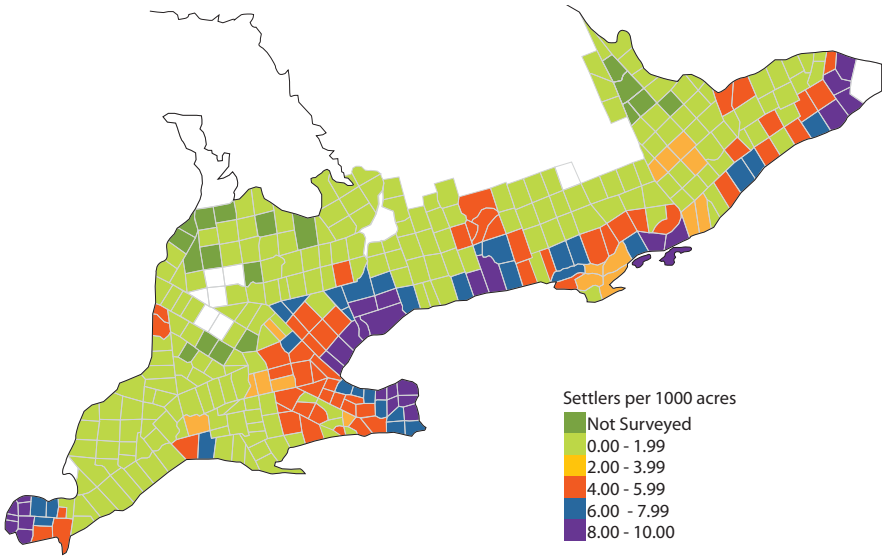
2.48 Agricultural Settlement of Upper Canada - 1831



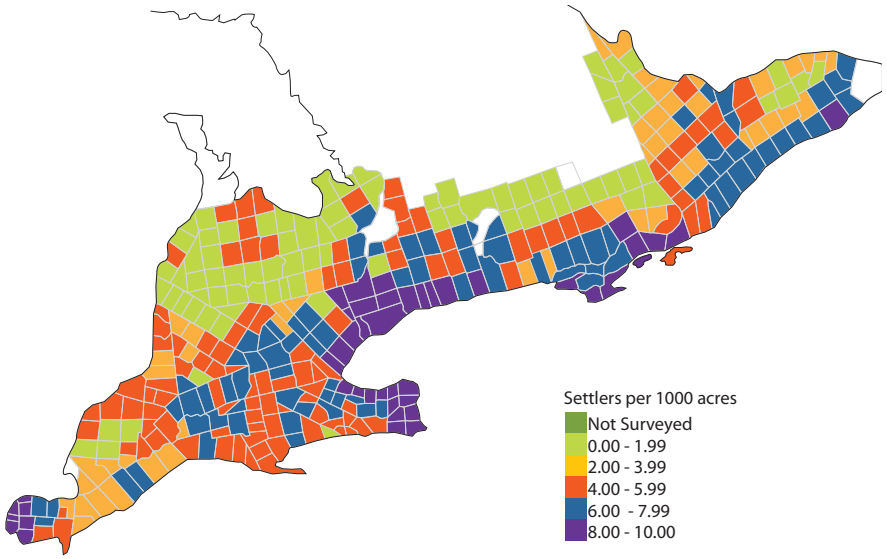
2.45 Agricultural Settlement of Upper Canada - 1801



2.46 Agricultural Settlement of Upper Canada - 1811



2.49 Agricultural Settlement of Upper Canada - 1841



2.50 Agricultural Settlement of Upper Canada - 1851

3.0 MANIFESTO: AN AGRARIAN VISION

3.01 LOCALIZE AGRICULTURE

We live in a very exciting and challenging period of time. The precipitate for change permeates the air. It is the choices we make now that shall have direct consequence in whether the inevitable downpour shall drown us, or shall provide sustenance for our growth. From the threat of peak oil to the reality of global warming, our daily lives are saturated with the notion of looming crisis. But what exactly is this crisis truly threatening? A lifestyle dependent upon extravagant consumption? A culture indulgent in its desires of convenience? Or, does it threaten the very survival of our habitation in this world? The solution to these questions is dependent upon the individual. So too, is the ability to foster change. If we wish to avert the onslaught of global resource shortages, we must revolutionize our ideals of living. We must shift our paradigm from the ideal of consumption to the ideal of sustainable production. We must reconnect ourselves to the essentials of survival, and excise the luxuries of convenience. The time is ripe to harvest a new ideology for living. It is time for AGRARIA.

LOCALIZATION

We are losing our capable lands for agriculture at a rapid rate. The predominance of suburban settlement patterning both in our physical and psychological realms has led to the decline of arable land. Our towns and cities were founded in areas that were both highly fertile and strategic points for trade and defence, in order for their survival and eventual growth. As the Canadian Frontier expanded, allowing for emigration into the rural areas, the settlement pattern adopted a distributed rural framework[1]. The lands appeared both endlessly vast and endlessly fertile to settlers from abroad.

1 Refer to Section 2.3 for illustrative examples

3.02 CITIZEN-FARMER

> "The province of Ontario is a magnificent farming country: it was here I first began to learn what a dangerous competitor in agricultural produce Great Britain and Ireland have in Canada. With a soil equal to any in the world, and practically unlimited in extent; the very best strains of cattle and sheep that can be purchased for money increasing daily in number, labour-saving machinery of the very finest description, and farms extensive enough to warrant its use; cheap food; a country which can, and will in time, supply every want of its people."[2]

As technological developments in the field of agriculture and the development of a transportation network allowed for both higher production and efficient transport of goods, localized agricultural supply began to fade. These developments fostered the notion that the loss of arable land surrounding our cities was unimportant as food could now be shipped to cities and towns from further and further distances.

Now, wrapped in the benefits of global food trade, we continue to spread into arable lands with little thought given to consequences of a food system subsidized by an era of cheap energy. When this period comes to an end we will need to rely upon localized resources in order to prevent societal collapse.

AGRARIA proposes a solution to these mounting problems - through the localization and internalization of a sustainable food supply within the built environment. This localization will not only strengthen the security of our food supply, it will also strengthen our communities, and create new relationships between our rural and urban populace. By directly connecting more of the population in the production, processing and distribution of our food supply - we not only ensure our food security, but we also develop new opportunities for employment. AGRARIA is the development of a new settlement typology that is agrarian in its foundations and communal in its structure.

2 Canada Department of Agriculture - Canada in 1880 (Excerpt from report by Mr. R.H.B.P.Anderson, p.61)

AGRICULTURAL METHODOLOGY

We can no longer accept the "farm as factory" mentality that dominates the agricultural sector. It is easy enough to see that this sustaining this methodology cannot work - both for food production and social cohesion. The idea of the monoculture must become a notion of the past, a model that had its time and use, but could never realistically hope to survive. We have tried the industrial approach to farming, applying all our scientific and technological advancements to something that every other species allows nature to provide. Our fields need to once again become ecosystems unto themselves, rather than the technosystems they have become, reliant upon artificial inputs for productivity. It is time to develop an AGROCULTURE within our urban and rural areas.

Diversity ensures security - this is seen in both economic and natural realms. So why do we force nature to produce monocultures for our survival - would it not be more productive to create as diverse of a food system as we can? Technological solutions in agriculture have allowed for the predominance of single-operator monocultural farming systems - that degrade our soil, water, and air. AGRARIA shall promote the formation of small scale multi-operator polycultures in harmony with surrounding ecosystems and built environs, to ensure the stability of our environment and of our communities. This is not to suggest that technology should not serve a role in AGRARIA, but rather it will serve as a tool, not as a methodology. The farms of AGARIA will become integrated with one another and both the surrounding ecosystems they inhabit and the city they create.

3.03 PLANT IN AGRARIA

RECONNECTING

Our society is in a rut of gluttonous energy consumption. The era of cheap fossil energy is coming to an end, we need to change our patterns of consumption and hence our lifestyles and attitudes. We are suffering from an increasing isolationist mentality, from one another, and from the land we inhabit. We have created technodystopic habitations (cities) in which to reside apart from the natural world, increasingly reliant upon externalities for urban survival. It is time to reevaluate this relationship, and develop a path where our society strives towards a culture rooted in the connection to our land. The primary foundations that exist for a connection to the land are shelter and food. Unfortunately these foundations are crumbling. It is the relationship between people and the productivity of our land that needs to be redefined in order to reconnect ourselves to the natural order. AGRARIA is that connection.

AGRARIA is to be developed through growth that is sensitive to both environmental and societal concerns, in its execution and lifespan. It is to create a society less fragmented in aspects of community, economy, and ideology. It is a society which has a cohesive relationship between the people and land. The urban environment shall become more physically organic in its makeup, not just metaphorically so. Life will return to our urban environments, not just waste away there as an artifice of the natural world. The time is nigh for an agrarian imperative within our society.

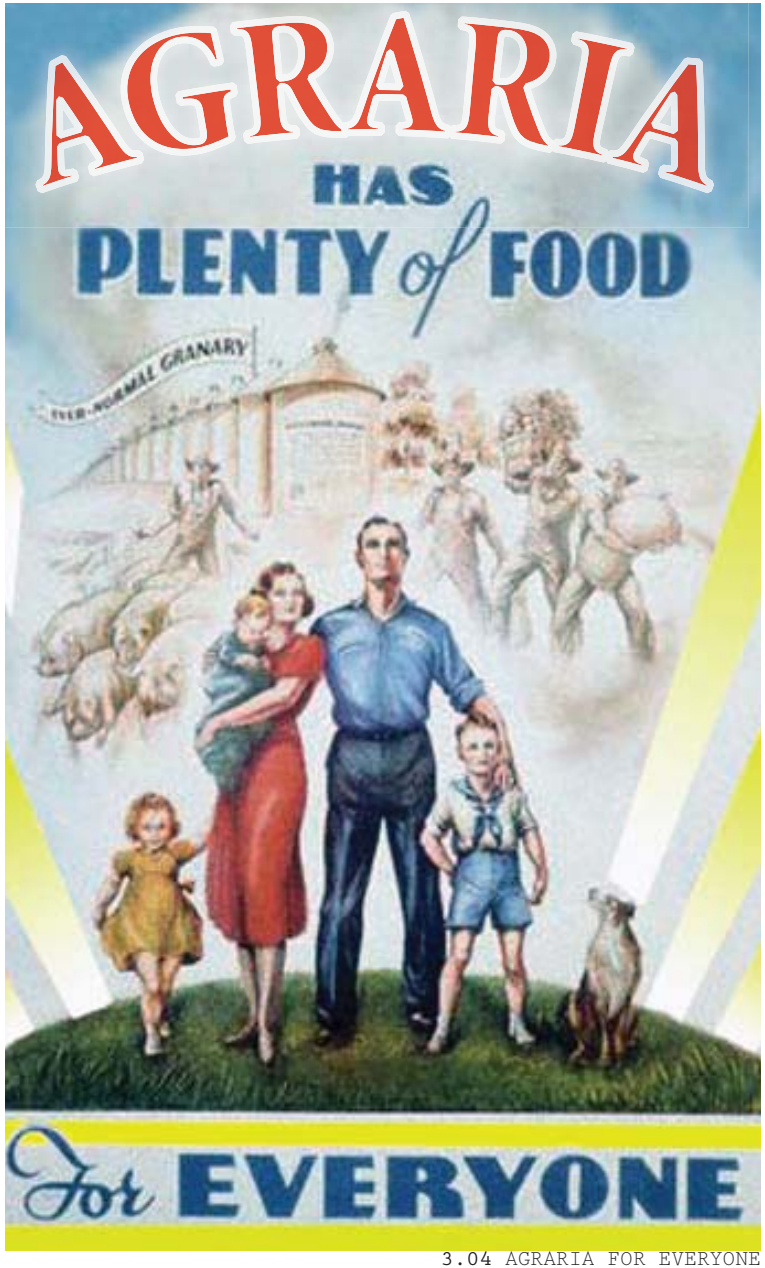
What is important first off, is the maintenance of agricultural productivity within the development. With an agrarian mentality directed towards the structuring of the city the specific aesthetics of the architecture is secondary to the social and communal development of the city. This is to say, that the function and

relation of architecture to the land and community are given first priority, over the particular aesthetics of the architecture. Importantly, this begins to re-humanize individuals, removing them from technologically isolating environments, and into socially active environs. Requirements of place and the requirements of function should arise together, in order to create a cohesive fabric that involves agricultural production and urban cohesion. This is to be architecture of the 'slow', of the everyday, of the pertinent, of the locality, of the land.

FOOD CULTURE

The transformation of our techno-urbanosystems into agro-urbanaties is one that requires a shift in the way food is perceived in our society. As our physical, psychological, and spiritual connections to our food system become further removed from their original source, food becomes a commodity rather than an essential element within cultures. The cultural shift in regards to our notions of food has changed what was once a social concern to what is now merely a concern of commodity production. "Just as agriculture has become an industry more than a way of life, so too preparing and eating food are now more a matter of commodity consumption than social activity."[3] This loss of the social element food can play in our society removes the act of eating from being one of pleasure to one of mere consumption. A consumptive mentality further weakens the connection that we have between the production of our food, and the enjoyment that can be derived from it. Food cannot be treated as another commodity, but rather as a necessity for the continuous development of our culture. "Via food - giving and sharing - we recognize each other as human beings. No longer a mere commodity, food returns to its bonding role in

3 Wilson, Alexander - The Culture of Nature (p.189)



3.04 AGRARIA FOR EVERYONE

human culture."[4]

Food must once again become an integral part of our education, community, environment, and economics. We must localize agriculture in order to create the basis of a sustainable food supply. This means an intensification of production within urban, rural, and fringe areas, an intensification of labour, density, and community.

The heart and soul of an agrarian mentality is community. Without the community the individual becomes impossible. Each individual is inherently tied to the success or failure of the community. The goal of capitalism is to create profit from necessity, once it has achieved this, luxury becomes a necessity. The goal of agrarianism is to create profit from diversity, once this has been achieved, luxury becomes inherent.

> "Food, its preparation and sharing, is a cornerstone of culture. […] Food is culture in the sense that it is at once an object, a crafted thing, and a symbol that, when exchanged, cements social relations."[5]

AGARARIA contains the ability to strengthen our communities so that they may grow; reconnect with our land; and recapture the variety of our culture. Through the introduction of direct connections with food production on a daily basis, AGRARIA promotes high levels of social interaction and interconnectedness through a shared food culture. All age brackets may participate in one way or another in the accumulation and dissemination of knowledge concerning food production, processing, distribution, and preparation. Schoolchildren shall have the benefits of hands-on teaching in school-gardens, backing onto and surrounded by the larger community fields. The elderly, valued members of the community, shall share their expertise from one generation to the next, and play valued roles in the education of the young. AGRARIA shall bond its inhabitants to one another and to the land they inhabit, providing its communities with a coherent base in which to develop and strengthen a thriving agrarian culture.

4 Lappé, Frances Moore - Hope's Edge (p.53)

5 Knetchel John - FOOD (Excerpt from 'take back the fruit: public space and community activism' by fallen fruit p.100)

SUMMATION

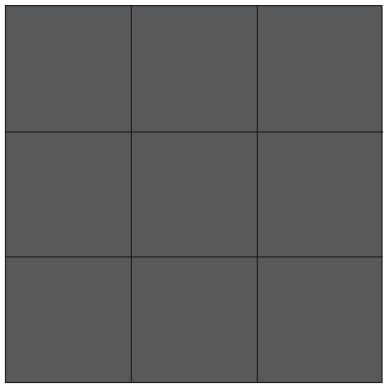
AGRARIA begins with the land and ends in the community. It is to be the start of a reconnection to our land, a development in which the productivity and beauty of nature is inherent in our daily lives through the vessel of food. It is to be a community reliant and respectful of the land which it inhabits. Land shall once more become a collective resource, to the mutual benefit of all who inhabit AGRARIA. Society shall no longer be a fragmented dystopia, but will become a unified whole, celebrant in its collective connection to individuals, and the land.

4.0 AGRARIA

The purpose of this design is to suggest an alternative to the development of arable land currently being lost to urban sprawl. It is intended that a city should be self-sufficient in its food production, and primarily independent in its energy use, and water consumption. It is not only a change to development patterns, but a shift in lifestyle values as well. Stressing self-reliant community strength, the program outlines a 40,000 person city for off-grid living within the context of contemporary agricultural lands demarcated by an existing concession grid. AGRARIA shall follow the ideals, utilizing the precepts outlined in the previous chapter, for developing this new agrarian society.

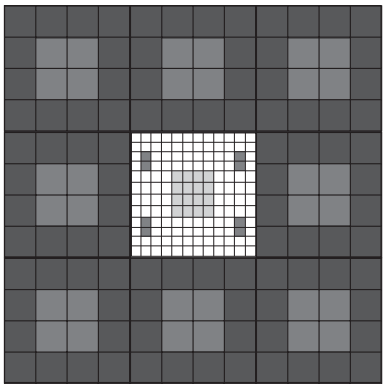
4.1 STRUCTURE

DIVISION

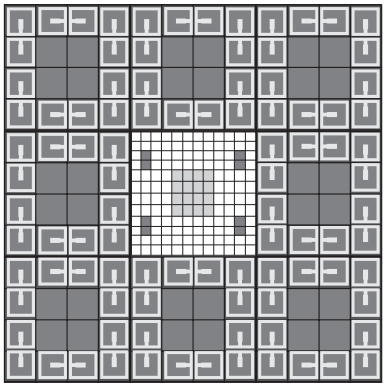


4.01 Division - A

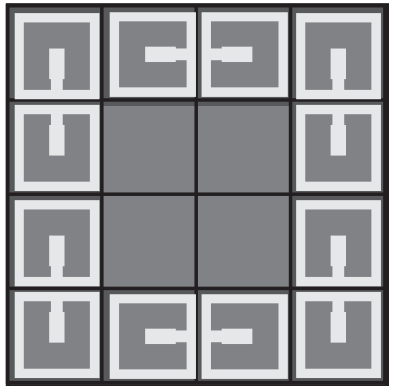
We shall begin by laying out an area of 5760 acres (9 square miles), for the development of the ideal-AGRARIA, somewhere in Southwestern Ontario. There shall be 9 AGRIZONES, with an area of 640 acres each (1 square mile). The middle AGRIZONE is to be reserved for civic and institutional areas required, and shall be gridded accordingly. The remaining 8 AGRIZONES shall be further divided into sixteen 40 acre productive parcels, 12 perimeter parcels called AGROMMUNITIES, surrounding the 4 central parcels known as an AGRISECTOR. All AGRISECTORS and the productive fields of AGROMMUNITIES shall be of community ownership, the inhabitants sharing in the mutual benefits of common lands.
It is suggested that AGRARIA be initially built upon existing farmland. The development of AGRARIA is to maintain productive fields as much as possible during construction of its built environment. To acheive this, only the perimeter of each AGROMMUNITY is alloted for building as well as the zoning of AGRISERVICE buildings to be centralized within the fields, and connected to the edge of the AGROMMUNITY. AGRISECTORS shall remain untouched during development, and allowed to remain productive of whichever crop they were aforehand producing. However, once an AGRIZONE has been developed the residents shall begin agricultural production as outlined in the next section.



4.02 Division - B



4.03 Division - C

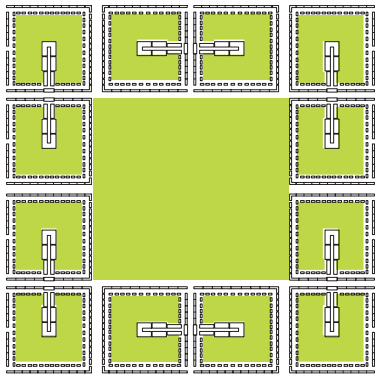


4.04 AGRIZONE

AGRICULTURAL PRODUCTION

As an agrarian community, AGRARIA shall provide its inhabitants with the majority of its food requirements. AGRIARA stresses low-impact sustainable agricultures, the production of small-scale livestock shall be promoted, such as the raising of rabbits, chickens, ducks, geese, and in certain areas goats and/or sheep. It is the goal of AGRARIA to provide the vegetative requirements of the community first and foremost, with supplemental externalities when required, and surplus distributed only once the community's needs are satisfied.

Each AGROMMUNITY consists of 40 acres of land, providing habitation and vegetative sustenance for a populace of 400 residents. Housing and mixed-use residential shall surround each AGROMMUNITY maintaining the interior of the area for vegetable and fruit production, while each AGRIZONE (collection of 12 AGROMMUNITIES) shall utilize the AGRISECTOR for supplementary fruit orchards and the growth of grains. (See Diagram Below).



4.05 Fields

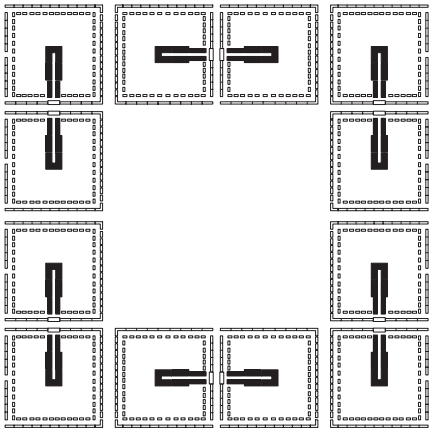
Within each AGROMMUNITY, shall reside 12 AGRISTEWARDS, who shall each be responsible for 4 acres of production, 10 STEWARDS shall work within the interior AGROMMUNITY fields, while 2 shall work within the larger AGRISECTOR fields, providing a total of 24 AGRISTEWARDS within an AGRISECTOR. Each AGROMMUNITY select a HEAD-STEWARD who shall be the recognized 'expert' within their selective AGROMMUNITY, to represent the community within each AGRIZONE. The AGRISTEWARDS shall work collaboratively under a comprehensive and collective agrarian strategy to be developed by each individual AGROMMUNITY and the HEAD-STEWARDS of each AGRIZONE, with a mandate to maintain productivity without compromising ecological integrity. The agricultural methods employed shall adhere to sustainable protocols such as those covered in Section 2.1 of this text. It is understood that these methods may need to be continually revised and developed over time, as farmers learn which method is best suited for the land and for themselves and the community. However, for initial application the following methodologies are recommended for the various productive areas:

- **Biodynamic Agriculture** (Steiner)
  for the holistic management of vegetative production and waste within AGROMMUNITIES.
- **Early Organics** (Howard)
  within AGRIZONES to replenish soil fertility and health.
- **Natural Farming** (Fukuoka)
  for production systems concerning growth of rice, barley, oats, and long-term fruit orchards within AGRISECTORS.
- **Permaculture** (Mollison)
  to develop and sustain mixed crop and livestock systems, within AGROMMUNITIES or AGRISECTORS.
- **Natural Systems Agriculture** (Jackson)
  for production systems concerning growth of wheats, sorghum or sunflowers, within AGRISECTORS.
- **GROW BIOINTENSIVE** (Jeavons)
  Within AGROMMUNITY production system for growth of vegetables and fruits.

The AGRISTEWARDS engaged in food production shall be contracted akin to Community Supported Agriculture(CSA), and shall have a developed knowledge of the needs/desires of their community.

AGRISERVICES

Every acre is capable of supporting up to 10 people. As one AGRISTEWARD maintains 4 acres, 1 provides food for 40, and those 40 provide the economic viability for the 1. AGRIHOMES, and AGRIBOXES (refer to Section 5.1), shall be employed for supplemental fruit and vegetable production. Greenhouses shall be used for cold-weather growth, pre-season seedling development, and some year-round production. There shall also be edible fungi production beneath the greenhouses as well as the raising of small-scale livestock.



4.06 AGRISERVICE Areas

AGRARIA will process and distribute all of its own products, within each AGROMMUNITY. This shall include, but not be limited to: the sanitization and temporary storage of fruits and vegetables; the preservation of foods for low-production months; the development of value-added products (such as jams, chutneys etc.); the processing of small-scale livestock. Essentially the 'heart' of the community, the AGRISERVICES play a central role in AGRARIA. They are to contain areas for community meetings or cultural events; educational facilities for young children; a community kitchen, which shall offer low-cost meals for residents. As, well there shall be AGROMARTS, which connect two AGROMMUNITIES together where the AGRISERVICES meet.

The processing and packaging of food (when required) shall be done immediately after harvesting in the appropriate AGRISERVICE buildings located within each AGROMMUNITY. The AGRISERVICE buildings pertaining to agriculture shall include, but are not limited to the following facilities:

STAGING FACILITIES

•**Compost Centre** -for the collection and distribution of the AGROMMUNITY's compost. The centre should be located centrally for ease of use. It shall be used to create a valuable soil resource for distribution amidst the AGROMMUNITY fields as well as the AGRISECTORS.

•**Produce cleansing facilities** -these should include all necessary equipment for intial cleansing of produce direct from the field, this includes necessary washing and drying stations. These facilities should be located in a central location to service the entirety of the fields equally. They should be easily accesible and open to the air, but covered from above, for the enjoyment of the workers.

STORAGE FACILITIES

•**Equipment Storage** -located centrally in relation to the fields, the equipment storage should be capable of housing all necessary tools for the planting, tending, and harvesting of crops, as well as any auxillary tools that would be required in the agricultural production.

•**Temporary Storage Areas (Dry & Cold)** -these areas should be located adjacent to the cleansing facilities, to expediate field to storage

procedures, in order to maintain freshness of produce. There should be refrigerated storage and a controlled humidity storage for the proper keeping of particular produce or grains.

•**Seasonal Storage Areas** -these areas are meant to be for the storage of produce, processed products, and other perishables for distribution during the inclement seasons. This storage should be dry and cool, secure from humidity and heat, safe against pest infestation. As their use is not on a regular basis they need not be in close proximity to other facilities or areas, othe rthan the AGROMARTS. It is recommended that they be placed beneath other AGRISERVICE structures if possible.

•**Irrigation Towers** -located centrally within the AGRISERVICE buildings, these are meant to store and cycle both rainwater, and AGROMMUNITY greywater for irrigation when required, and in the primary cleansing facilities. AGROMMUNITY greywater shall be cycled through "Living Machines" located within the Irrigation Tower to ensure its quality before use. The towers are also used as vertical greenhouses utilizing AGRIBOXES, on facades of proper orientation to supplement outdoor production.

PROCESSING FACILITIES

•**Primary Processing Facility (Vegetative)**-these are to be facilities in which the seasonal preperation of vegetables and fruits occur, as well as creating value-added products for the AGROMARTS and distribution. It is to be a full-service kitchen with the necessary equipment to facilitate the canning, pickling, drying, sugaring etc. of produce.

•**Primary Processing Facility (Grain)** -this is for the threshing of grains. Only one such facility need exist per AGRIZONE, as all cereal crops are a shared resource amongst its constituent AGROMMUNITIES.

•**Secondary Processing Facility (Grain)** -this shall include milling facilities. As with the primary grain processing facility, only one is required per ARGIZONE.

•**Primary Processing Facility (Livestock)**-as livestock production in AGRARIA is meant to be of small-scale, the primary processing of livestock will require minimal facilities for slaughter and primary processing (cuts of meat/poultry). This facility should have direct access, if not be partially open, to the outside environment.

•**Secondary Processing Facility (Livestock)**-to be adjoined to the primary livestock processing facility, this is to be an area dedicated to the varied processing of meats and poultry. This shall include but not be limited to the curing, smoking, pickling, salting etc. of meats and/or poultry.

GROWTH FACILITIES

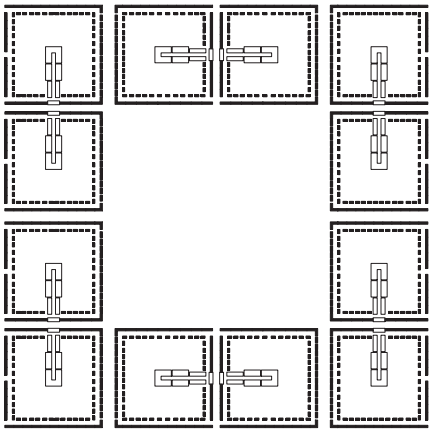
•**Small-scale Livestock Quarters** -this shall be appropriate shelter for livestock that the AGROMMUNITY has decided to raise and tend. These areas should include, but are not limited to, chicken-coops, rabbit-hutches, shelters for wildfowl, etc. The location of these quarters shall be determined by the ARGISTEWARD in care of the animals.

•**Greenhouses** -are to be utilized in the year-round production of certain fruits and vegetables, as well as for pre-season seedling growth. They should be located between the staging/storage and the processing facilities.

OTHER FACILITIES

Although other non-agricultural functions, such as the community centre, youth educational facility, community kitchen, and AGROMART are housed in, or connected with the AGRISERVICES complex, their roles shall be further explained in the subsequent relevant sections.

LIVING



4.07 Living Areas

Each AGROMMUNITY shall consist of a combination of mid-rise apartment complexes, co-housing residences, and a minimal of detached single-family homes, in order to foster strong communal connections through the built environment. The buildings are to be suited to the land they inhabit, and shall employ sustainable methodologies in their construction and life-use.

As each AGROMMUNITY is to be primarily self-sufficent in nature, it is scaled towards a humane level of 1/4 mile divisions. The buildings of each AGROMMUNITY shall form a perimeter around the central fields (see above diagram), but shall be double-loaded, serviced by Local Lanes. Residences of 2-3 storeys shall line the interior fronting onto the central production fields, while mixed-use 3-5 storeyed buildings line the perimeter facing either main transit arterials, “Greenways”, or “Tramways”. The exterior perimeter buildings lining transit arterials and “Tramways” are meant to encourage a ‘Main Street’ style typology, with street level office and commercial facilities, and living above.

AGROMMUNITY residents shall have private vehicular access to their residences through the Local Lanes, with street parking limited to one vehicle per household. However, due to the human scale of AGRARIA public transit, cycling or walking will be the prefered mode of circulation.

The majority of dwellings shall be a form of co-housing, where common energy-intensive elements of residences are shared, such as a kitchen, in order to reduce overall energy consumption. These co-housing units shall comprise of 2-4 units providing residence for up to 16+ individuals. There shall be apartments for low to mid-income residents, as well as subsidized housing interspersed within the multi-family dwellings. These buildings shall be in a manner similar to private dwellings in order to maintain a cohesive built fabric.

The individual architecture of the AGROMMUNITY’s buildings, shall be focused on fostering community interactions while integrating the productive nature of AGRARIA. Some residences may be AGRIHOMES, or employ the use of AGRIBOXES in their structure(See Section 5.1). Buildings that have displaced formerly productive land shall have ‘growth roofs’ for the production of communal crops, or livestock.

COMMUNITY

The community/cultural centre, located within the core of each AGROMMUNITY, is to be a place where the whole of the community may gather for meetings, events, activities, festivals, weddings, dinners, etc. It should be large enough to house the whole of the AGROMMUNITY; have clear, and abundant access to the outside; and should be central to the fields of production and relevant AGRISERVICES to the functions delineated for its use.

There shall be a cooperative community kitchen, which shall serve low-cost nutritious meals to its members. This kitchen shall tie in with the facilities used for Primary Vegetative Processing, as it will have a full-service kitchen that is under-utilized. The kitchen should be located next to the community/cultural centre for the ability to service the entire community. The number of Food Preperation Experts shall be determined by the number of members of the cooperative. The facility shall utilize the AGROMMUNITY's food products in its daily meals, supplementing when necessary from AGRARIA-wide stock.

The "GREENWAY" is a public park that is shared by two AGROMMUNITIES. It stretches the length of the AGROMMUNITY, abutted on one side by a Main Transit Arterial, and by an AGROSECTOR on the other. Wide enough to accomodate a soccer pitch, it provides parkspace for the two AGROMMUNITIES. It should also be lined with trees, perhaps of a productive nature, to allow for shade and pleasure. Larger trees, such as oaks, maples, etc, should be interspersed throughout the GREENWAY, but enough open space should remain for various sporting activities. Flower gardens, and scenic pathways shall wind through the space, as well as water features for relaxation, and recreation.

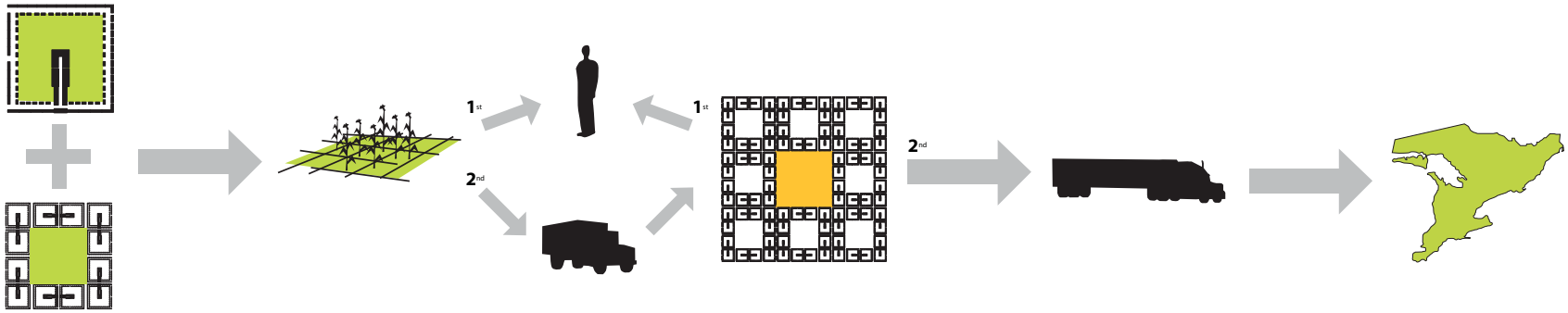
The schooling of young children shall take place in Primary Educational Facilities within each AGROMMUNITY from the ages of 4 to 12 (pre-school to Grade 8), while the schooling of elder children, aged 13-17 (Grades 9 through 12) shall take place at Secondary Educational Facilities located within the core of AGRARIA.

The Primary Educational Facilities shall be centrally located within the AGROMMUNITY, connecting children directly with hands-on learning opportunities in food production. Classes shall be administered by appropriate teachers, and the elderly shall be encouraged to share their wisdom through daily interaction with the children.

Secondary Educational Facilities gather pupils from all AGRIZONES centrally within the core of AGRARIA. This is to encourage interaction amongst outerlying communities and introduce a more urban learning environment, to ready young adults for Post-Secondary Educational pursuits.

DISTRIBUTION

4.08 Conventional Distribution



4.09 AGRARIA Distribution

For each two conjoined AGROMMUNITIES, there shall be a common local marketplace (the AGROMART), where the residents of that AGROMMUNITY will obtain their food necessities.
Surplus from AGROMMUNITIES shall be distributed due to the necessity firstly within the AGRIZONE, then AGRARIA, and finally, if needs have been met within AGRARIA, surplus is to be exported regionally. This is to ensure that every AGRARIAN shall have access to the necessities of diet year round removing the reliance upon externalities for food requirements. Only gastronomic desire shall necessitate the need for food importation, which shall be accommodated at the CENTROPLAZE within the city core, with connections to both regional and national distribution networks.
The CENTROPLAZE is a collection of service buildings which coordinates the collection and distribution of agricultural surplus from the AGRIZONES. It contains the TRANSIT HUB, which services not only the municipality, but also intercity and regional connectors as well. Located adjacent to the TRANSIT HUB, is AGRARIA's central AGROMART, a large market where members of each AGROZONE can trade, sell, or purchase food and food related products. The central AGROMART is also where the collection of surplus is transferred to the TRANSIT HUB for exportation.

NETWORKS

GENERAL
There will be limited private vehicle road networks within AGRARIA is meant to develop opportunity for enhancing slow modes of transport such as walking and or cycling. Efficient, electric, clean, and affordable public transit shall be the preferred mode of circulating through the city. The reduction of roadways allows a freeing up of the ground plane for nature, pleasure, and the increased possibilities of social interaction. The street can become a flowing public realm stretching through the city and interconnecting all Greenways, AGRISECTORS, and existing parkscapes/plaza space. Remove the automobile from the urban environment and it becomes at once an environment of scale, rather than of speed. It becomes a scale of human use. It at once enables a shift in the day-to-day lives of AGRARIA's citizens.

LOCAL
Road networks are to be minimized within the development as much as possible, with major vehicular circulation constrained to the perimeter of AGROZONES, and local traffic to the perimeter of the AGROMMUNITIES. Public transit shall be accessible within ¼ mile walk to all residents of AGRARIA. The public transit, shall service all areas, and have direct connection to the TRANSIT HUB, located in teh city core. Pedestrian walkways and bicycle paths shall line roadway, separating speeds of travel. Main arterial roads shall be tree-lined boulevards, with tramlines, single lane roads with street parking, cycle paths, and ample pedestrain areas. There shall be narrow one-way Local Lanes with street parking for the interior circulation in residential areas, providing a pleasant distinction/transition between commercial and residential areas.

MUNICIPAL
City-wide transportation networks are serviced by the Main Transit Arterials, which occur at the edges of each AGRIZONE. Local public transit, shall have links to these Main Arterials at strategic locations. Public transit which runs along a Main Transit Arterial, shall be linked directly to the TRANSIT HUB.

REGIONAL
There shall be connections to Intercity and Regional transit lines from the TRANSIT HUB. These services shall be below grade, and should enter AGRARIA thus beneath Main Transit Arterials, in order to maintain the 'speed-scale' of AGARIA.

SYSTEMS

As AGRARIA strives to be self-sufficient development in non-agricultural areas as well, it is recommended that the community develop as many closed-loop systems as is possible. A few of these are discussed below for the cycling of water, generation of power, and management of waste.

WATER

Water-cycling and rainwater harvesting shall be employed, in both residential and commercial/ communal buildings. Water will be cycled through small systems(utilizing the Waterloo Biofilter® technology) for daily household use, and larger systems (using Living Machines®) for irrigation and communal water distribution.

The small-scale systems will employ a wastewater reclamation process consisting of preliminary, primary, secondary, and tertiary treatment plus disinfection. After being cycled completely approximately three times, the water shall be entered into the large-scale system.

The large-scale system apply the Living Machine® principles for wastewater reclamation. In this process wastewater is cycled through anaerobic and aerobic reactors before entering a hydroponic reactor, and finally a clarifier before being stored for use. As fish can be used in this process it has the added benefit of producing both a marketable product, and a valued fertilizer from the fish waste.

Harvested water shall be deemed as grey-water, for the use in irrigation, toilets, laundries, and other non-potable needs. For potable requirements appropriate systems such as filters and UV disinfection will be required. The majority of harvested water shall be stored for use in irrigating crops. On a residential level, water will be collected into cisterns for input into the small-scale system, with surplus being inputed back to the large-scale system.

POWER

Being an agricultural community, AGRARIA has large amounts of organic waste leftover. Although some of this is directly put towards composting, it is suggested that a majority of this waste be used in *Methane Digesters* for the generation of electricity. Methane digesters are small-scale systems that uses anaerobic reations to decompose organic waste which causes the release of mathane gas. The methane is then captured and stored for use in electrical generation. The remaining solids can then be used as a natural fertilizer.

Supplementary power should be provided through solar technologies, and small-scale wind-power generators. The use of hydro-power (if available) may be deemed appropriate for local milling processes.

Geothermal technology is proposed for the heating and cooling of the majority of AGRARIA's buildings, as the majority are multi-unit buildings.

WASTE MANAGEMENT

It is proposed that all community organic waste is gathered for "green-cycling". This "green-cycling" involves the processing of bio-waste in methane digesters for power generation and composting for soil regeneration.

Human waste after proper treatment through the wastewater remediation cycle will be used as fertilizer in the ARGISECTORS.

CONSERVATION

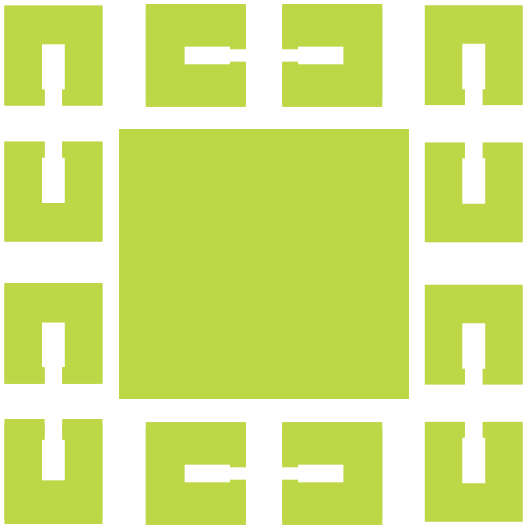
In the application of AGRARIA the conservation of existing natural systems is paramount. As an environmentally sensitive community, AGRARIA is developed in accordance to ecological guidelines to ensure a healthy diverse environment.

Waterways shall be properly identified and protected. No new development shall occur within riparian zones. Instead a riparian buffer shall be maintained of at least ⅛ mile from the bank edge of either side, but shall not encroach upon the floodplain of the waterway. All efforts are to be taken to ensure that no effluent waste shall enter water-systems. Any water removed from the system must not exceed natural replenishment rates. Any water returned into the system must be of higher or equivalent quality.

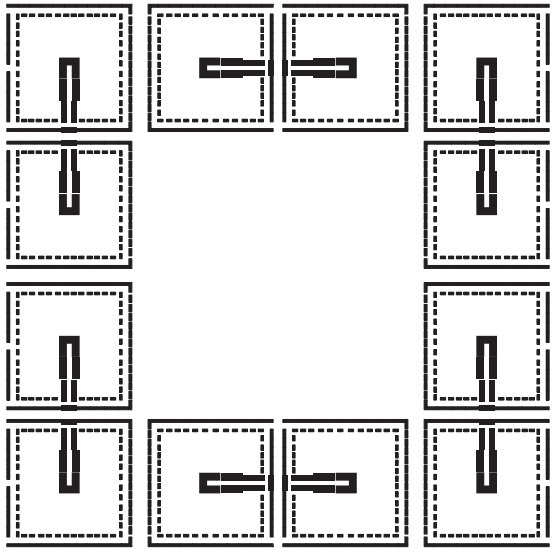
Existing woodlots and forested areas will be evaluated firstly by habitat diversity and secondly upon scale to determine which areas may be used for development. Habitat diversity should be evaluated by a recognized expert. Conservation of rare/unique habitats shall override any development. Any forested area over 10 acres in size may not be fully razed for development. Areas deemed suitable for development shall not exceed the reduction of over 25% of a continous forest.

Wetlands and protected areas are not considered as being suitable areas for any development.

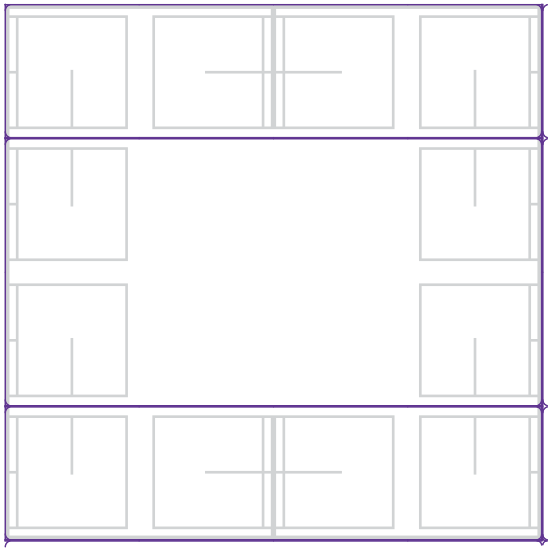
ASSEMBLAGE



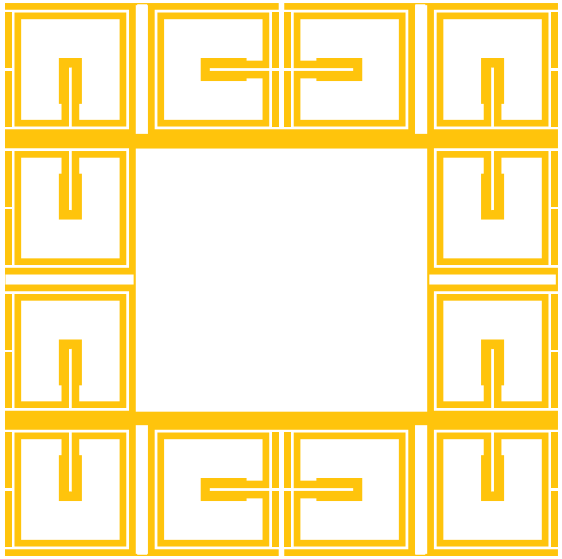
4.10 Fields



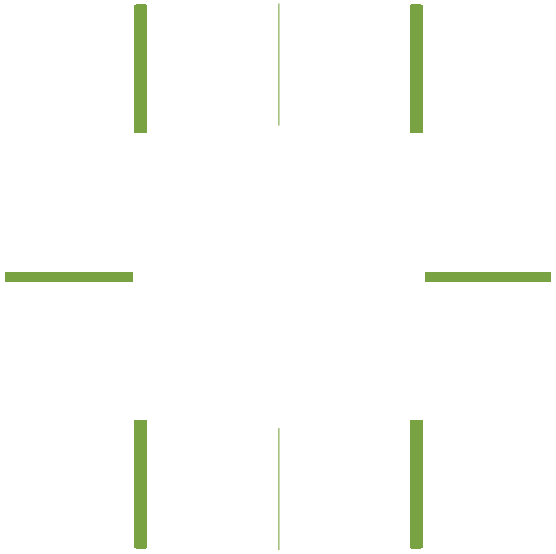
4.11 Buildings



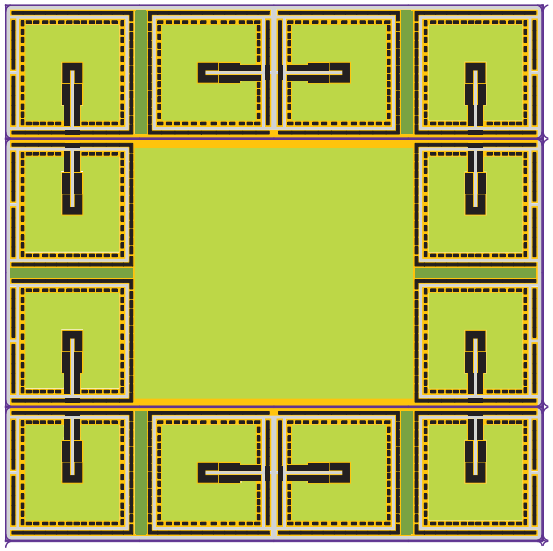
4.12 Networks - Vehicular



4.13 Networks - Pedestrian



4.14 Parkspace



4.15 AGRIZONE

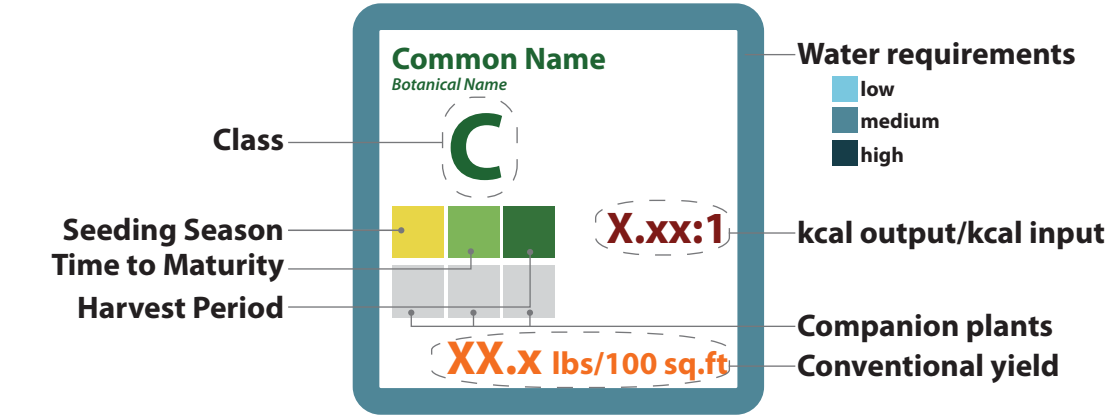
This section shows the development of AGRARIA, and how its ideals would be acheived. It includes reference guide for the production of certain fruits, vegetables, grains and livestock. It's purpose is to allow a quick study of inputs, companion plants, yields, growth/harvest cycles, seasonality and land requirements. Following ths is an ideal vision of AGRARIA. From its initial outlay, to the life of its streets, parks, and fields, this vision for AGRARIA illustrates how to marry an agrarain ideology to sustainable urbanization.

4.2 ELEMENTS

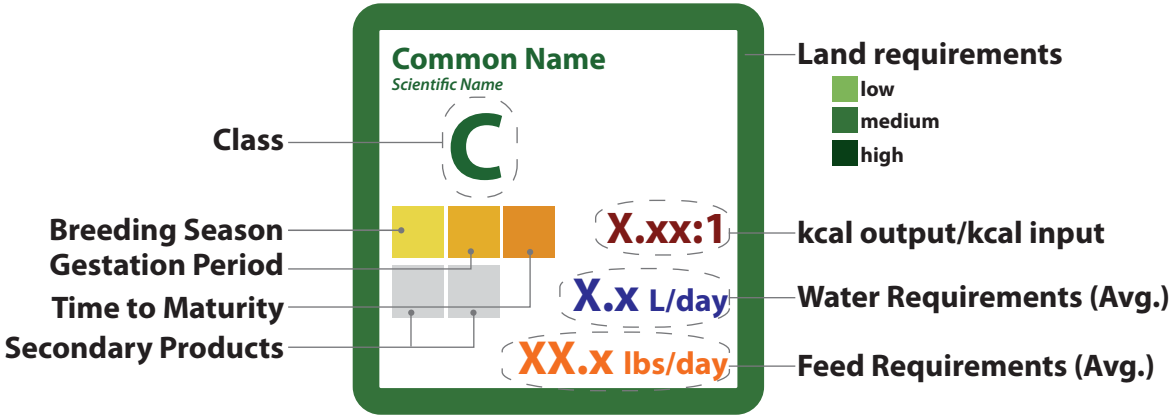

WINTER
FALL
SUMMER
SPRING
DECEMBER
SEPTEMBER
JUNE
MARCH
JANUARY
OCTOBER
JULY
APRIL
FEBRUARY
NOVEMBER
AUGUST
MAY

CROP & LIVESTOCK REFERENCE GUIDE

Fruits, Vegetables, & Field Crops



Livestock



Class Notations

Fruits & Vegetables

C	- Cole/Cabbage
F	- Fleshy-fruited
G	- Greens
O	- Onion group
P	- Perennials
S	- Salad
V	- Vine
L	- Legumes
T	- Tree
R	- Root
M	- Miscellaneous

Field Crops

Ce	- Cereal
F	- Forage
L	- Legumes
Gr	- Grain
O	- Other

Livestock

R_L	- Ruminant, large
R_S	- Ruminany, small
P	- Poultry
W	- Waterfowl
S	- Swine
A	- Alternative

Letter Codes

Seasons

SP	- Spring
SU	- Summer
FA	- Fall
WI	- Winter

Other

ND	-Not Determined

Asparagus
Asparagus officinale

P

SP | 1 yr | 8 wks

ND

7.3 lbs/100 sq.ft

Aubergine
Solanum melongena

F

SU | 10 wks | 13 wks

ND

55.1 lbs/100 sq.ft

Beans, bush
Phaseolus spp

L

SP SU | 8 wks | 12 wks

0.345:1

17.6 lbs/100 sq.ft

Beets
Beta vulgaris spp

R

SP SU FA | 8 wks | 4 wks

ND

34 lbs/100 sq.ft

Broccoli
Brassica oleracea

C

SP FA | 8 wks | 5 wks

0.33:1

33.9 lbs/100 sq.ft

Brussels Sprouts
Brassica oleracea gemmifera

C

SP FA | 11 wks | 12 wks

0.69:1

36.7 lbs/100 sq.ft

Cabbage
Brassica

C

SP FA | 12 wks | 4 wks

0.76:1

69.4 lbs/100 sq.ft

Carrots
Daucus carota

R

SP SU FA | 10 wks | 4 wks

ND

72.5 lbs/100 sq.ft

Cauliflower
Brassica botrytis

C

SP FA | 10 wks | -

ND

38.5 lbs/100 sq.ft

Celery
Apium graveolens

S

SP FA | 14 wks | 4 wks

0.599:1

160.7 lbs/100 sq.ft

Chard, Swiss
Beta vulgaris

G

SP SU FA | 8 wks | 44 wks

ND

34 lbs/100 sq.ft

Cucumber
Cucumis sativus

V

SU | 8 wks | 12 wks

0.35:1

39.3 lbs/100 sq.ft

Garlic
Allium sativum

O

SP FA | 1½yr | -

ND

40.9 lbs/100 sq.ft

Kale
Brassica sabellica

G

SP FA | 8wks | 17wks

ND

16 lbs/100 sq.ft

Lettuce, head
Latuca spp

S

SP FA | 12wks | 2wks

0.14:1

85.8 lbs/100 sq.ft

Onion
Allium spp

O

SP FA | 15wks | -

ND

101.4 lbs/100 sq.ft

Peas
Pisum sativum

L

SP FA | 10wks | 12wks

1.7:1

9.2 lbs/100 sq.ft

Potatoes
Solanum tuberosum

R

SP SU | 12wks | -

1.23:1

84.2 lbs/100 sq.ft

Spinach
Spinacea oleracea

G

SP FA | 6wks | -

0.23:1

34.6 lbs/100 sq.ft

Squash, zucchini
Cucurbita pepo

V

SU | 8wks | 25wks

ND

27 lbs/100 sq.ft

Sweet Corn
Zea mays

M

SU | 11wks | -

2.5:1

27 lbs/100 sq.ft

Sweet Pepper
Capsicum annuum

F

SU | 10wks | 17wks

0.14:1

68.7 lbs/100 sq.ft

Tomato
Lycopersicon esculentum

F

SU | 10wks | 17wks

0.60:1

67 lbs/100 sq.ft

Turnip
Brassica napus

R

SP FA | 8wks | 4wks

ND

47 lbs/100 sq.ft

Apple
Malus domestica

T

SP 3yr -

1.1:1

51.4 lbs/100 sq.ft

Blueberry
Vaccinium

P

SP 3½yr -

0.075:1

8.8 lbs/100 sq.ft

Cherry, sour
Prunus cerasus

T

SP 4yr -

0.5:1

14 lbs/100 sq.ft

Cherry, sweet
Prunus avium

T

SP 4yr -

1.527:1

15 lbs/100 sq.ft

Grapes, raisin
Vitis spp

V

SP 3yr -

0.986:1

45.4 lbs/100 sq.ft

Grapes, wine
Vitis spp

V

SP 3yr -

0.174:1

31.6 lbs/100 sq.ft

Peach
Prunus persica

T

SP 3½yr 10yr

0.38:1

53.4 lbs/100 sq.ft

Pear
Pyrus communis

T

SP 4yr 75yr

0.51:1

66.6 lbs/100 sq.ft

Plum
Prunus domestica

T

SP 4yr 25yr

0.765:1

26.7 lbs/100 sq.ft

Raspberry
Rubus idaeus

P

SP 2yr 8yr

0.34:1

12.3 lbs/100 sq.ft

Strawberry
Fragaria virginiana

P

SP 2yr 4yr

0.21:1

102.4 lbs/100 sq.ft

Watermelon
Citrullus edulis

V

SU 12wks 13wks

0.07:1

58.7 lbs/100 sq.ft

Alfalfa
Medicago sativa

F

SP | 12 wks | 50 yr | 6.17:1

14.9 lbs/100 sq.ft

Barley
Hordeum distichon

Ce

SP FA | 12 wks | - | 4.14:1

6.5 lbs/100 sq.ft

Buckwheat
Fagopyrum esculentum

O

SP SU | 11 wks | - | ND

2.6 lbs/100 sq.ft

Lentils
Ervum lens

L

SP SU | 12 wks | 8 wks | ND

2.8 lbs/100 sq.ft

Oats
Avena sativa

Ce

SP FA | 15 wks | - | 5.1:1

4.8 lbs/100 sq.ft

Rice
Oryza sativa

Gr

SU | 17 wks | - | 2.1:1

15.3 lbs/100 sq.ft

Rye
Secale cereale

Ce

FA | 17 wks | - | 2.75:1

3.5 lbs/100 sq.ft

Sorghum
Sorghum

O

SU | 13 wks | - | 1.96:1

6.8 lbs/100 sq.ft

Soybean
Glycine max

L

SU | 9 wks | 4 wks | 4.15:1

4.6 lbs/100 sq.ft

Sunflower
Helianthus annuus

O

SP | 17 wks | - | ND

4.1 lbs/100 sq.ft

Wheat, durum
Triticum spp

Ce

FA | 17 wks | - | 2.2:1

4.6 lbs/100 sq.ft

Wheat, white
Triticum aestivum

Ce

FA | 17 wks | - | 3.69:1

3.7 lbs/100 sq.ft

Cattle, Beef

Bos taurus

RL

FA	284 days	12 mo.	0.029:1

34-56 L/day

110 lbs/day

Cattle, Dairy

Bos taurus

RL

FA	284 days	12 mo.	0.053:1

80-160 L/day

72 lbs/day

Chicken

G. gallus domesticus

P

SP SU	21 days	5 mo.	0.063:1

0.5 L/day

0.3-0.8 lbs/day

Duck

Anatinae anas

W

SP SU	28 days	12 mo.	ND

0.5 L/day

0.4-0.5 lbs/day

Geese

Anserinae anser

W

SP SU	28-30 days	5-6 mo.	ND

0.6 L/day

0.5-0.7 lbs/day

Goat

Capra aegagrus hircus

RS

SU FA	150 days	10 mo.	ND

3.8 L/day

2-3 lbs/day

Lamb

Ovis aries

RS

n/a	n/a	10 wks.	0.005:1

2.0 L/day

3.5 lbs/day

Pigs

Sus scrofa domestica

S

FA	113 days	5 mo.	0.015:1

11-26 L/day

8 lbs/day

Rabbit

Lagomorpha leporidae

A

Year round	32 days	11-13 wks.	ND

0.3-0.5 L/day

1 lb/day

Sheep

Ovis Aries

RS

FA	145 days	12 mos.	0.063:1

3.8 L/day

5 lbs/day

Turkey

Meleagris gallopavo

P

WI	28 days	10 mo.	ND

0.6-1.2 L/day

1.2 lbs/day

Veal

Bos taurus

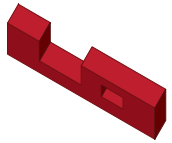
RL

n/a	n/a	3-14 wks.	ND

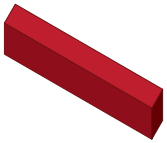
34-56 L/day

3.7 lbs/day

MIXED-USE

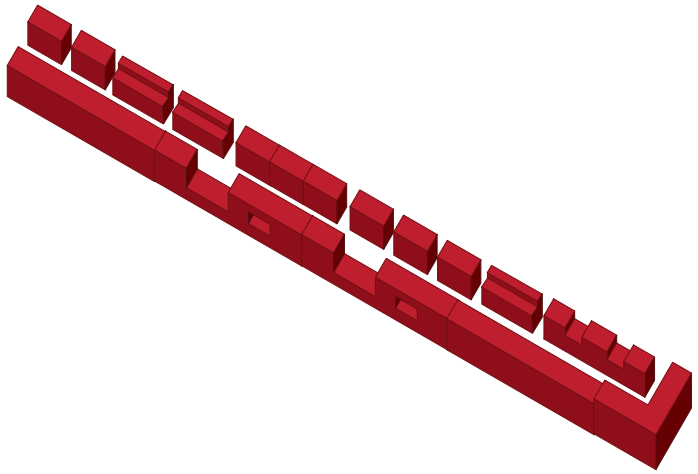


Perforated Block

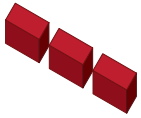


Linear Block

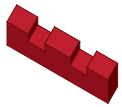
L-shaped Block



RESIDENTIAL

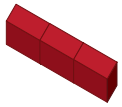


Single Detached Housing



Stepped Row houses

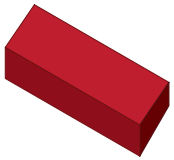
AGRIHOME



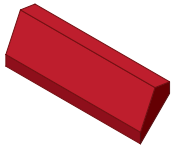
Multiunit Cohousing

AGRISERVICES

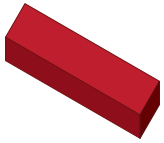
Irrigation Tower



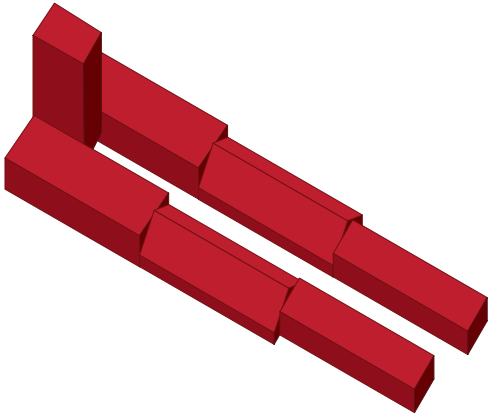
Staging/Storage Primary Processing

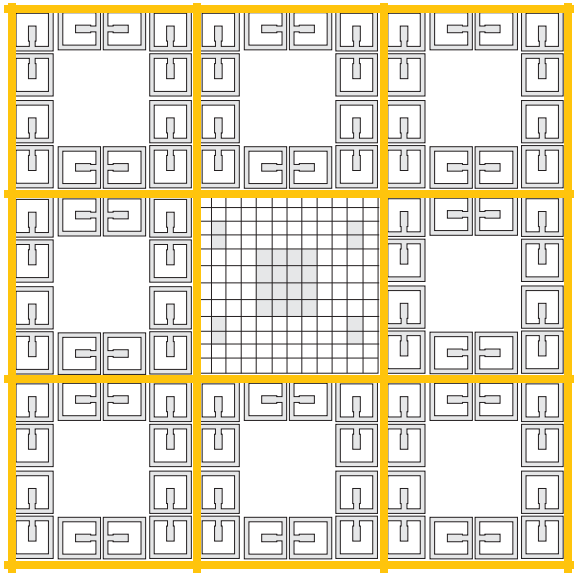


Greenhouse

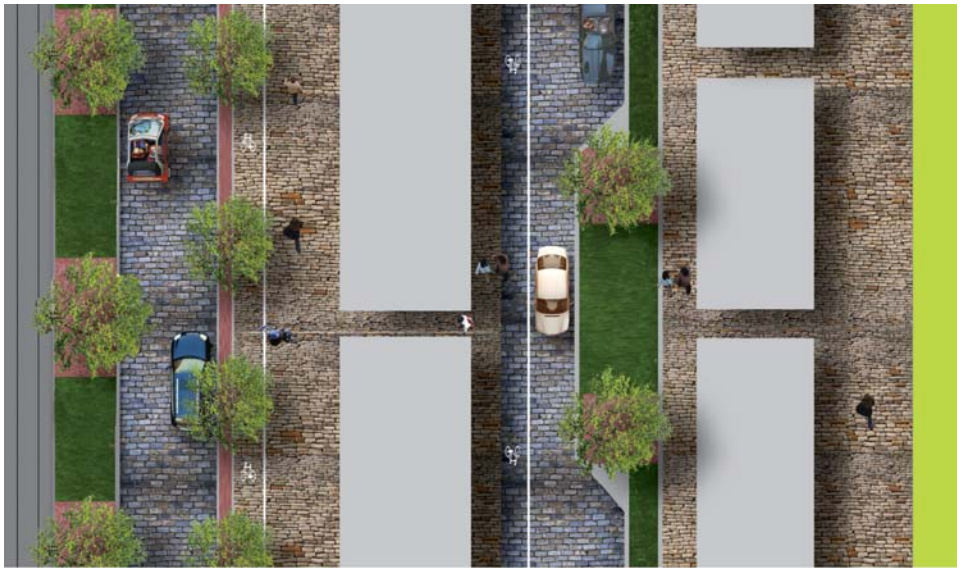


Secondary Processing

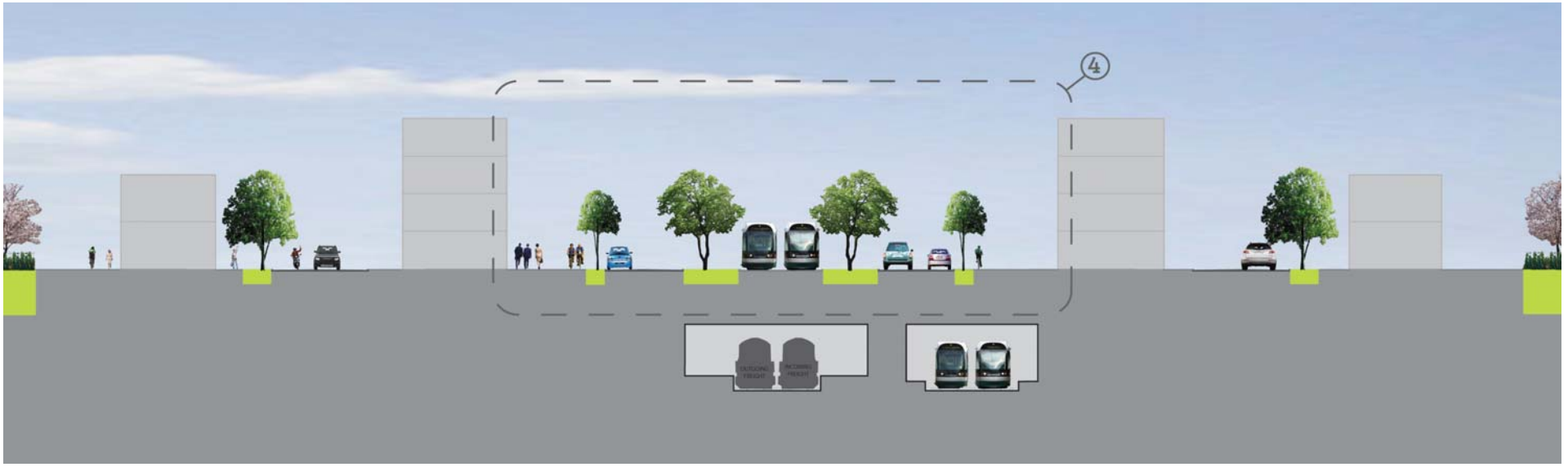




4.24 KEY PLAN A - Main Transit Artery

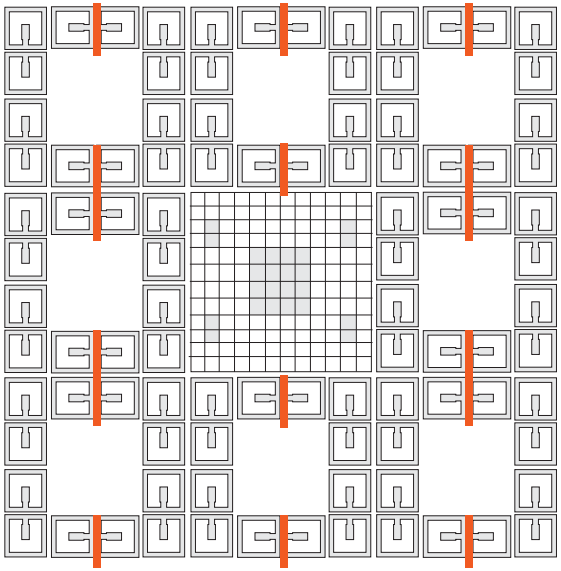


4.25 PLAN A - Main Transit Artery



4.26 SECTION A - Main Transit Artery

4.27 View of Main Transit Artery

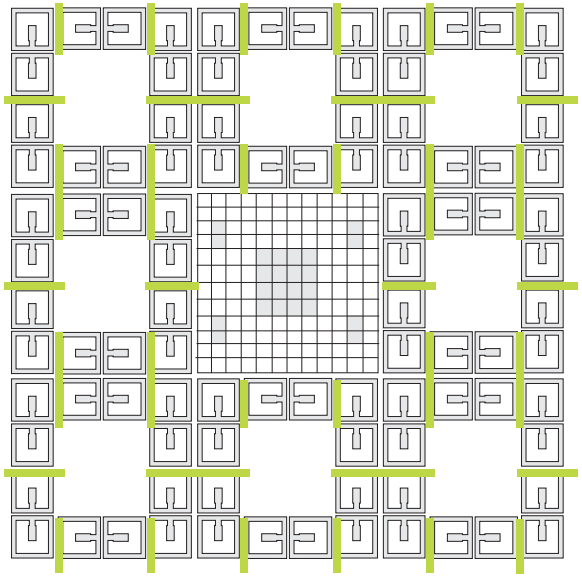


4.28 KEY PLAN B - Local Lane

4.29 PLAN B - Local Lane

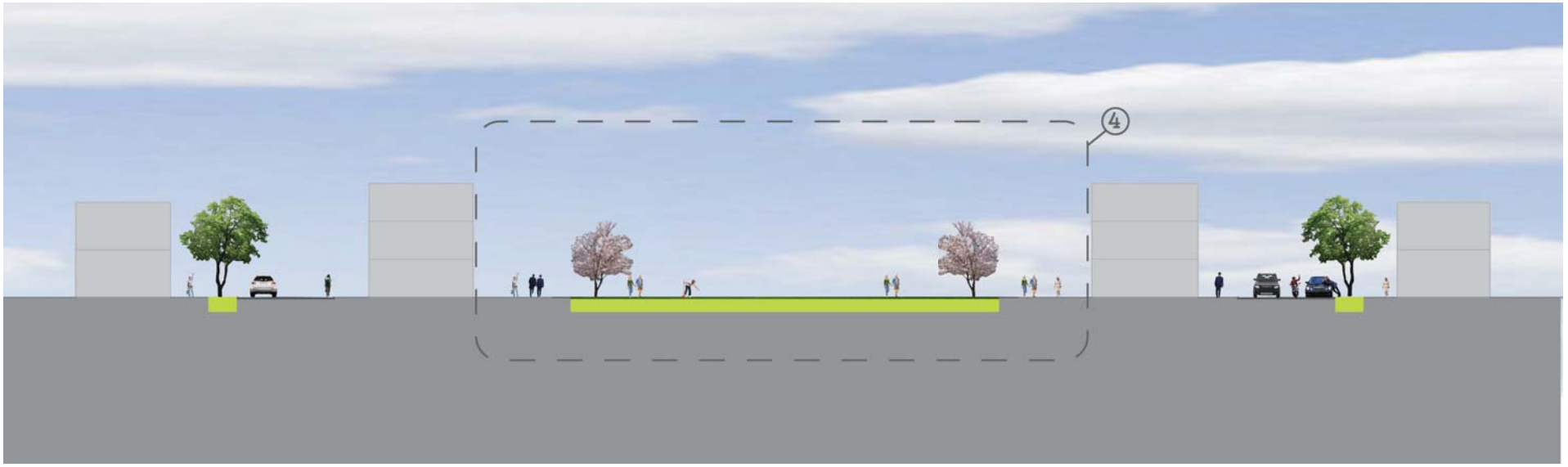
4.30 SECTION B - Local Lane

4.31 View of Local Lane



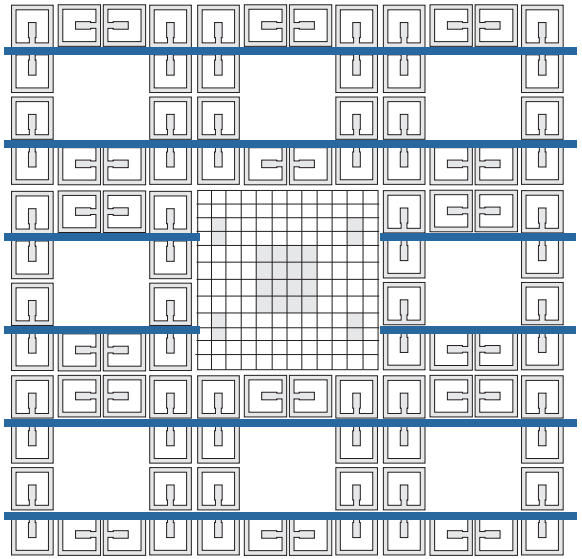
4.32 KEY PLAN C - Greenway

4.33 PLAN C - Greenway

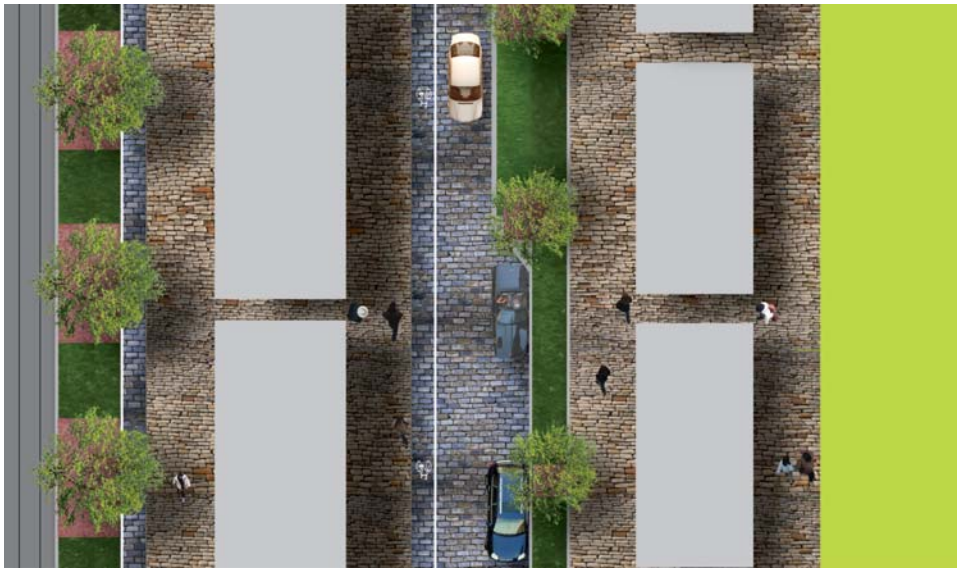


4.34 SECTION C - Greenway

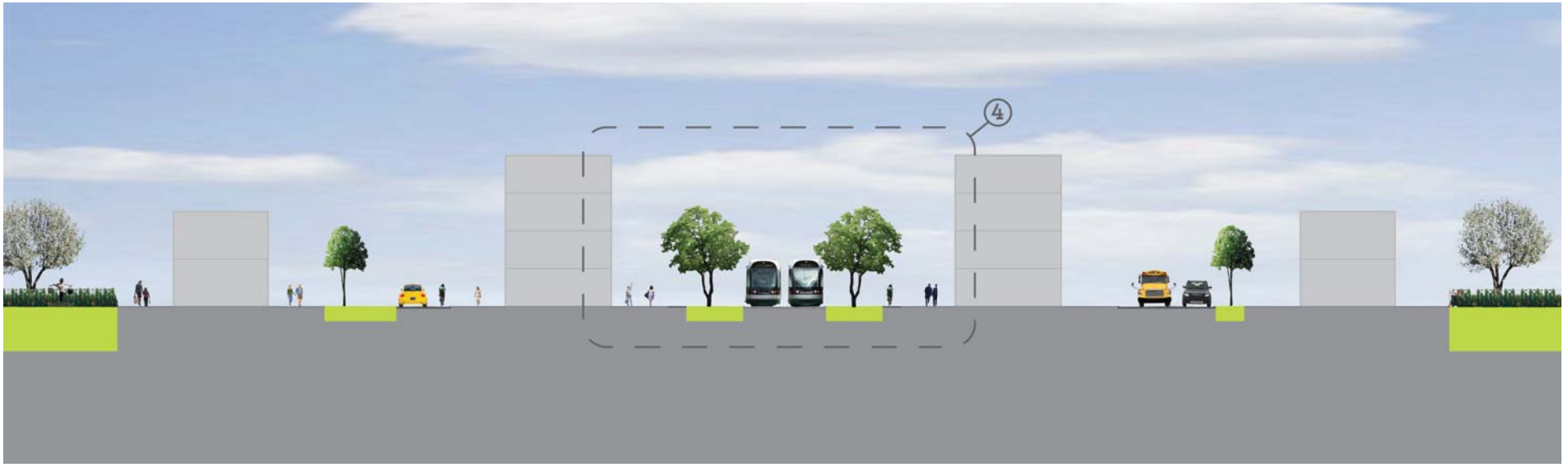
4.35 View of Greenway



4.36 KEY PLAN D - Tramway



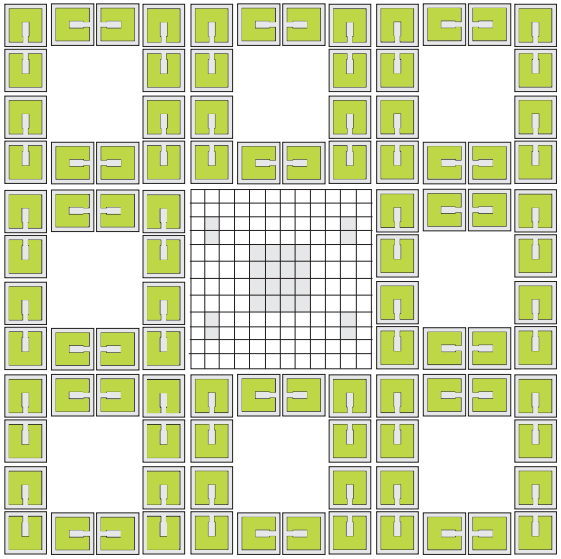
4.37 PLAN D - Tramway



4.38 SECTION D - Tramway

4.39 View of AGROMART


FRUITS Quality & VEGETABLES
FRESH PICKED DAILY

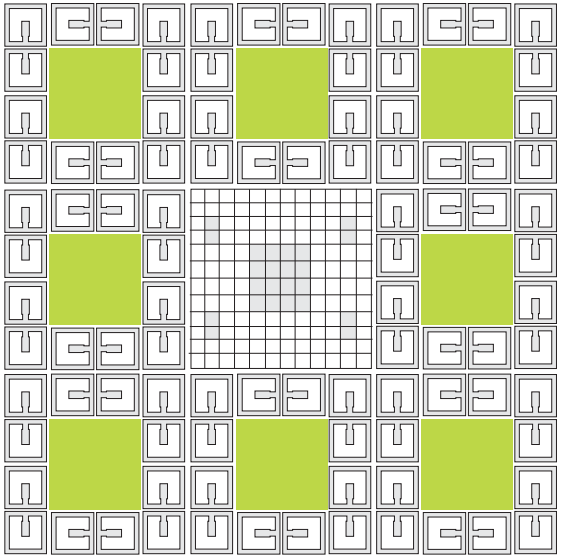


4.40 KEY PLAN E - AGROMMUNITY Field

4.41 PLAN E - AGROMMUNITY Field

4.42 SECTION E - AGROMMUNITY Field

4.43 View of AGROMMUNITY Field



4.44 KEY PLAN F - AGRISECTOR

4.45 PLAN F - AGRISECTOR

4.46 SECTION F - AGRISECTOR

4.47 View of AGRISECTOR

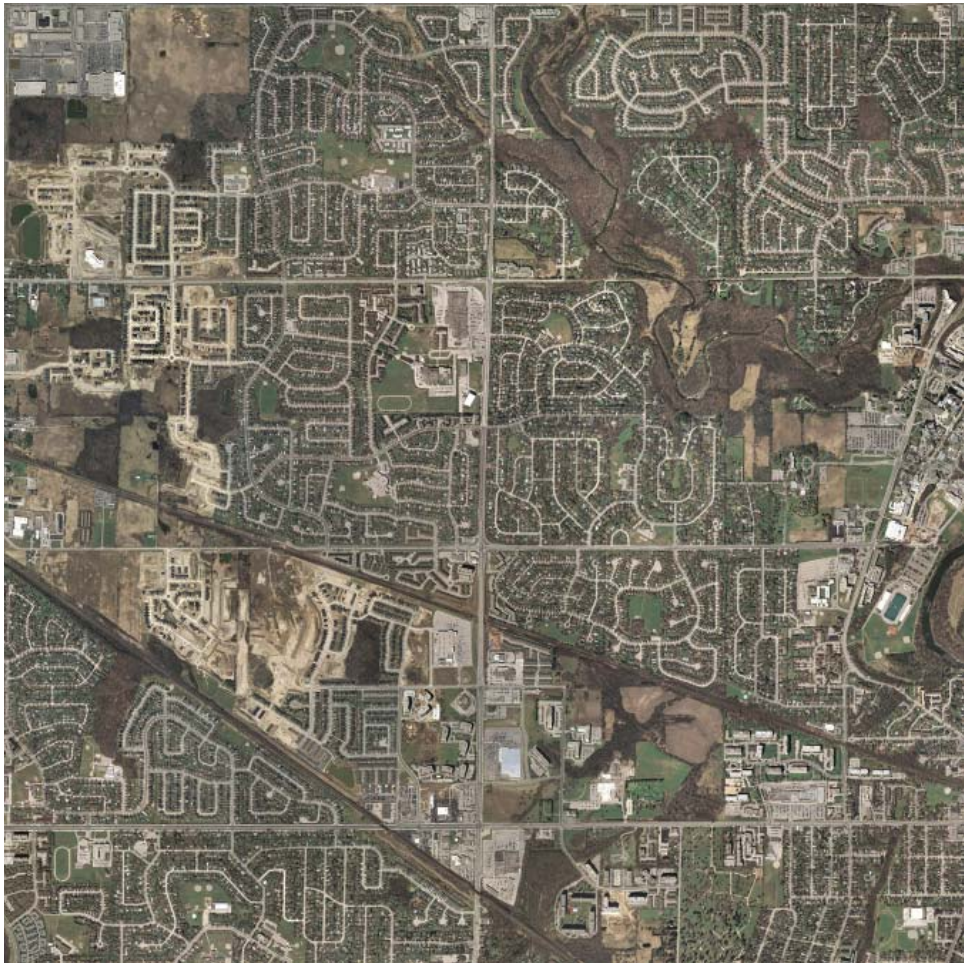
Developed to understand the scale of this proposal, this section contrasts the population, density, and agricultural self-sufficiency of urban, fringe, and rural situations with the master plan for AGRARIA,

4.3 COMPARATIVE SCALES

URBAN

4.48 Aerial View - Toronto, Ontario

FRINGE

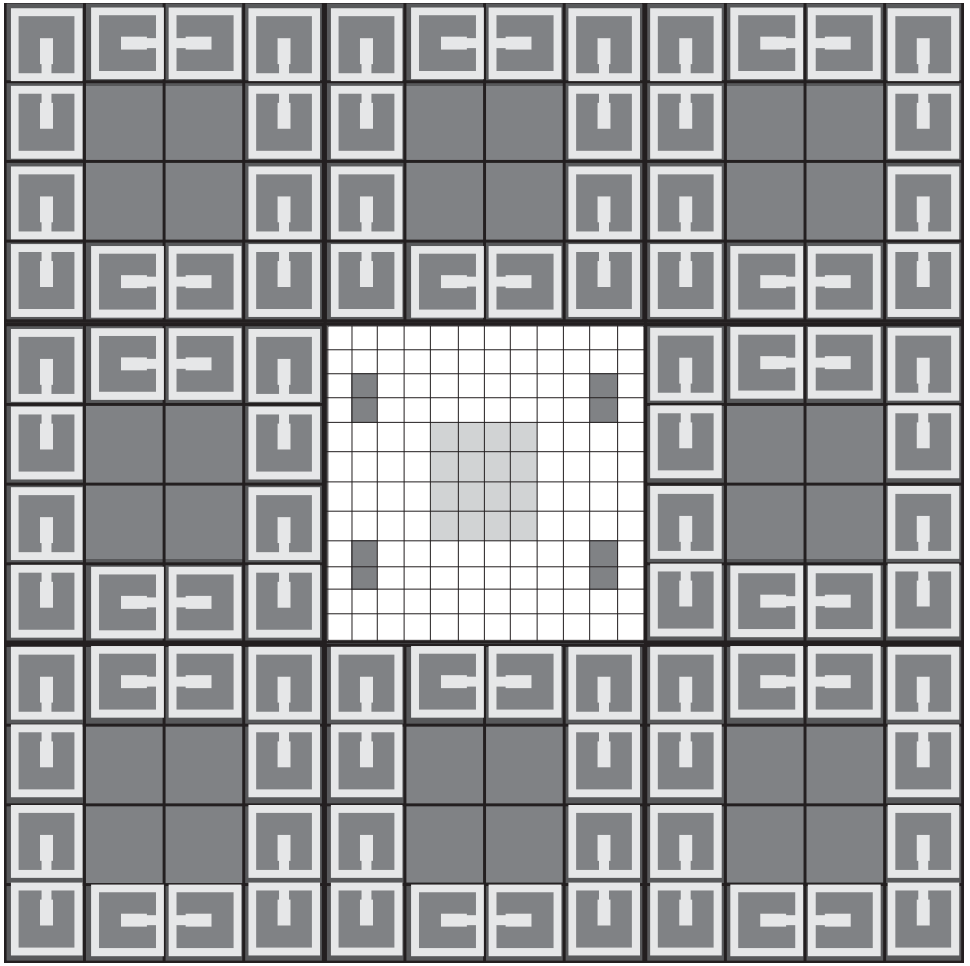


4.49 Aerial View - London, Ontario

RURAL

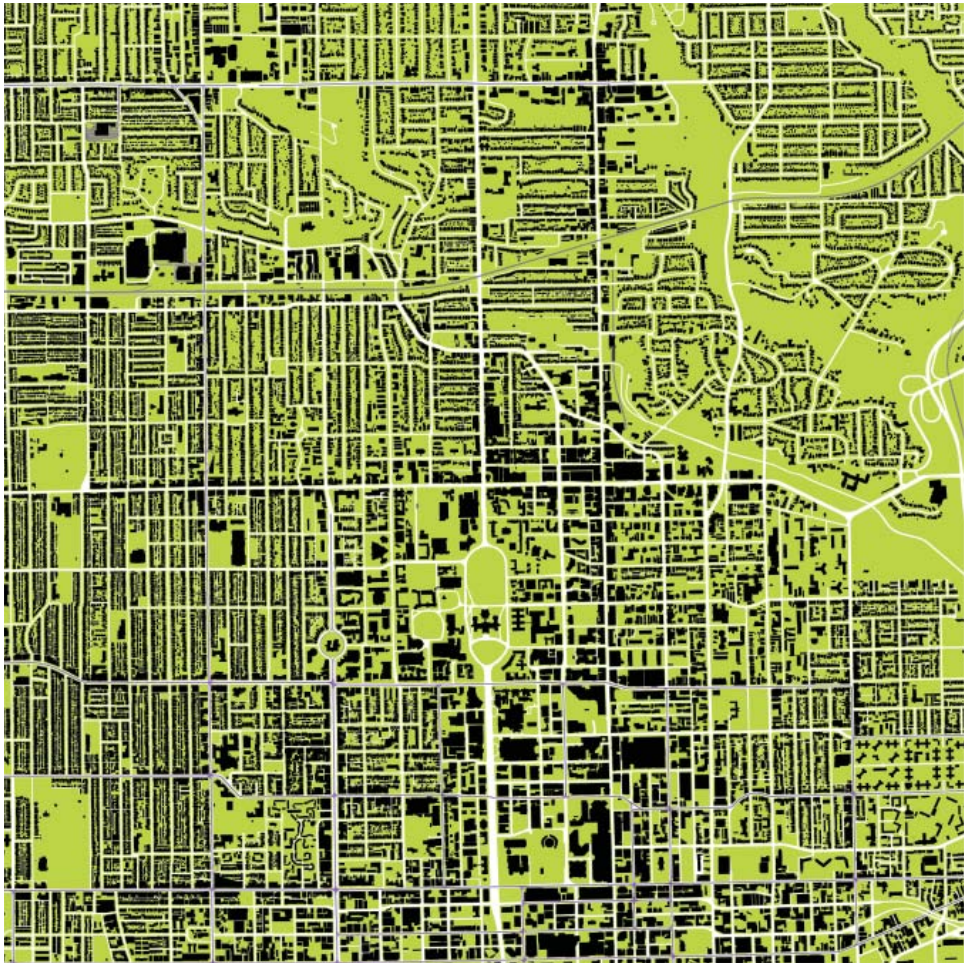
4.50 Aerial View - Woolwich Township, Ontario

AGRARIA



4.51 AGRARIA Master Plan

URBAN



4.53 Diagrammatic View - Toronto, Ontario

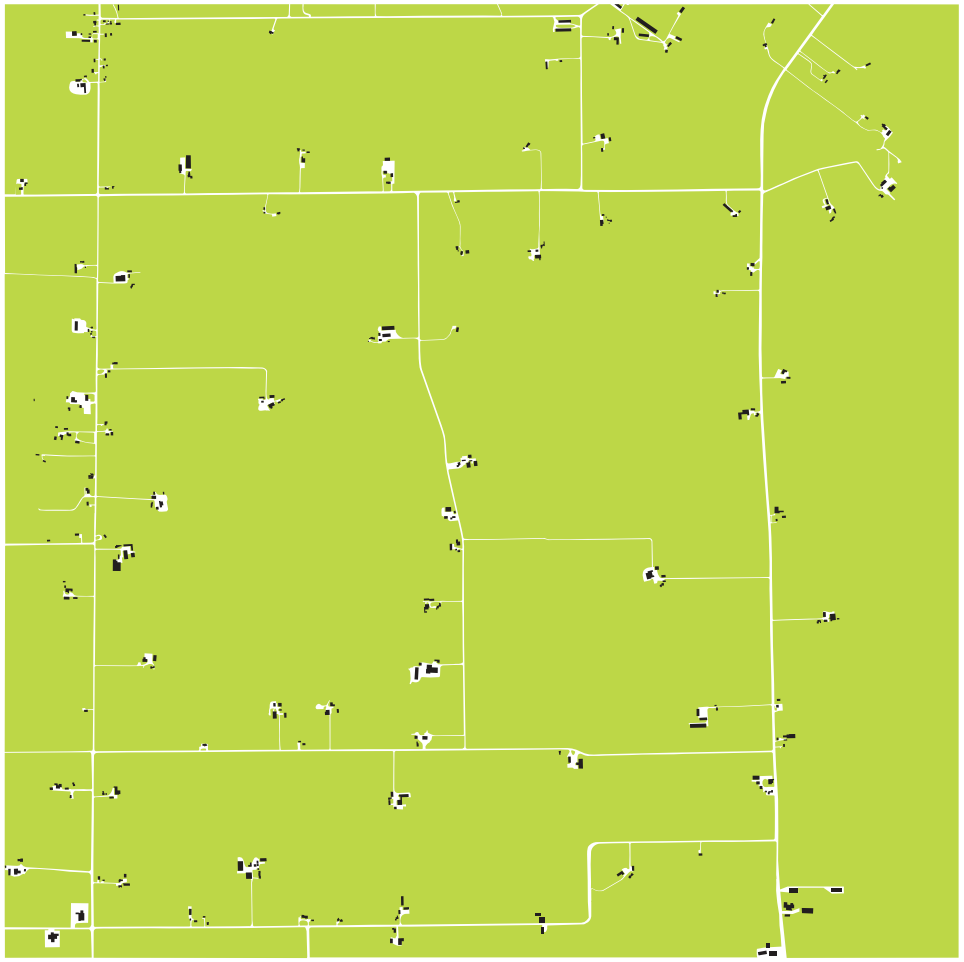
Study Area:5760 Acres
Population:258,425
Density:11.2 Units/acre

FRINGE

4.54 Diagrammatic View - London, Ontario

Study Area:5760 Acres
Population:77,142
Density:3.3 Units/acre

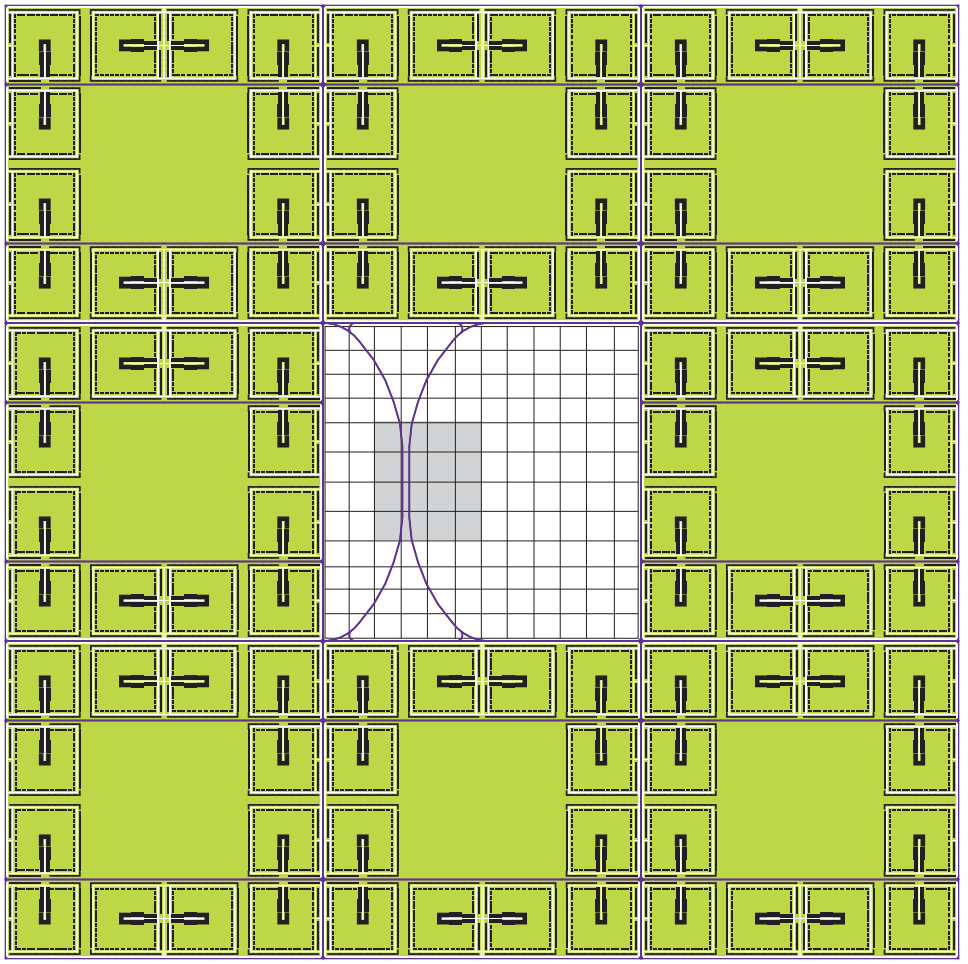
RURAL



4.54 Diagrammatic View - Woolwich Township, Ontario

Study Area:5760 Acres
Population:475
Density:0.016 Units/acre

AGRARIA



4.55 Diagrammatic View - AGRARIA MAster Plan

Area:5760 Acres
Population:40,000 (excluding Core)
Density:1.8 Units/acre

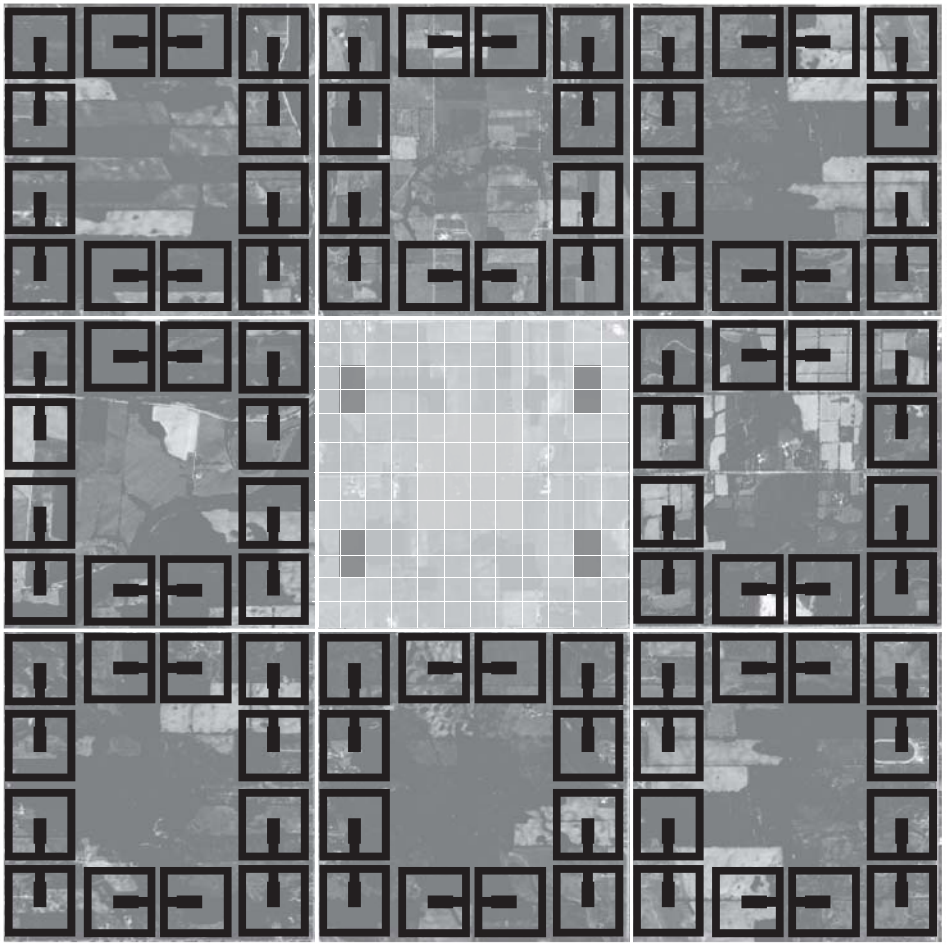
Illustrating how the Master plan of AGRARIA would alter due to existing conditions or restrictions laid upon its development is critical aspect for its success. This section shows the development of AGRARIA within two distinct situations. The first is how it would develop from scratch with the inclusion of existing natural elements such as waterways and wood lots. The second is how AGRARIA would develop around a “seed city”.

4.4 ADAPTATION

STAGE 1

4.56 Development of New City

STAGE 2



4.57 Master Plan Overlay

STAGE 3

4.58 Areas of Conservation

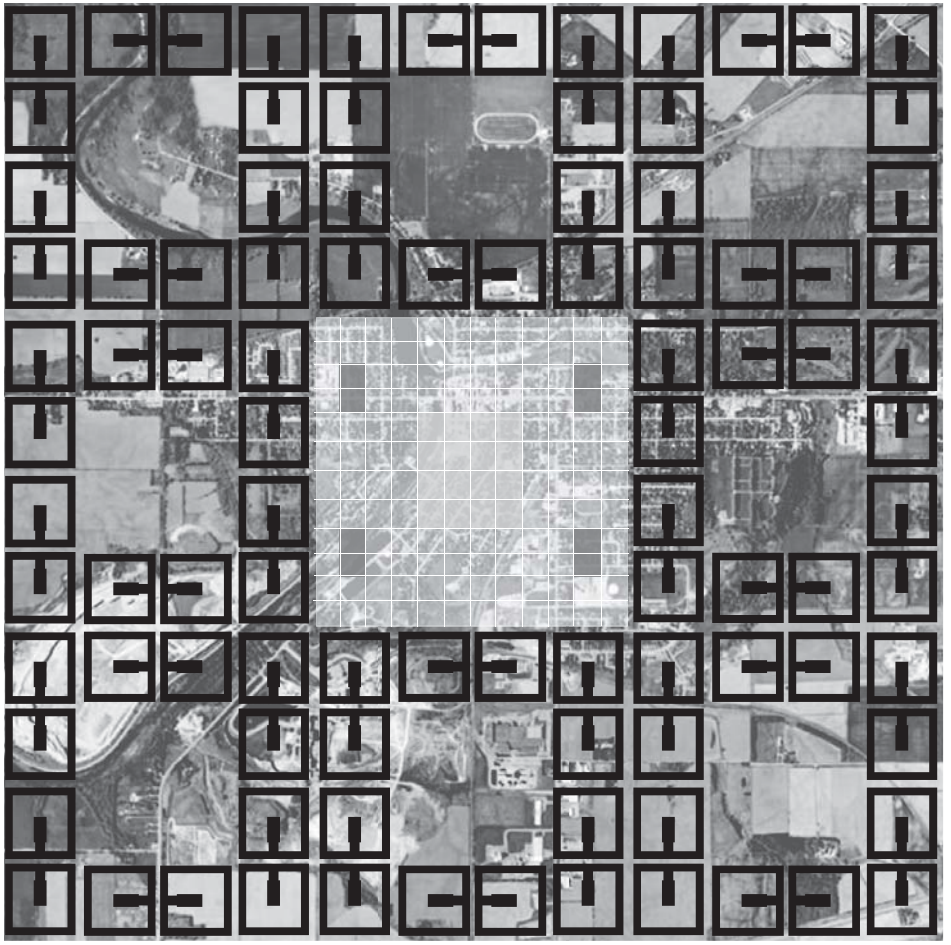
STAGE 4

4.59 Adaptation of AGRARIA

STAGE 1

4.60 Development from ‘Seed City’

STAGE 2



4.61 Master Plan Overlay

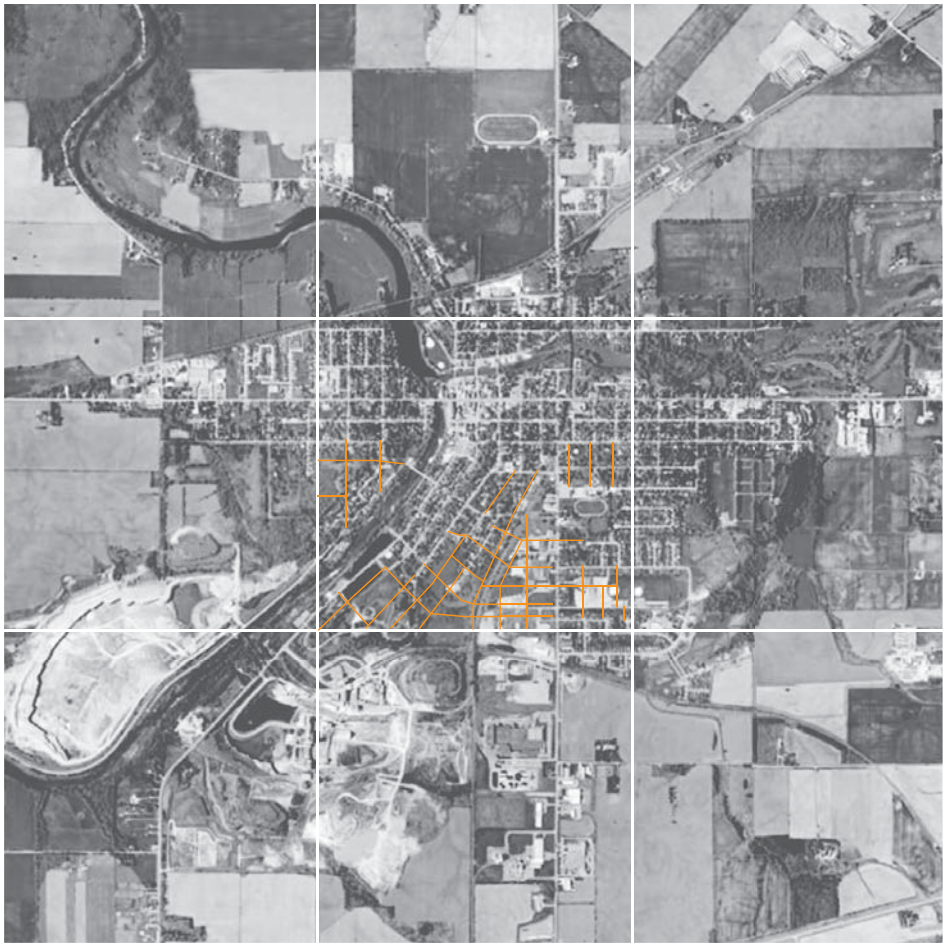
STAGE 3

4.62 Existing Networks

STAGE 4

4.63 Areas of Conservation

STAGE 5



4.64 Adaptation of AGRARIA A - Core Expansion

STAGE 6

4.65 Adaptation of AGRARIA B - AGRIZONES

Where shall AGRARIA lead us? How can its methodology be applied to existing built and rural fabric? This chapter seeks to answer these questions, as it discusses the application of the precepts of AGRARIA to our current built environment.

4.5 HORIZONS

Reflecting upon this thesis, it becomes apparent that it is a utopian vision. Within the same genre as Howard's Garden City and Wright's Broadacres, AGRARIA is a suggestion of how to develop an idealized communal network within the built environment. Through the lens of self-sufficiency, AGRARIA takes its form, as an agrarian-based city, comprised of self-sustained community nodes.

If we look towards Howard's Garden City we can see a similarity in the proposal to AGRARIA, in that its boundaries are meant to provide for the town's populace. Unlike the Garden City plan however, AGRARIA does allow for future internalized or boundary growth but only if the productive capacity of the land can provide for the populace.

In reference to Broadacres, AGRARIA is alike in that theoretically it could spread continuously throughout the country. The difference between the two being that Broadacres is a decentralized plan heavily reliant upon private transportation, whereas AGRARIA is concentrated to be self-sufficient within each community itself. Looking into the application of AGRARIA, rural areas provide the best opportunity for implementation. Ideally the proposal would be applied to existing agricultural lands that are primarily under monocultural production. As AGRARIA can be implemented incrementally, either in just single AGROMMUNITIES, or whole AGROZONES it is adaptable to different scales of development.

As the realization of the original AGRARIA scheme is complete, it has the ability to expand

sequentially, under the same guidelines as the original. For every nine AGROZONES, one shall be a central core. It is imagined that the core of the original AGRARIA would begin to expand at an appropriate rate as the overall city expands. It should be cautioned however, that the expansion of the core must not exceed the city's capability for food self-sufficiency.

Existing centres of agricultural communities also provide a unique prospect for the execution of AGRARIA. As shown in section 4.4, AGRARIA can absorb an existing town as AGROZONES spread from a historic core into the surrounding agricultural lands.

Urban sprawl and development of arable land will be restricted if it does not reflect the ideology of AGRARIA. Development at the rural/ urban fringe will therefore follow a pattern deeply rooted in creating productive landscapes. Thus, any new development upon arable land will be regulated so that 70% remain productive land, 10% for communal alternative energy sources, and 20% for private development.

Existing suburban areas will be infiltrated through adaptive zoning and planning regulations. Suburban land lots shall be rezoned for agricultural and small-commercial uses. This is encourage the opportunity for continuous peri-urban farms within reclaimed lawnscapes with local markets for the distribution of produce. The R.O.W.'s of existing suburban lands provide areas for the introduction of intensive vegetable crop production.

Urban intensification and urban agricultures must be intrinsically linked, whereupon the vegetative needs of a city are supplemented if not met within its own boundaries. Implementing social programs concerning urban farming, urban agronomists will play a key role in the education and knowledge dissemination of alternative agricultural practices within an urban context. Utilizing vacant lots, rooftops, side and backyards, urban centres will supplement if not become entirely self-sufficient in regards to their vegetable crop needs. The maintenance of such urban farms will create new employment opportunities, provide supplemental income, and foster stronger ties between individuals within a community.

Urban expansion must be held accountable for the continuing loss of arable land. Cities must become capable of sustaining what the land can maintain rather than shifting to externalities for survival. The trend of externalized, low-density consumptive urban expansion must shift towards a productively internalized methodology of development., AGRARIA can provide this methodology.

APPENDICES

The AGRIHOME was an investigation into a self-sufficient homestead. Through its conception the development of a modular growth wall-system dubbed AGRIBOXES was created. This allowed for the year-round production of fruits and vegetables. This residence, although recommended as a typological part of AGRARIA, was abandoned after the M1 term as the thesis began to broaden its scope so its design has not been fully realized.

THE AGRIHOME

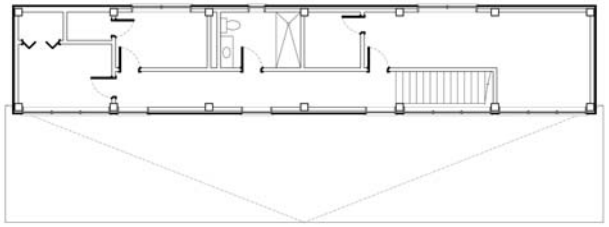
The current trends in industrial agriculture and continued urban sprawl have lead to an increasing **threat** upon our arable lands. Food shall become a **limited** resource unless measures are taken to ensure its **future**. As the oil age ends it is no longer a question of convenience but one of **survival!**

Introducing:

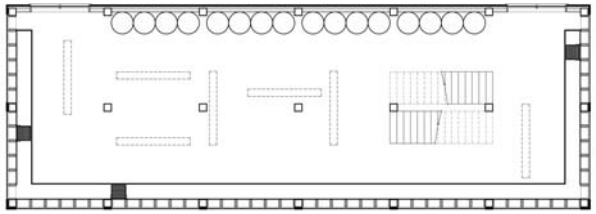
AGRIHOME

An exploration into a new way of living.
A lifestyle that incorporates agricultural practices into daily life.
Grow at home eat at home.

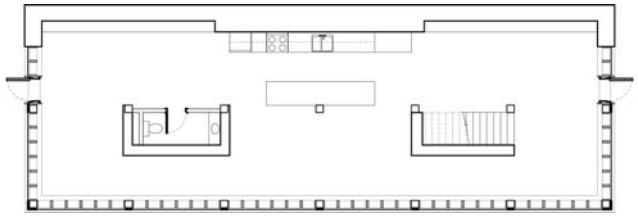
DESIGN SCHEMATICS



living floor

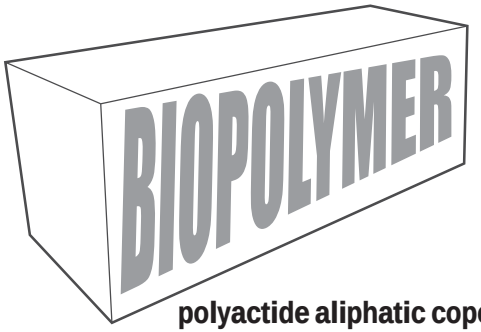


growth floor



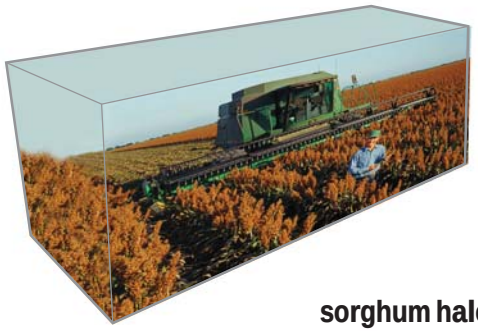
ground floor

MATERIAL DEVELOPMENT



polyactide aliphatic copolymer

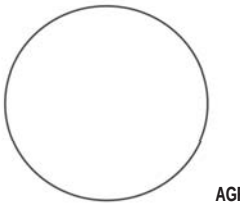
phyllostachys mitis (bamboo)



sorghum halepense

cannabis sativa (hemp)

MATERIALS

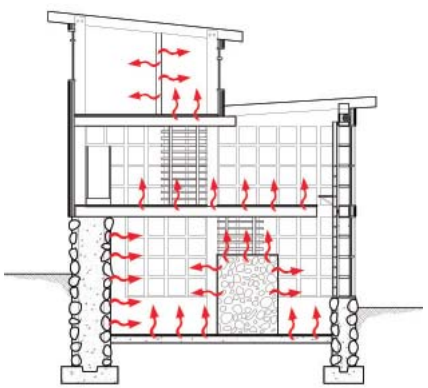


AGRIBOXES

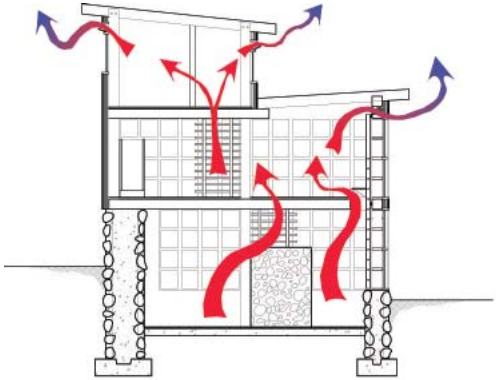
GLU-BAM
BEAMS & POSTS

flooring
CEILING FINISH

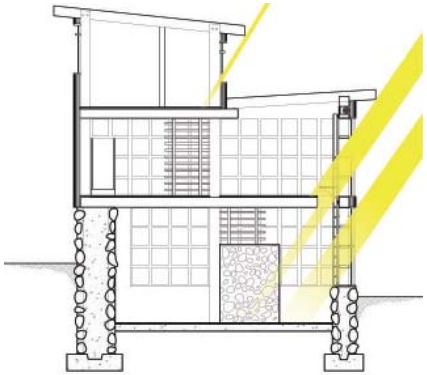
TILES
THERMAL SCREENS



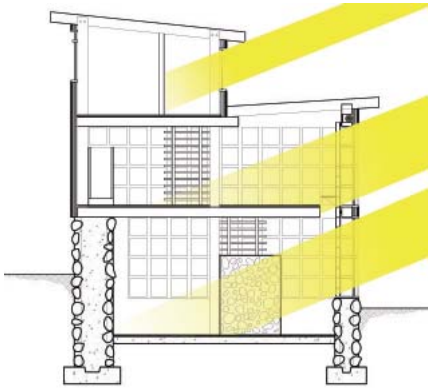
THERMAL MASSING



VENTILATION



SUMMER SUN



WINTER SUN

EXTERIOR INTEGRATION

INTERIOR HABITATION (GROWTH FLOOR)

BACKGROUND

Canada's population is expanding at a rate of 0.88% per annum and will double within the next 75 years

Estimates indicate that 1 acre of land is lost to urbanization for every person added to the population

Urbanization in Canada over the past 30 years increased by 76%

81% of Canada's population is urban, the remaining population being rural

Canada's rural population is declining at a rate of 1% per annum

Currently only 2% of Canada's population is responsible for its food supply

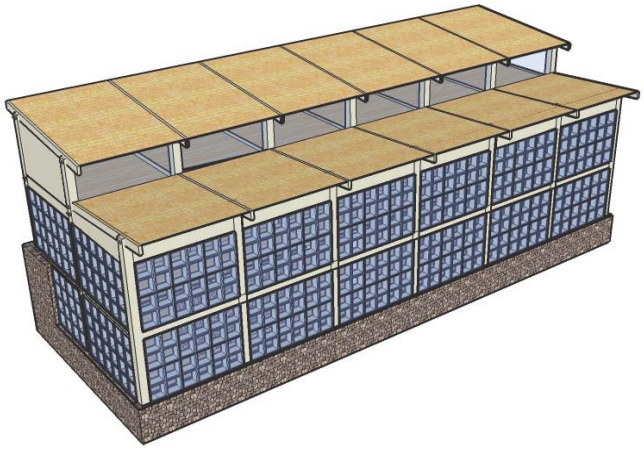
Most development occurs around the rural-urban fringe

There are currently 10.2 acres of arable land for every person in Canada

It takes a minimum of 1.2 acres of arable land to support the diet of 1 person with current agricultural practices

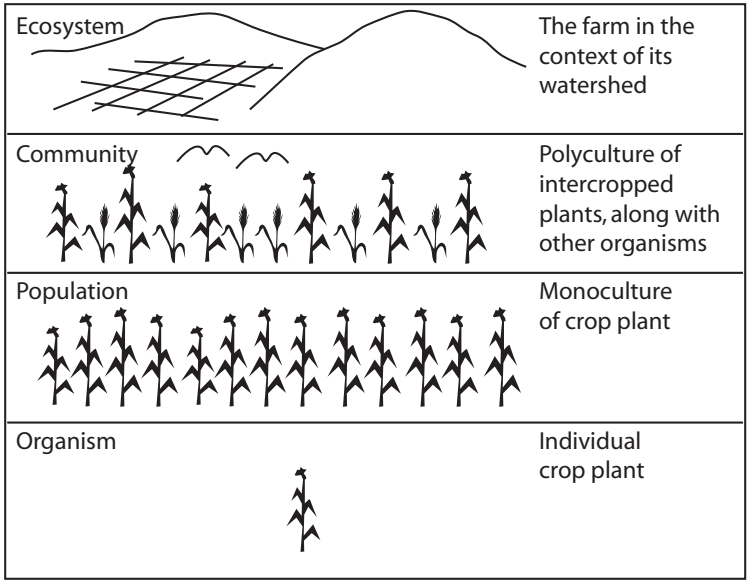
The average AGRIhome provides a productive diet for four people on 1/2 acre of land

One AGRIbox can provide over 5kg of food per annum

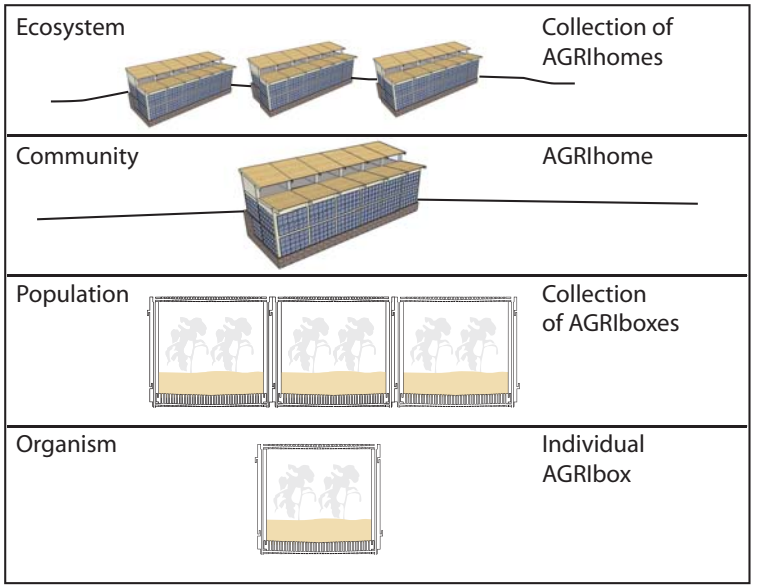


The AGRIhome is a response to the current crisis contemporary agriculture is facing due to the threat of peak oil, and the continuing loss of arable land to urban sprawl. The foundation of our agricultural system has become dependent upon high fossil fuel inputs in order to meet global demand and the satisfy the interests of agribusiness. Large scale, single-operator, 'corporate' farms dominate the agricultural sector, creating a system where the individual is a faceless entity within the collective whom rely upon these individuals for their food security. The AGRIhome is the adoption of a new agronomy based lifestyle, where each individual becomes an integral part of the food security of the collective.

AGRICULTURAL HOLARCHY



5.03 Physical levels of agroecosystems



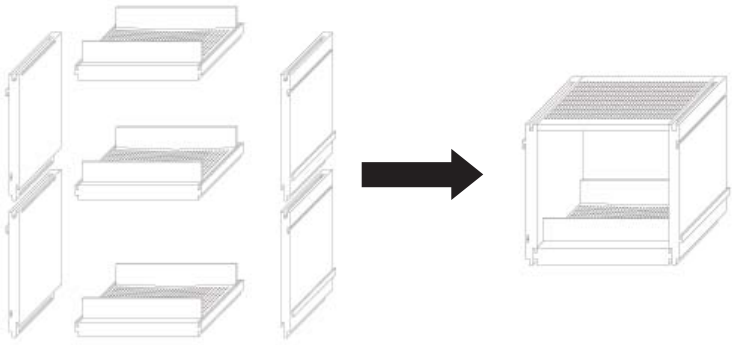
5.04 Physical levels of agroecosystems applied to AGRIhome system

ABC & E ANALYSIS

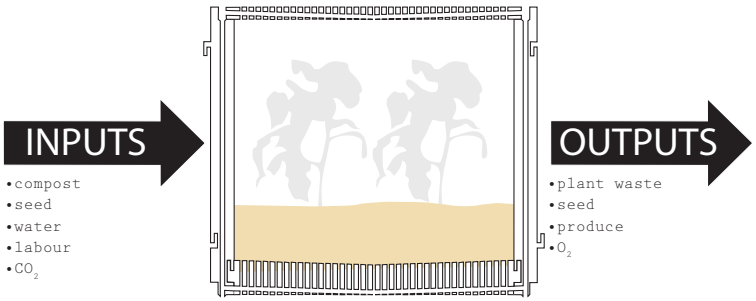
Organizing principle	System	Perspective Influences
ABIOTIC		
	Geography	Location: Ecoregion: Lake Erie Lowlands Provincial Region: Southwestern Ontario
	Climate	Temperate climate with a longer growing season than areas at similar latitudes in the continent's interior. Annual precipitation ranges from 750mm to 1000mm.
	AGRIhome Specifications	Area: Total land: 2024 m^2 AGRIhome footprint: 112m^2 Cultivated land: 1000m^2 Orchard: 500m^2 Other land: 412m^2
		Requirements: Water requirements: 2,000,000 L/annum Energy requirements: 14,600 kwh/annum Food requirements: 3,900cal/person/day=1kg/day
		AGRIbox Specifications: Volume/unit: 2 cubic ft. Growth area/unit: 2 sq.ft. Average units/AGRIhome: 416 Food produced/AGRIbox: appr. 5kg/annum
	AGRIbox cropping	tomatoes, cucumber, zucchini, peppers, basil, oregano, mint, coriander, parsley, lettuce, aubergine, onion, potatoes, carrots, celery, beets, soybean, broccoli, cauliflower, cabbage
	Aquaculture	tilapia, mussels
	Outside cropping	wheat, barley, corn, sunflowers, apples, melons, grapes

Organizing principle	System	Perspective Influences
BIOTIC		
	AGRIhome ecosystem	An AGRIhome is a controlled system in which all parts are managed by the inhabitants through an agroecological strategem. After implementa tion of the AGRIhome, no external inputs are required, and external outputs are surplus food only.
	Aquatic ecosystems	AGRIhome aquaculture cultivates the growth of tilapia and mussels within designed AQUAboxes. Other aquatic ecosystems pertain to the treatment of waste water, and harvested rainwater, through filtration ponds, and purification tanks (akin to “Living Machine” system developed by Oceanarks International)
	Biodiversity	AGRIhomes promote the biodiversity of agroecosystems through agroecological strategies (i.e. alleopathy, companion planting, polycultures, etc. - refer to Appendix B for more information)
	Environmental issues	AGRIhome
CULTURAL		
	People	Population: 4 people/AGRIhome Population Density: 1976 people/km^2
	Human Use	**AGRIhome Land Use** Arable land: 74% Cultivated: 49% Orchard:25% Forest & Pasture:12% Developed: 5% **Ruralization** Agrihome development leads to the ruralization of the rural-urban fringe. Rural areas become consolidated communities localized around groupings of AGRIhomes. Urban areas are intensified through a process of densification.

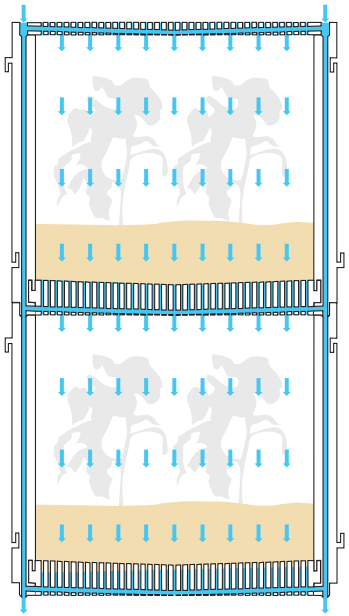
Organizing principle	System	Perspective Influences
CULTURAL cont'd		
	Ideology	The AGRIhome ideology promotes the notion of self-reliance within a post-peak-oil society. Localization of resources, economy, and social units are encouraged.
ENERGETICS		
	Electricity	**Electricity production** The production of electricity for an AGRIhome is derived from two sources. The primary source being collective solar arrays and wind farms accounting for approximately 70% of the AGRIhome's required energy consumption. The remaining 30% of energy production is on-site through the conversion of biomass to methane. **Electricity consumption** 14,600 kwh/annum (based on current low-energy lifestyle with minimal luxuries)
	Economy	Localized within AGRIhome community. Communities are linked to urban centres and other AGRIhome communities through agrilcultural trade.



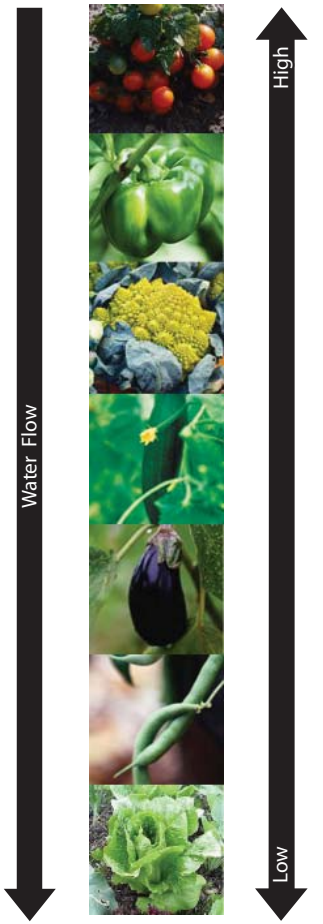
5.05 AGRIbox construction diagram



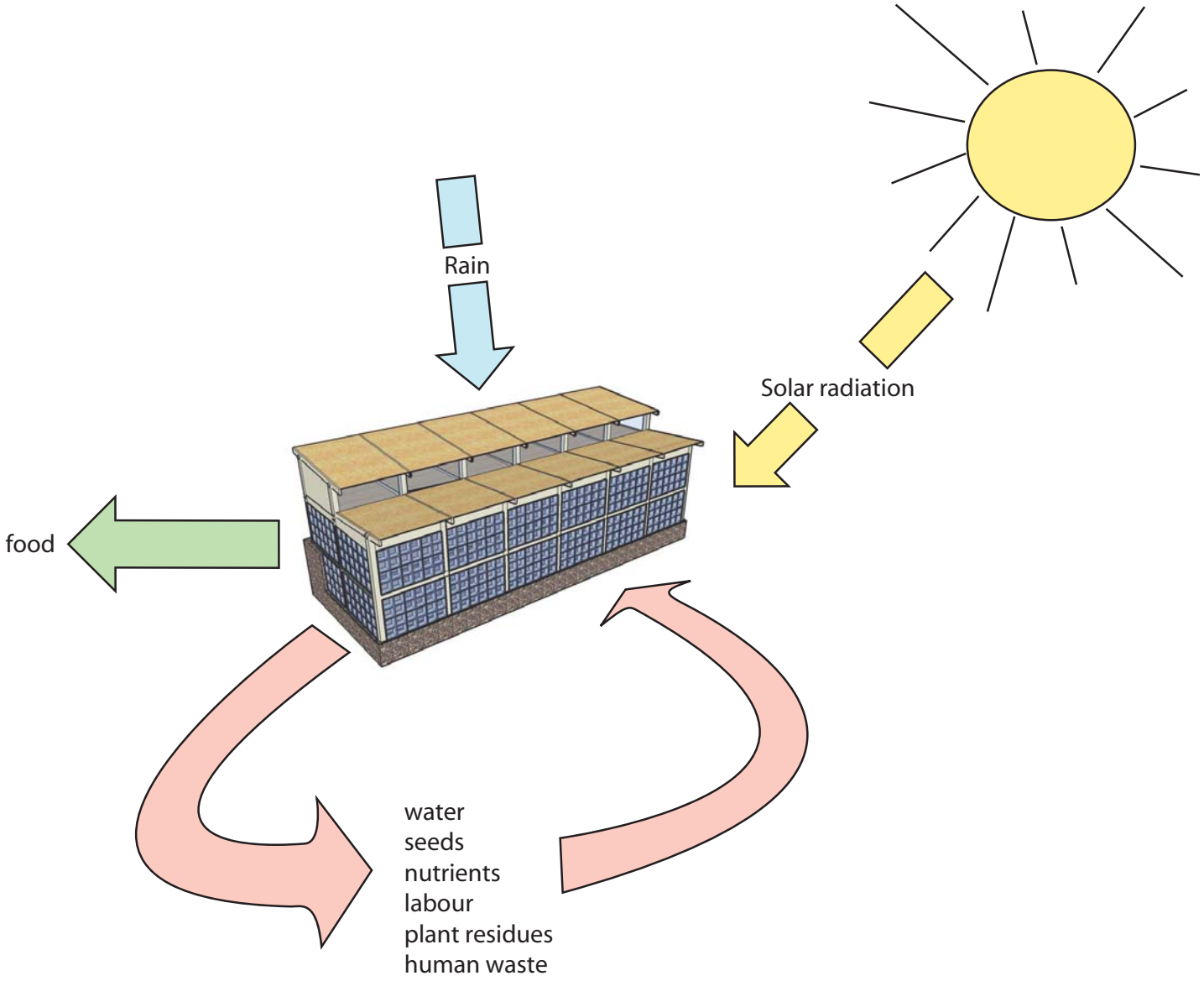
5.06 Input/outputs within an AGRIbox



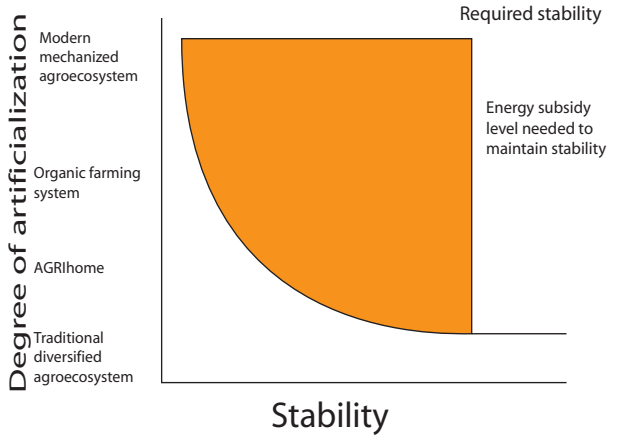
5.07 Water flow within AGRIbox system



5.08 Planting heirarchy concerning water requirements within AGRIbox system



5.09 General input/output cycles of AGRIhome system



5.10 Modification of the natural system related to energy subsidy and stability

5.11 Important structural and functional differences between natural ecosystems, agroecosystems, and AGRIhomes

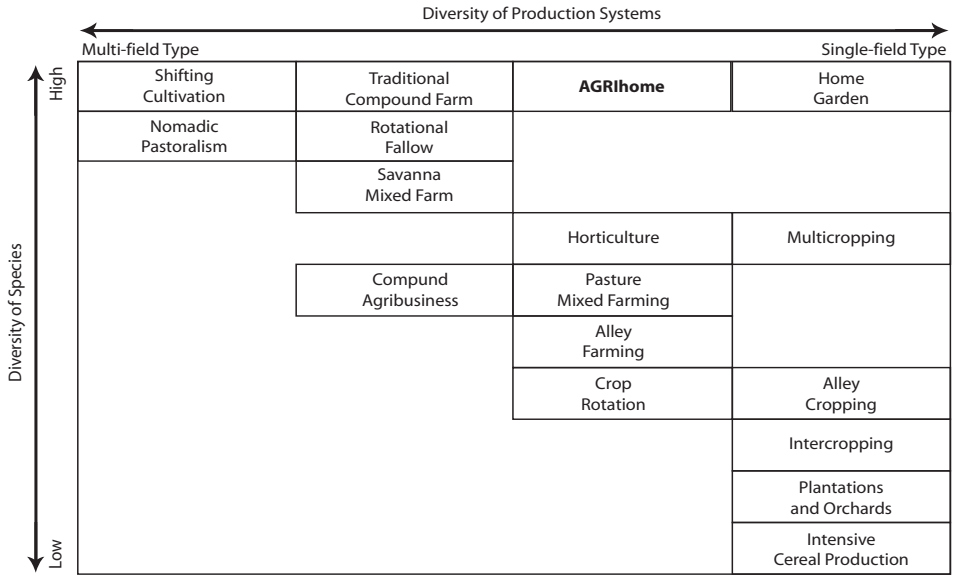
	Natural ecosystems	Agroecosystems	AGRIhome
Net productivity	Medium	High	High
Trophic interactions	Complex	Simple, linear	Controlled
Species diversity	High	Low	Medium
Genetic diversity	High	Low	Medium
Nutrient cycles	Closed	Open	Closed
Stability (resilience)	High	Low	High
Human control	Independent	Dependent	Dependent
Temporal permanence	Long	Short	Short
Habitat heterogeneity	Complex	Simple	Simple
Entropy	High	Low	Medium
Phenology	Synchronized	Seasonal	Controlled
Maturity	Immature, early successional	Mature, climax	N/A

Adapted from: Gliessman (1998) & Altieri (1995)

5.12 Agroecosystem determinants that influence the type of agriculture in each region.

Type of Determinants	Factors affecting Agroecosystems	Factors affecting AGRIhome
Physical	Radiation	Temperature
	Temperature	Water supply
	Rainfall, water supply(moisture stress)	Orientation
	Soil conditions	
	Slope	
	Land availability	
Biological	Insect pests and natural enemies	Insect pests
	Weed communities	Plant diseases
	Plant and animal diseases	Crop heirarchies
	Soil biota	Substrate biota
	Background natural vegetation	Photosynthetic efficiency
	Photosynthetic efficiency	
	Cropping patterns	
	Crop rotations	
Socioeconomic	Population density	Population density
	Social organization	Social Organization
	Economic (prices, markets, capital, and credit availability)	
	Technical assistance	
	Cultivation implements	
	Degree of commercialization	
	Labour availability	
Cultural	Traditional knowledge	Alternative knowledge
	Beliefs	Ideology
	Ideology	
	Gender issues	
	Historcial events	

Adapted from: Altieri (1995)

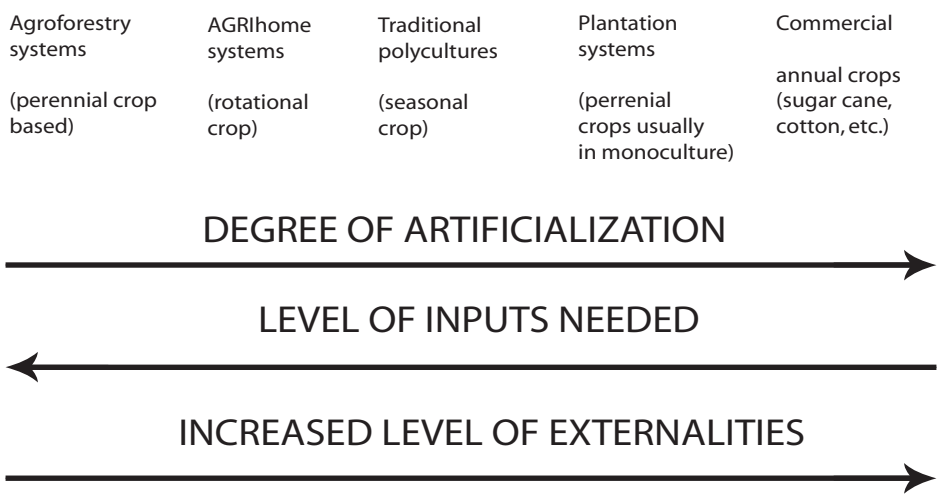


5.13 Agro-diversity in production systems

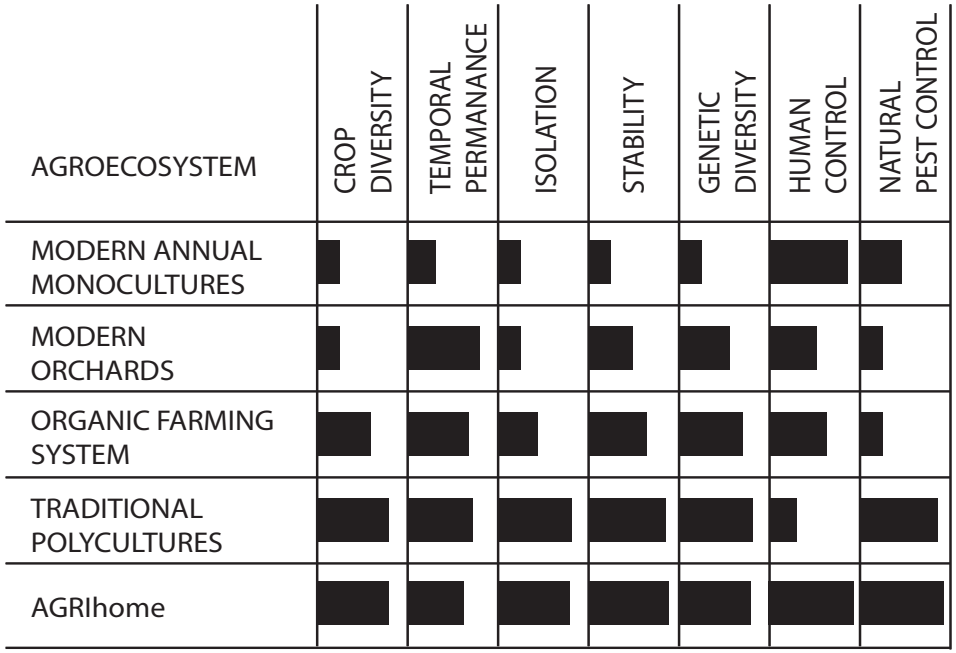
Strategy	*1.*	*2.*	*3.*	*4.*	*5.*	*6.*
Land-use system	*Create wild biodiversity reserves to benefit local people*	*Develop habitat networks in nonfarmed areas*	*Increase agricultural productivity to reduce land conversion*	*Minimize agricultural pollution*	*Modify resource management*	*Modify farming systems to mimic natural systems*
• Intensive irrigated cropping	★	★★	★	★★★	★★★	★
• Intensive annual rainfed crops on high-quality land	★	★★	★	★★★	★★★	★★
• Intensive annual crop systems on marginal lands	★★★	★★	★★	★★	★★	★★
• Perennial tree crop systems in rainfed lands	★★	★★	★★	★★★	★★★	★★★
• Extensive fallow-based cropping systems	★★★	★★★	★★★	★	★★	★★★
• Pastoral and ranching systems	★★★	★★★	★★	★	★★★	★★★
• Intensive livestock systems	●	★	★	★★★	★★★	★★
• Agroforests and forest fallows	★★★	★★★	★★★	★	★★	★★★
• Forest plantations	★★	★★★	★	★★★	★★	★★★
• Natural forest management	★★★	★★★	★★★	★★	★★★	★★★
• Aquaculture	★	★★★	★	★★	★★★	●
• Natural fisheries management	★★★	★★★	★	★	★★★	●
• **AGRIhome**	★	★★	★★★	★★★	★★★	★★

★★★ High benefit for wild biodiversity.
★★ Medium benefit for wild biodiversity.
★ Modest benefit for wild biodiversity.
● Negligible benefit for wild biodiversity, not feasible in this system, or not relevant to this system.

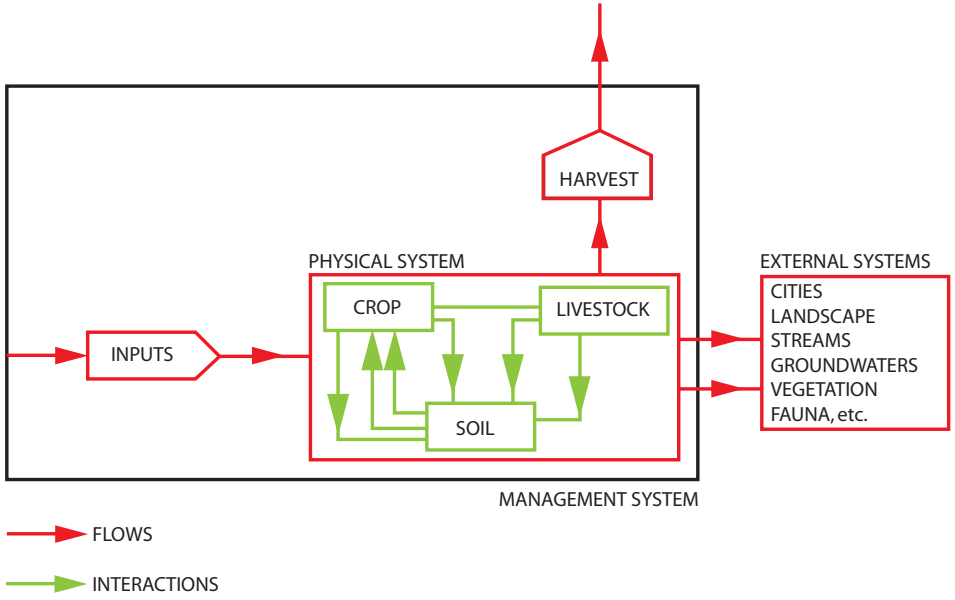
5.14 Potential benefits for wild biodiversity from interventions in agricultural regions



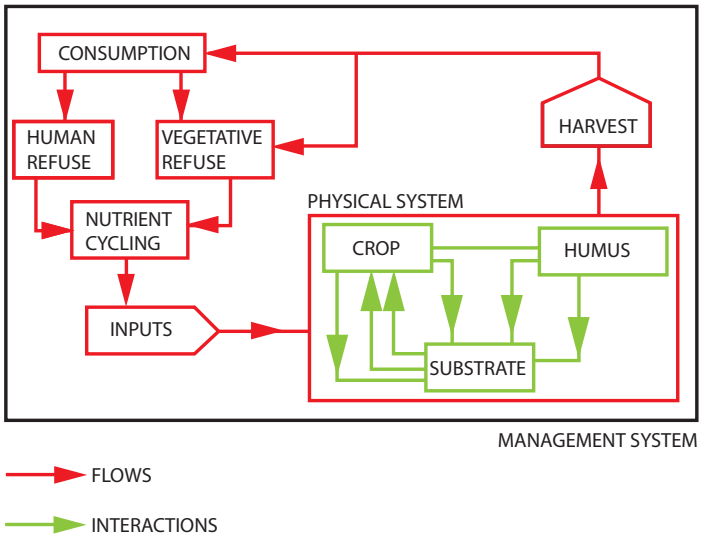
5.15 Effects of modifying the natural ecosystem



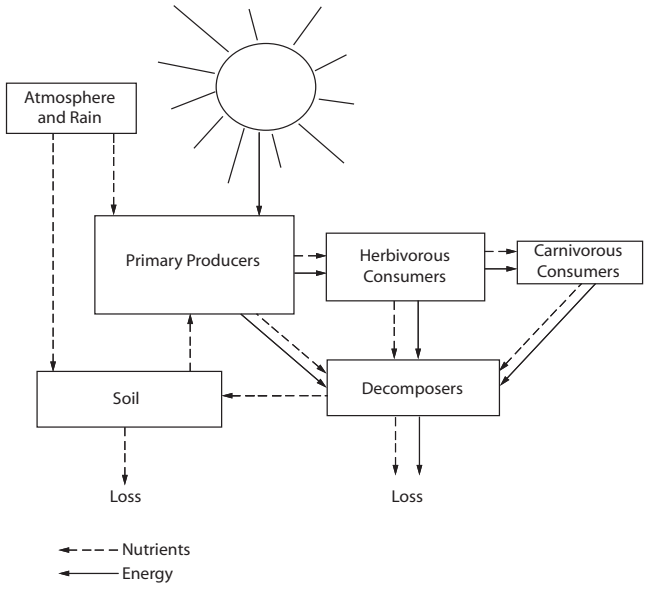
5.16 Ecological patterns of contrasting agroecosystems



5.17 - General structure of an agricultural system

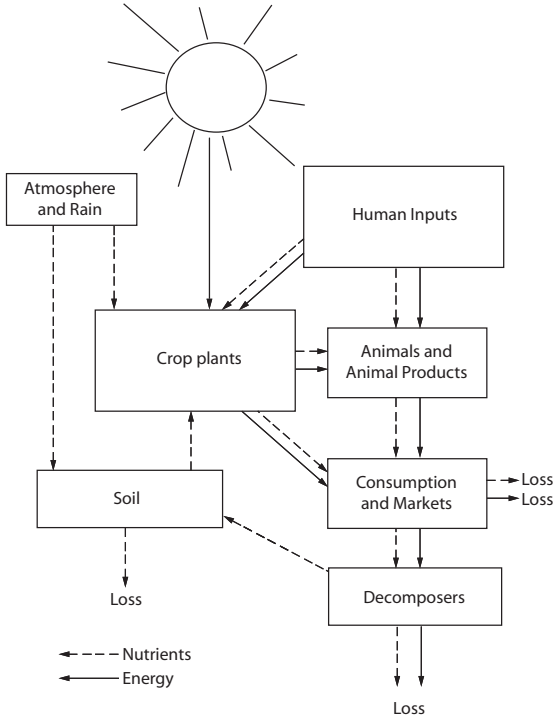


5.18 General structure of an AGRIhome agricultural system

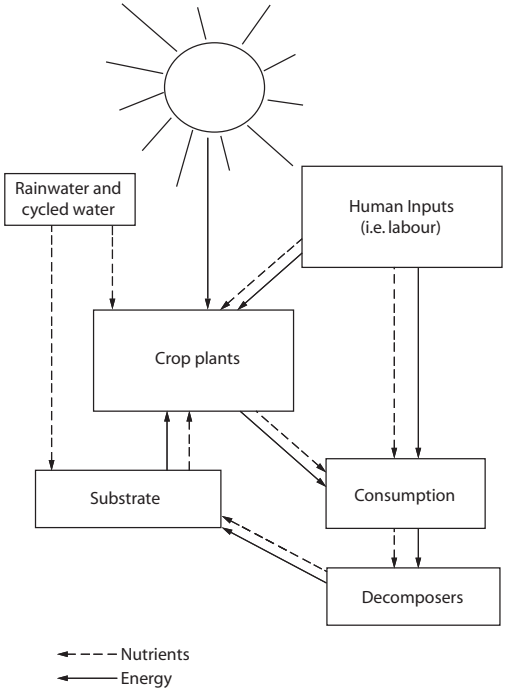


Functional components of a natural ecosystem

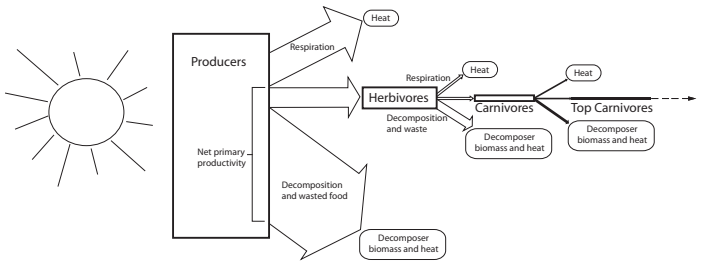
5.19 Functional components of a natural ecosystem



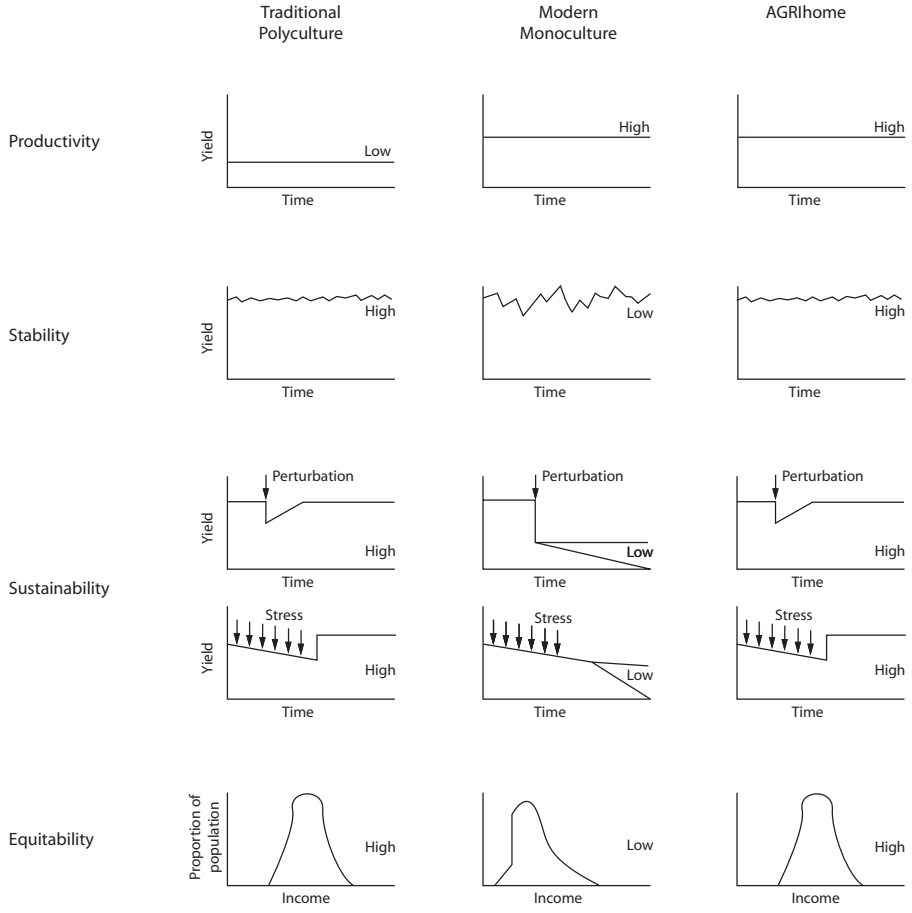
5.20 Functional components of an agroecosystem



5.21 Functional components of an AGRIhome system



5.22 Ecosystem energy flow
The size of each box represents the relative amount of energy flowing through that trophic level. In the average ecosystem, only about 10% of the energy in a trophic level is transferred to the next trophic level. Nearly all the energy that enters an ecosystem is eventually dissipated as heat.



5.23 The system properties of agroecosystems and indices of performance

The following section is an overview of how agricultures have developed over history throughout the world, and the availability of arable lands on a global scale.

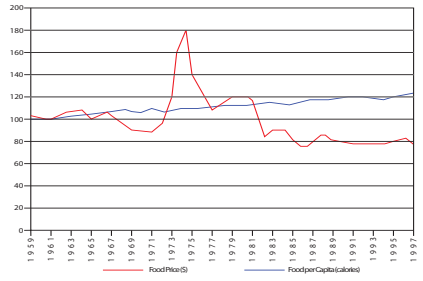
HISTORICAL NARRATIVE OF AGRICULTURE

Agriculture has been crucial in the development of human society. The beginning of agriculture around 10,000 years ago in both the Fertile Crescent and China, is linked to the slow decline of hunter-gatherer societies and the subsequent formation of complex social organization based upon surplus food. Enabled with a stable and abundant food supply, an unprecedented, steady increase in human population ensued allowing also for the development of social hierarchies.

5.24 Centres of early agricultural and plant domestication

As villages, towns, and eventually cities developed, their foundation was agriculture. Filson (2004) links the second period of agricultural development which began around 650 A.D. to "the creation of an urban consumer market for food", a direct result of the consolidation of the population. The most productive form of this "subsistence to market" period was characterized by individual family farms.

Increasing agricultural yields as growth and densification of the population continued caused agriculture to turn away from trial and error methodology towards solutions proffered by the scientific community. Approximately 150 years ago the scientific basis for plant cultivation and animal husbandry was developed (Ryszkowski & Jankowiak, 2002), leading to the mass subjugation of land and animals that characterizes the third agricultural period. This third stage of development, according to Filson (2004) has three distinct phases: (1) mechanization involving steam and petroleum-based tractors in the 1890s; (2) chemical farming in the 1950s; (3) food manufacturing in the 1960s and 1970s. These three phases are responsible for the "industrialization of agriculture".



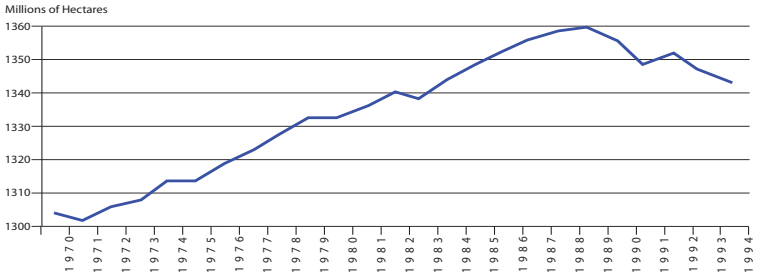
5.25 Global index of food per capita and food prices

An analysis of these three phases leads to a direct correlation with socio-economical factors during those times: (1) an explosion of immigration to North America, the expansion of existing cities and the further mechanization of society led to more land being put under cultivation at a rapid rate; (2) the end of World War II, and the subsequent resettling and rebuilding of North America and Europe respectively, created a great need to stabilize world

5.26 World land use in 1990 in percent of land area

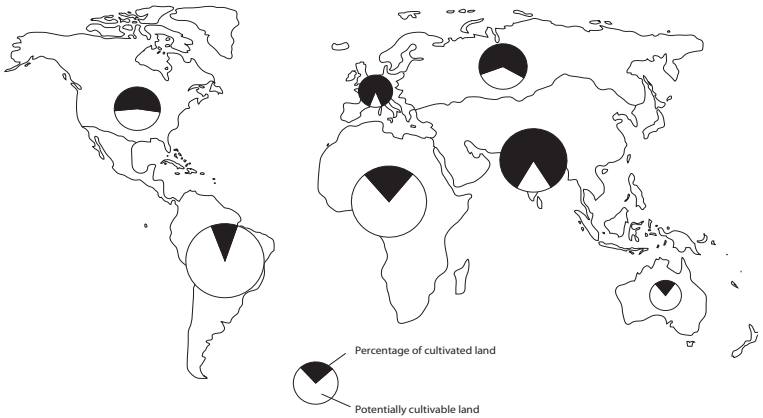
	Arable land and permanent crops	Permanent pasture	Forest and woodland	Other land
World	11.0	26.0	30.8	32.2
Africa	6.1	30.4	23.1	40.4
North and Central America	12.8	17.1	33.5	36.6
South America	6.5	28.2	47.3	18.0
Asia	17.0	28.4	20.0	34.6
Near East	7.1	26.9	7.9	58.0
Far East	19.6	28.6	23.6	28.2
Europe	29.4	17.6	33.2	19.8
Oceania	5.9	51.1	18.6	24.4

Source: FAO Production Yearbook 1992



5.27 Worldwide arable land area

markets. With the cessation of armed conflict the chemical manufacturers needed another outlet for the surplus that war created - agriculture became the new target. Through synthetic means agriculture achieved unprecedented yields never before accomplished. (3) an increase in urban population during the 1960s was a result of the social migration of the 1950s from rural to urban as increased agricultural yields allowed for less of the rural population to provide for the majority of the populace. The globalization of economy brought agriculture into the world market creating



5.28 Cultivated land as a percentage of potentially cultivable land area

a demand for high and sustainable yields. These two factors, of an increasing urban population and global demand for agricultural exports, led to advancements in food preservation and food engineering.

Globalization and the increasing world population have placed a high demand upon agricultural systems. Urban sprawl combined with reliance upon the high input/output, intensive farming systems typical of modern agriculture, have led to the degradation of the environment not to mention the majority of arable land available to support the current demands. As the population continues to increase unabated and the threat of peak oil looms near, agriculture is entering a critical period. A period in which the outcome may have dire consequences for the populace of all nations developing and developed countries alike.

Technological change and agriculture

Before 1900s	• beginning of mechanization • scientific process for plant and animal genetics and breeding
Up to the 1930s	• on-farm use of combustion engines
1930s to 1960s	• electrification, electric motors
1940s to 1950s	• rise of chemical and pharmaceutical industries, growth of input supply industries (e.g.,compound feed manufacturers) • refrigeration • availability of cheap testing (feed, soils) • development of hybrids
After 1970s	• genetic engineering • information technology • computerization • management systems and technology • targeted breed development for market (e.g., canola) • precision farming systems

Source: R..J. MacGregor, Agriculture and Agri-Food Canada

In order to understand how contemporary agriculture can affect ecosystems, and how to develop sustainable agroecosystems through an agroecological methodolgy, the following research in this section was conducted.

AGROECOSYSTEM OVERVIEW

STRATEGIES

5.30 Basic technical elements of an agroecological strategy

1. *Conservation and Regeneration of Natural Resources*
   - A. Soil (erosion, fertility, and plant health)
   - B. Water (harvesting, in-situ conservation, management, irrigation)
   - C. Germplasm (plant and animal native species, land races, adapted germplasm)
   - D. Beneficial fauna and flora (natural enemies, pollinators, multipl use vegetation)

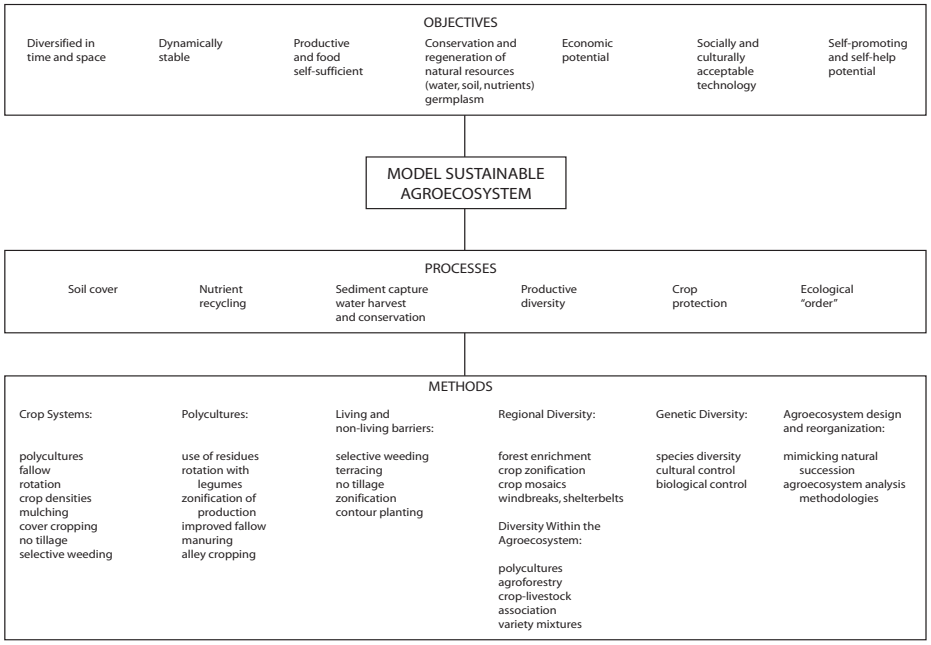
2. *Management of Productive Resources*
   - A. Diversification
     - -temporal (rotations, sequences, etc.)
     - -spatial (polycultures, agroforestry, crop/livestock mixed systems)
     - -genetic (multilines, etc.)
     - -regional (zonification, watershed, etc.)
   - B. Recycling of nutrients and organic matter
     - -plant biomass (green manure, crop residues, N fixation)
     - -animal biomass (manure, urine, etc.)
     - -reutilization of nutrients and resources internal and external to the farm
   - C. Biotic regulation (crop protection and animal health)
     - -natural biological control (enhancement of natural control agents)
     - -artificial biological control (importation and augmentation of natural enemies, botanical insecticides, alternative veterinary products, etc.)

3. *Implementation of Technical Elements*
   - A. Definition of resource regeneration, conservation and management techniques tailored to local needs and agroecological-socioeconomical circumstances.
   - B. The level of implementation can be at the microregion watershed level, farm level and cropping system level.
   - C. The implementation is guided by holistic (integrated) conception and therefore does not emphasize isolated elements.
   - D. The strategy must be in agreement with the peasant rationale and must incorporate elements of technical resource management.

5.31

Desirable ecological characteristics of agroecosystems in relation to successional development

Characteristic	Successional stage of greatest development: Early	Middle	Late	Benefit to agroecosystem
High species diversity				Reduced risk of catastrophic crop loss
High total biomass				Larger source of soil organic matter
High net primary productivity				Greater potential for production of harvestable biomass
Complexity of species interaction				Greater potential for biological control
Efficient nutrient cycling				Diminished need for external nutrient inputs
Mutualistic interference				Greater stability; diminished need for external inputs



5.32 Objectives and processes in the design of a model sustainable agroecosystem

Dimensions of ecological diversity affected

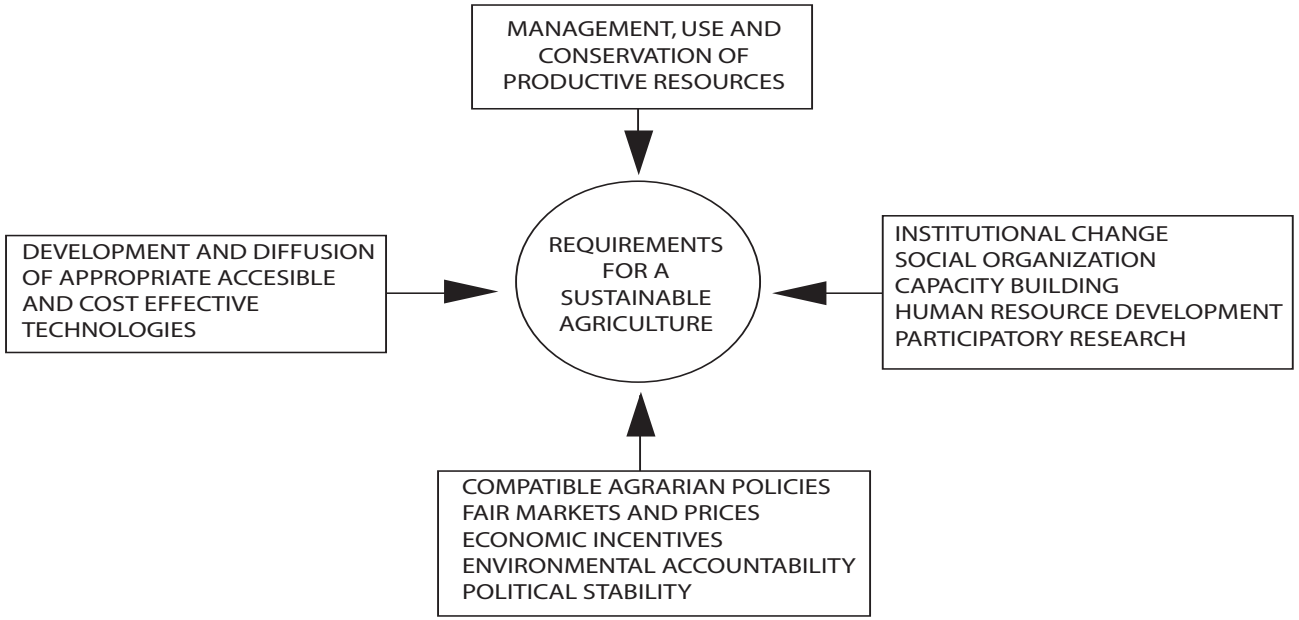
Method	Species	Genetic	Vertical	Horizontal	Structural	Functional	Temporal
Intercropping							
Strip cropping							
Hedgerows & buffers							
Cover-cropping							
Rotations							
Fallows							
Minimum tillage							
High inputs of organic matter							
Reduction of chemical use							

Direct or primary effect

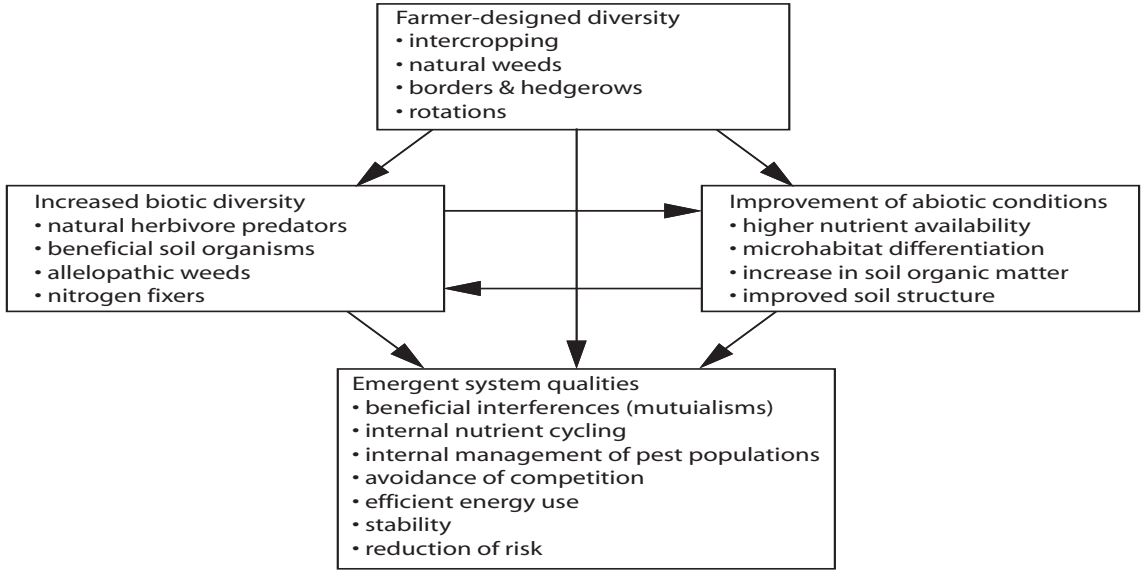
Indirect, secondary, or potential effect

Little or no effect

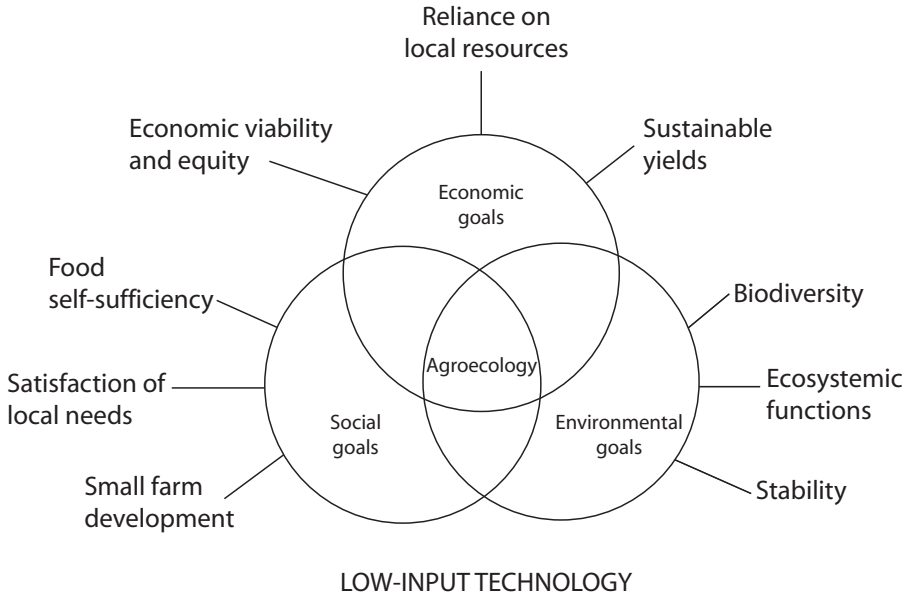
5.33 Methods of increasing ecological diversity in an agroecosystems



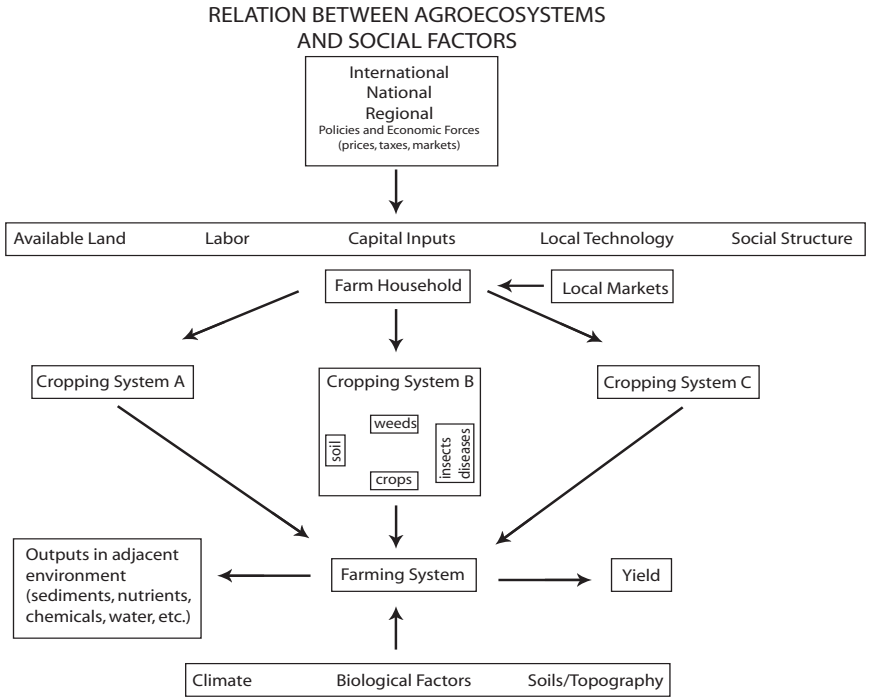
5.34 The requirements for a sustainable agriculture



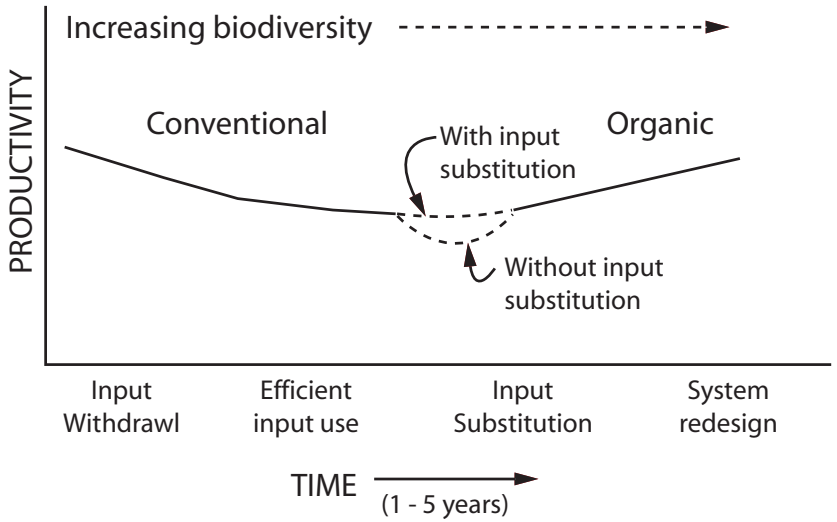
5.36 System dynamics in diverse agroecosystems



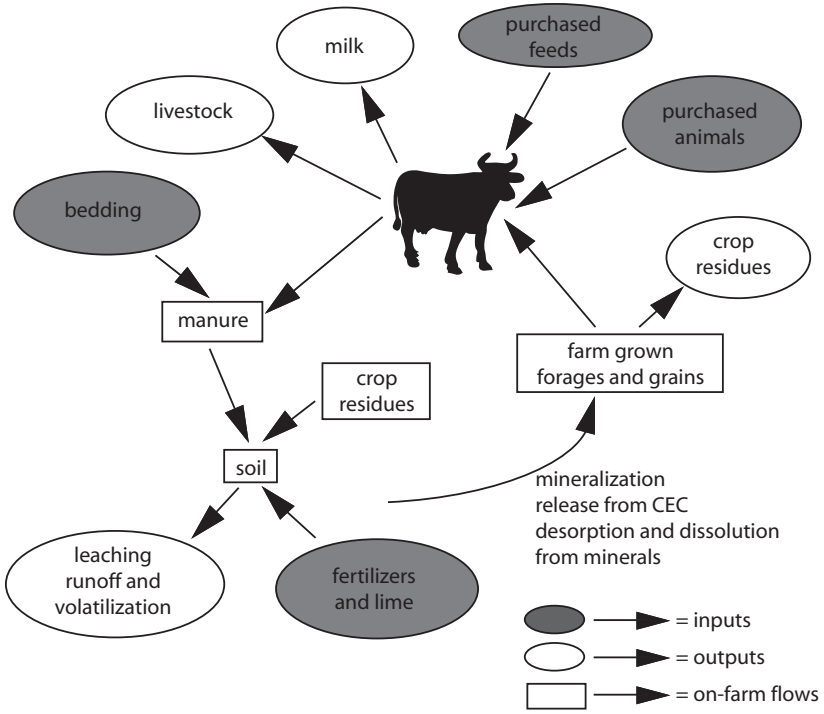
5.36 The role of agroecology in satisfying social, environmental, and economic goals in rural areas



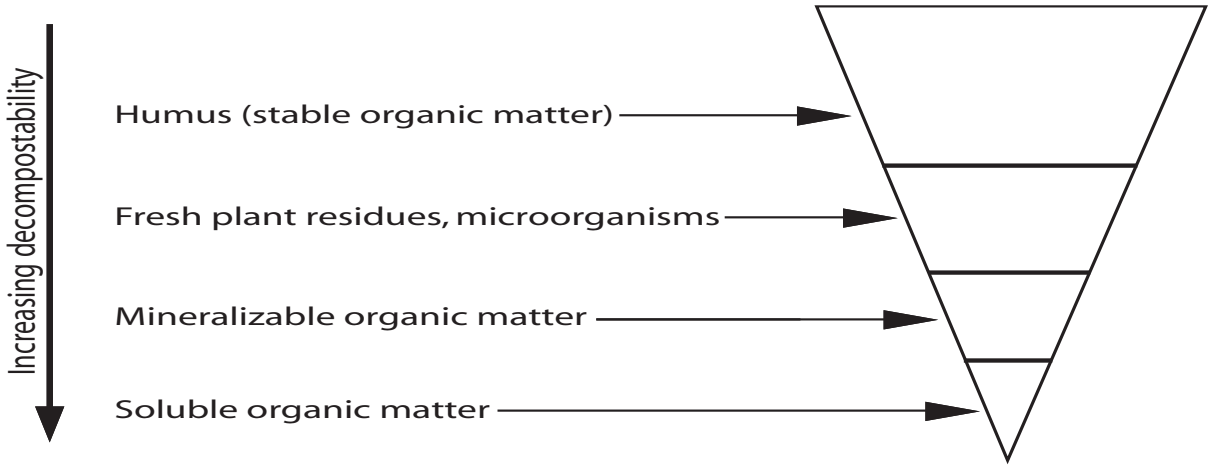
5.37 Relation between agroecosystems and social factors



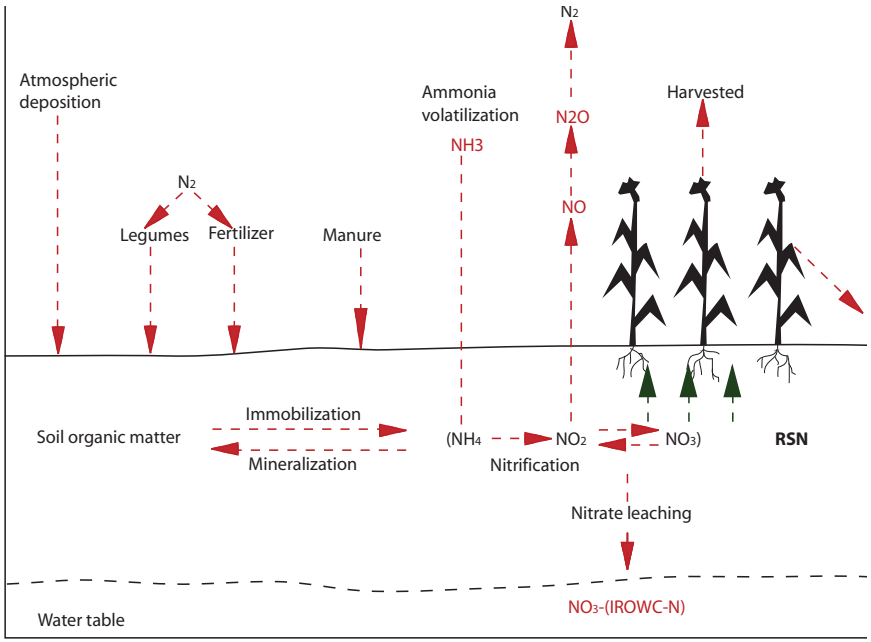
5.38 Productivity trends during the phases of the organic conversion process



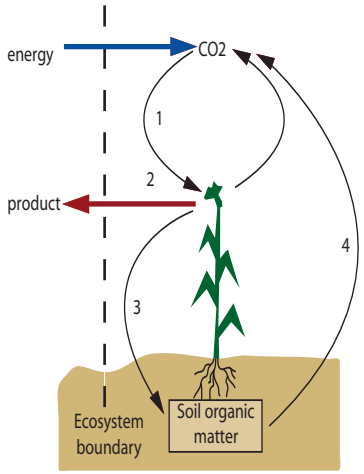
5.39 Nutrient flows and cycling on a dairy farm



5.40 Fractions of soil organic matter



5.41 Nitrogen cycle in an agroecosystem



5.42 Carbon cycle in agriculture

5.43

Dominant premises of modern science and alternatives

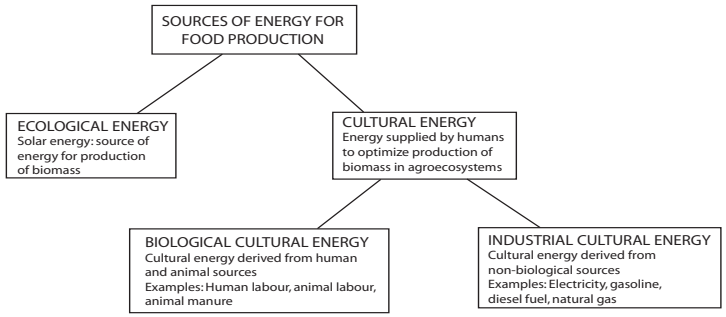
Dominant Premises	*Alternate Premises*
ATOMISM: Systems consist of unchanging parts and are simply the sum of their parts.	HOLISM: Parts cannot be understood apart from their wholes and wholes are different from the sum of their parts. Parts might evolve new characteristics or totally new parts can arise.
MECHANISM: Relationships between parts are fixed, systems move smoothly from one equilibrium to another, and changes are reversible.	Systems might be mechanical, but they might also be deterministic yet not predictable or smooth because they are chaotic or simply very discontinuous. Systems can also be evolutionary.
UNIVERSALISM: Diverse, complex phenomena are the result of underlying universal principles which are few in number and unchanging over time and space.	CONTEXTUALISM: Phenomena are contingent upon a large number of factors particular to the time and place. Similar phenomena might well occur in different times and places due to widely different factors.
OBJECTIVISM: We can stand apart from what we are trying to understand.	SUBJECTIVISM: Social and most "natural" systems cannot be understood apart from our activities, our values, and how we have understood and hence acted upon these systems in the past.
MONISM: Our seperate individual ways of understanding complex systems are merging into a coherent whole.	PLURALISM: Complex systems can only be known through multiple, different patterns of thinking, each of which is necessarily a simplification of reality. Different patterns are inherently incongruent.

5.44

Comparison between Green Revolution and agroecological technologies

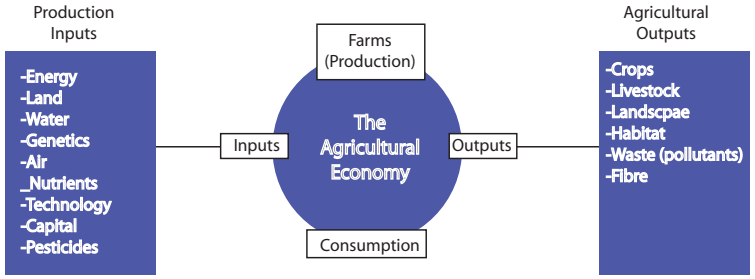
CHARACTERISTIC	GREEN REVOLUTION	AGROECOLOGY
TECHNICAL		
Crops affected	Wheat, maize, rice, and few others.	All crops.
Areas affected	Mostly flatlands and irrigated areas.	All areas, especially marginal areas (rainfed, steep slopes).
Dominant cropping system	Monocultures, genetically uniform.	Polycultures, genetically heterogenous.
Dominant inputs	Agrochemicals, machinery; high dependency on external inputs and fossil fuels.	Nitrogen fixation, biological pest control, organic amendments, high reliance on local-renewable resources.
ENVIRONMENTAL		
Impacts and health hazards	Medium to high (chemical pollution, erosion, salinization, pesticide,resistance, etc.). Health risks in pesticide application and pesticide residues in food.	Low to medium (nutrient leaching from manure).
Crops displaced	Mostly traditional varieties and land races.	None.
ECONOMIC		
Capital costs of research	Relatively high.	Relatively low.
Cash needs	High. All inputs must be purchased in the market.	Low. Most inputs are locally available.
Cash returns	High. Rapid results. High labour productivity.	Medium. Needs time to acheive highest yields. Low to medium labour productivity.
INSTITUTIONAL		
Technology development	Quasi-public sector, private companies.	Largely public; large NGO involvement.
Proprietary considerations	Varieties and products patentable and protectable by private interests.	Varieties and technologies under farmer's control.
SOCIOCULTURAL		
Research skills needed	Conventional plant breeding and other disciplinary agricultural sciences.	Ecology and multidisciplinary expertise.

"Agriculture, in essence, is the human manipulation of the capture and flow of energy in ecosystems. Humans use agroecosystems to convert solar energy into particular forms of biomass - forms that can be used as food, feed, fibre, and fuel." -Gleissman (1998)



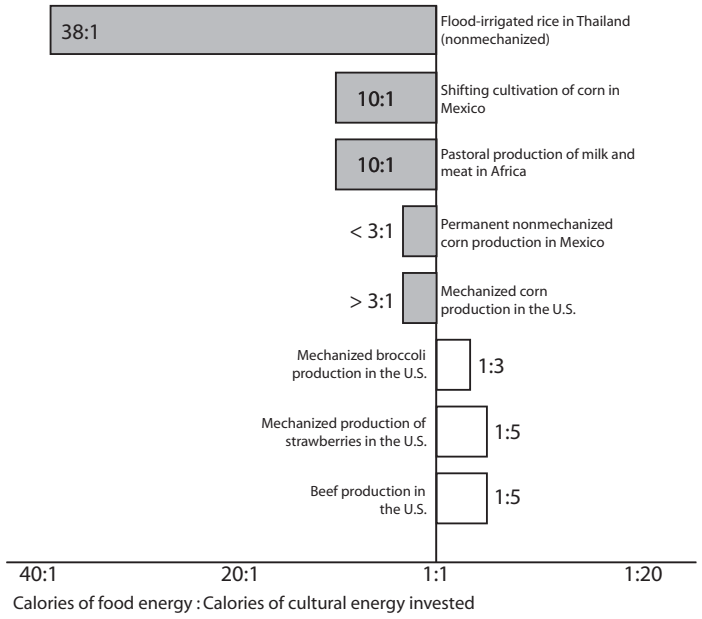
5.45 Types of energy inputs in agriculture

Fundamental to any ecosystem is the flow of energy amongst its parts and the cycling of nutrients. In an agroecosystem there is a need for human intervention in these cycles in order to maintain yields, control pests, stave-off disease et cetera. These interventions in the natural flow of energy and nutrients has become increasingly dependent on industrial sources to the point that the ratio of energy input is outstripping energy output sometimes as much as 10 to 1.



5.46 The energetics and the economy of agriculture

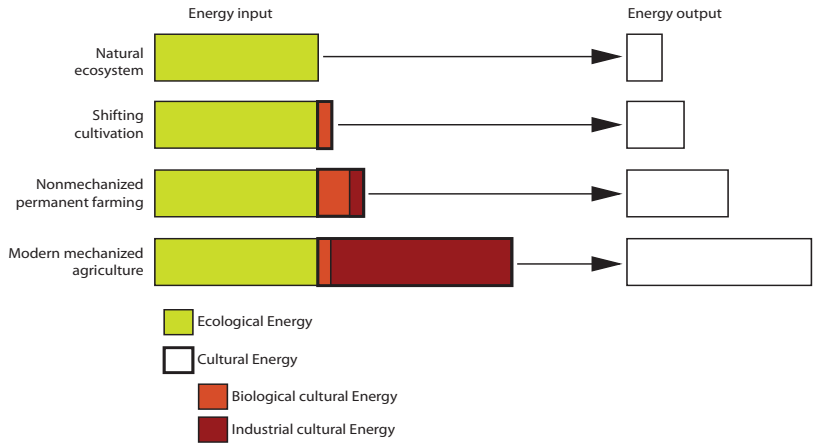
The energy contained within our food all originally derives from the sun, however, additional energy is required to produce food in an agroecosystem. Whether that additional energy comes from human or animal sources or nonbiological sources depends on a variety of influences: politics; consumer opinion; economics; cultural traditions; et cetera.



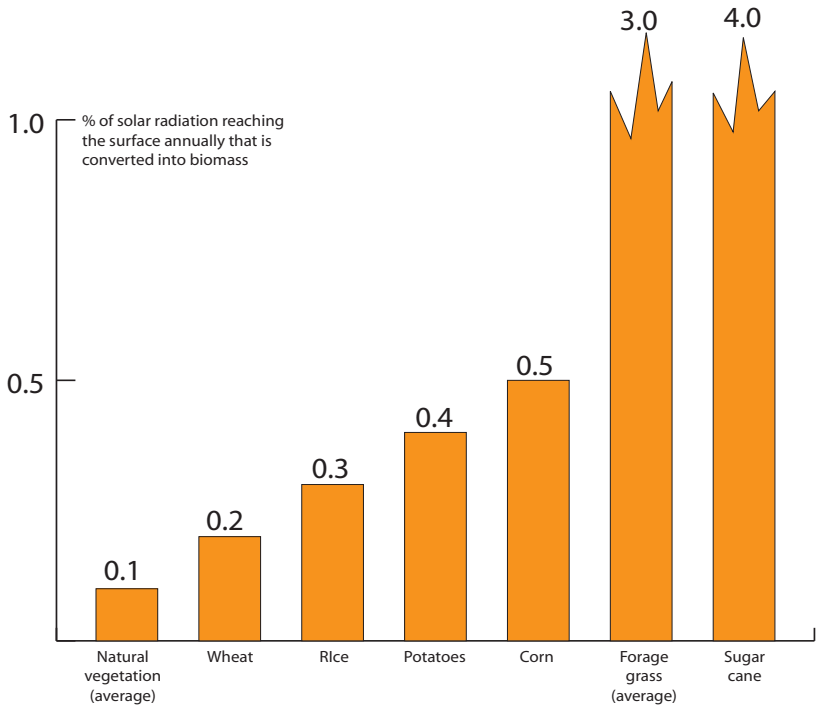
5.47 Comparison of the returns on energy investment for various agroecosystems

"Modern agriculture is the use of land to convert petroleum into food. Without petroleum we will not be able to feed the global population."

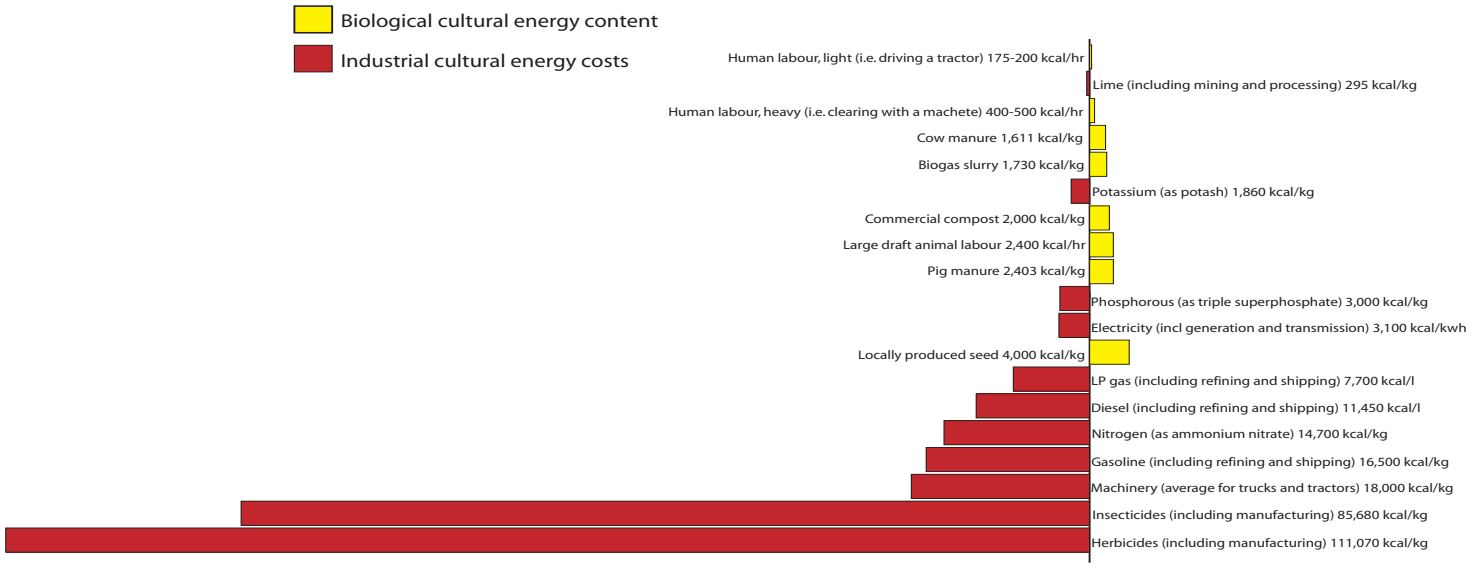
- Robert L. Hickson



5.48 Approximate relative size of energy inputs in four types of systems



5.49 Efficiency of solar energy-to-biomass conversion



5.50 Cultural energy inputs in agriculture

The following chapter section is a synopsis of agriculture in Canada. It is meant to be indicative of the current agricultural climate within our country, and the effects it can on our environment and resources.

STATE OF AGICULTURE - CANADA

Geography

Geographic location

Occupying most of northern North America. Extending from the Atlantic Ocean to the Pacific Ocean and northward into the Arctic Ocean, Canada shares land borders with the United States to the south and to the northwest.

Geographic coordinates

60 00N, 95 00 W

Area

Total: 9,984,670 km^2
Land: 9,093,507 km^2
Water: 891,163 km^2

Geomorphology

Terrain

Mostly plains with mountains in west and lowlands in southeast.

Elevation Extremes

lowest point: Atlantic Ocean 0 m
highest point: Mount Logan 5,959 m

Climate

Varies from temperate in south to subarctic and arctic in north.

Natural Resources

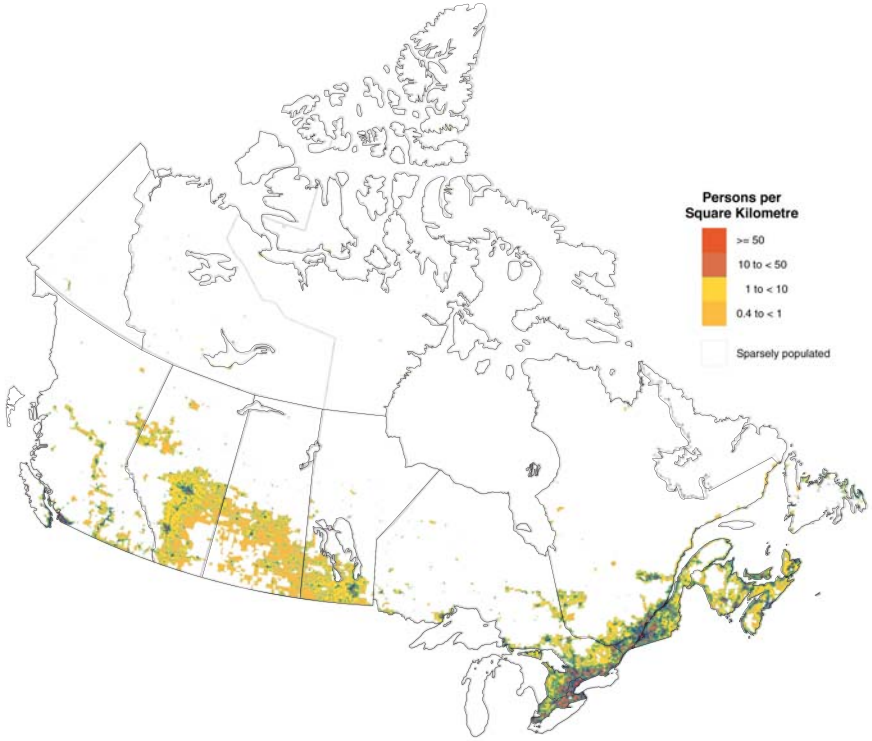
iron ore, nickel, zinc, copper, gold, lead, molybdenum, potash, diamonds, silver, fish, timber, wildlife, coal, petroleum, natural gas, hydropower

Natural Hazards

continuous permafrost in north is a serious obstacle to development; cyclonic storms form east of the Rocky Mountains, a result of the mixing of air masses from the Arctic, Pacific, and North American interior, and produce most of the country's rain and snow east of the mountains

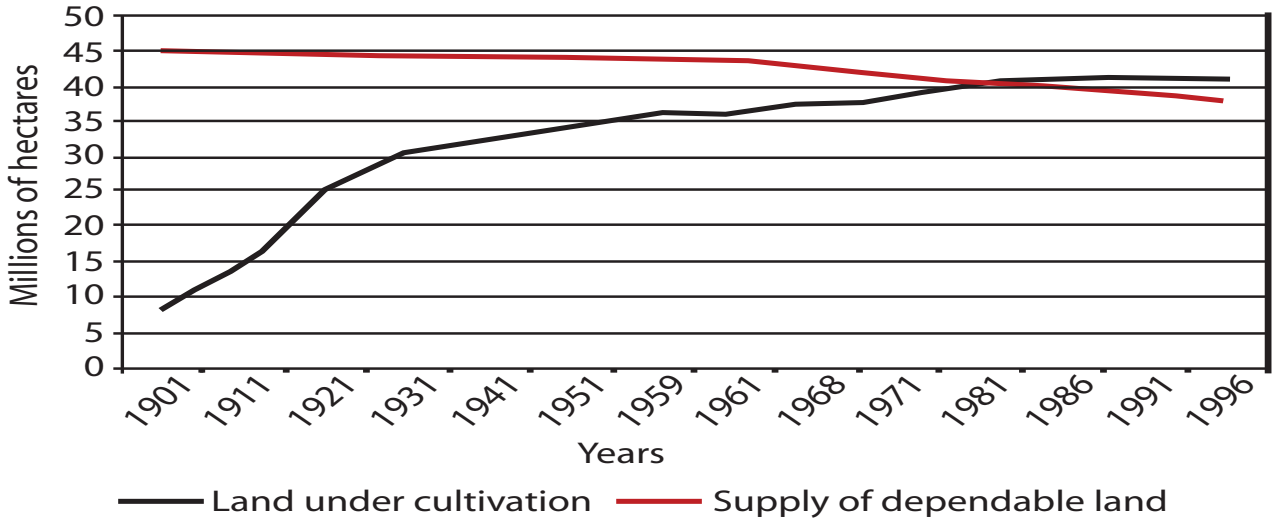
Canada is located within two climactic zones - the temperate zone and the cold climactic zone, with the majority of the country in the cold climactic zone. This explains why the land available for agriculture only accounts for approximately 13-14 per cent of Canada's land mass. Of this relatively small area, only a fraction is utilized (arable 4.4 per cent, meadow and pasture 2.4 per cent) due to the unfavourable climate and soil characteristics. Arable cultivation is centred around the southern areas, primarily the Ontario peninsula and St. Lawrence plain. Four-fifths of the cultivated land is on the prarie provinces of Manitoba, Saskatchewan, and Alberta.

Source: Burger(1994)



5.52 Population density of Canada

5.53 Arable land in Canada



5.54 Land under cultivation & supply of dependable land (Canada)

AGRICULTURAL LAND USE: ONTARIO 2001
SHARE OF FARMLAND IN VARIOUS USES (IN %)

AGRICULTURAL LAND USE: CANADA 2001
SHARE OF FARMLAND IN VARIOUS USES (IN %)

5.55 Agricultural land use(Ontario and Canada)

Land Statistics

Total area	998.5 million ha
Total land area	909.4 million ha
Total farm area	67.5 million ha
Cultivated land	61%
Pastureland	30%
Other land	9%
Average farm area	273 ha

Livestock Population (number of animals)

Poultry	126 million
Cattle & calves	16 million
Pigs	14 million
Dairy cows	1 million

Farm Characteristics

Total number of farms	247,000
Total number of families	188,000
Total number of operators	346,000
Average age of operators	50
Education level of operators	
Postsecondary & university	40%
Grade 9 to 13	48%
Less than grade 9	12%

Farm income

Total net cash income	$8.1 billion
Total cash receipts	$36.3 billion
Total operating expenses	$28.2 billion
Distribution of farms by revenue class	
Less than $10,000	22%
$10,000 to $49,000	31%
$50,000 to $100,000	14%
More than $100,000	33%

Major Agricultural Outputs

Cattle & calves	$7.9 billion
Dairy	$4.1 billion
Hogs	$3.8 billion
Wheat	$2.5 billion
Poultry & eggs	$2.4 billion
Floriculture & nursery	$1.7 billion
Canola	$1.7 billion
Vegetables	$1.5 billion
Potatoes	$0.7 billion
Corn	$0.6 billion

Food & Beverage Industry

Total number of establishments	6,035
Small (less than 50 employees)	81%
Medium (50 to 199 employees)	14%
Large (more than 200 employees)	5%
Total value of shipments	$70.2 billion
Food manufacturing	$61.6 billion
Meat products	31%
Dairy products	16%
Fruits and vegetables	9%
Grain and oilseed milling	9%
Other food	35%
Beverages	$8.6 billion

International Trade Statistics

Trade Balance	$7.4 billion
Exports	
Total agricultural exports	$26.6 billion
Bulk	25%
Intermediate	25%
Consumer-oriented	50%
Major export markets	
United States	$16.6 billion
Japan	$2.4 billion
EU-15	$1.3 billion
Mexico	$0.9 billion
China	$0.8 billion
Imports	
Total agricultural imports	$19.2 billion
Bulk	13%
Intermediate	16%
Consumer oriented	71%
Major import markets	
United States	$12.3 billion
EU-15	$2.4 billion
Austrailia	$0.6 billion
Mexico	$0.4 billion
New Zealand	$0.4 billion

Contribution to GDP

Agri-food sector	$28.1 billion
Primary agriculture	$6.8 billion
Food processing	$21.3 billion

Source: Agriculture and Agri-Food Canada (2005)

Terrestrial ecozones of Canada

Ecozones are broad areas of Canada having similar subcontinental-scale geography, climate, and ecology. Commercial agriculture is practised widely in the seven ecozones described below, and to a very limited extent in two others (Boreal Cordillera and Taiga Plains).

Pacific Maritime: Covering the mainland Pacific coast and offshore islands of British Columbia, this ecozone has some of the mildest and wettest climatic conditions in Canada. Native vegetation is dominated by conifer forests composed of mixed western red cedar, western hemlock, and Douglas fir. Most of the province's population and agricultural production are located in a few major valleys and lowland plains within this mountainous ecozone, producing strong competing demands for land resources. The ecozone totals 207 930 km2 in area, with farmland comprising less than 1% of the area, all of which is confined to the Fraser Valley and eastern coastal area of southern Vancouver Island.

Montane Cordillera: This ecozone comprises most of interior southern British Columbia and a portion of southwestern Alberta. The most diverse of all of the ecozones, its vegetation ranges from alpine tundra to dense conifer forests to sagebrush-dominated grasslands. Tree fruit production and viticulture dominate under the mild climate of the semi-arid valleys of the southern-most portions of the ecozone; extensive beef cattle production is common in the more northerly valleys and higher-elevation plateau regions. The ecozone totals 487 900 km2 in area, of which only 2% is farmland.

Boreal Plains: This ecozone extends as a wide band from the Peace River country of British Columbia to the southeastern corner of Manitoba. It supports productive agriculture north of the Prairies ecozone in what is often referred to as the grey wooded soil zone. The native vegetation is mixed forest composed of white and black spruce and aspen. Cereals, oilseeds, and forages are the principal crops grown. The ecozone totals 737 290 km2 in area, with about 20% as farmland.

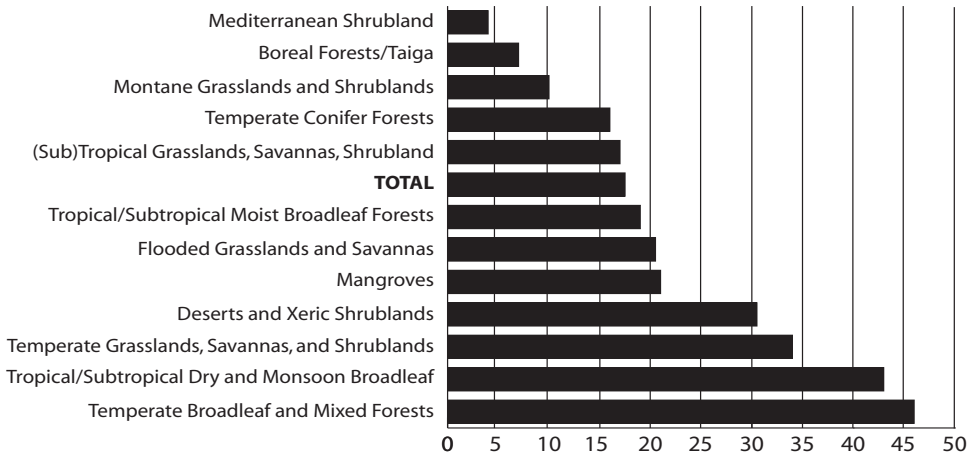
Prairies: Incorporating all of the grasslands and aspen parkland from the foothills of the Rocky Mountains to the Canadian Shield country east of Lake Winnipeg, this ecozone is characterized by relatively level topography and a semi-arid climate with cold winters and warm summers. Agriculture dominates most landscapes. The ecozone totals 465 090 km2 in area, of which 90% is farmland; about two-thirds of all farmland in Canada is located in the Prairies.

Boreal Shield: The largest of all ecozones, the Boreal Shield extends from northern Saskatchewan east to Newfoundland, passing north of Lake Winnipeg, Lake Superior, and the St. Lawrence Lowlands. Agriculture is practised in a few locations in the southern portions of the ecozone and in scattered locations throughout Newfoundland and Labrador. Farmlands have been cleared from mixed conifer and poplar forests, and agriculture is mixed. The ecozone totals 1 937 520 km2 in area, with less than 1% as farmland.

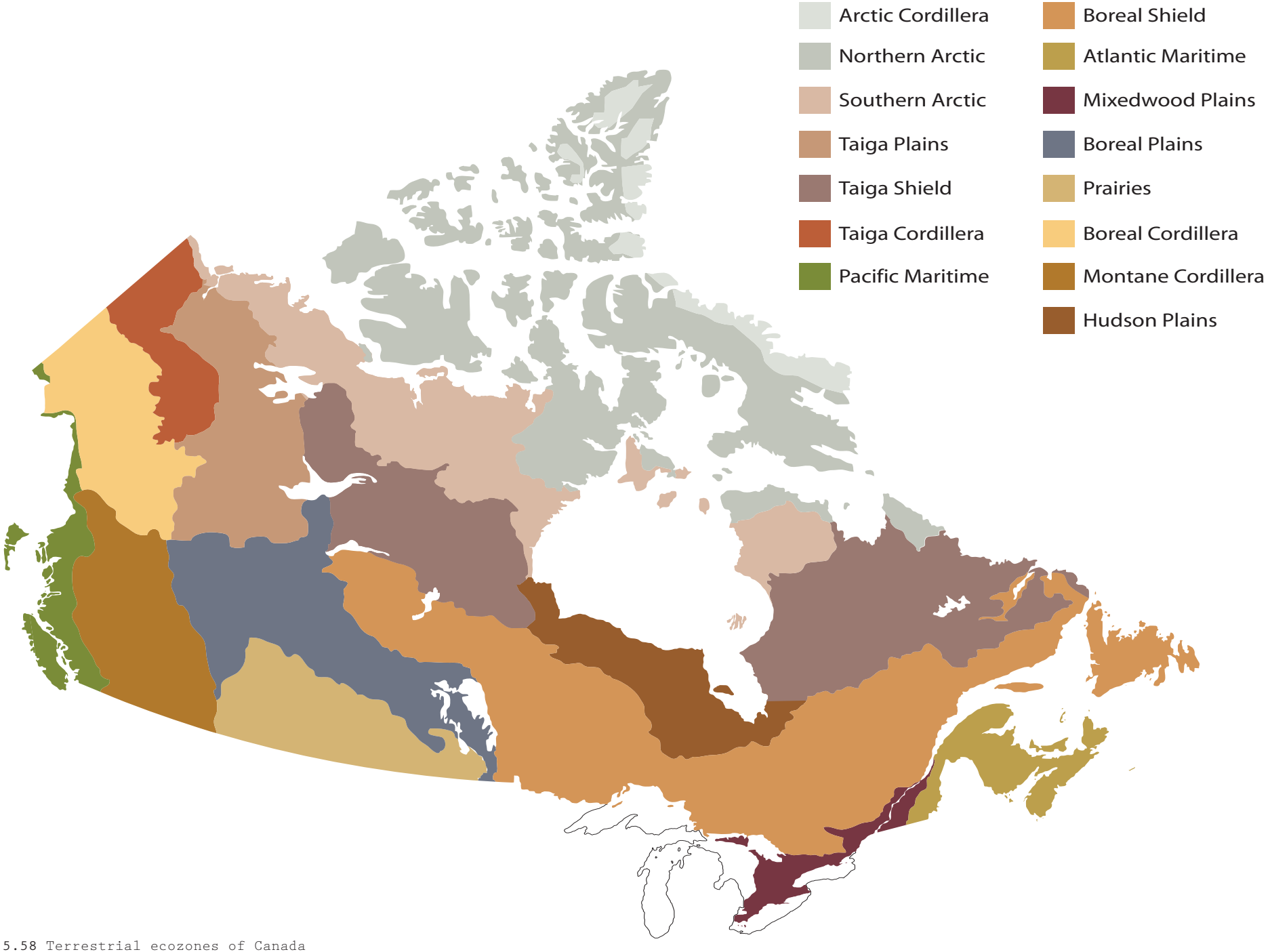
Mixedwood Plains: The ecozone extends from southwestern Ontario through to the Ottawa Valley and the St. Lawrence Lowlands of southern Quebec. It encompasses most of the primary agricultural lands of the provinces of Quebec and Ontario. The extent of agricultural production is second only to that of the Prairies ecozone, but agricultural output is Canada's largest in economic terms. The relatively warm, humid climate is conducive to the production of a wide range of products, including most of Canada's dairy products, vegetables, and specialty crops. Agriculture competes with industrial land uses, transportation routes, and urban and suburban residential development for land. The ecozone totals 168 200 km2 in area, of which about 40% is used as farmland.

Atlantic Maritime: The ecozone incorporates the Eastern Townships and Gaspé regions of Quebec along with all of the Maritime Provinces. Agriculture is the dominant land use on Prince Edward Island and elsewhere is concentrated in particular valleys (e.g., the St. John River Valley in New Brunswick, the Annapolis Valley in Nova Scotia, and the Sherbrooke–Lennoxville region in Quebec) or exists as a secondary land use on otherwise forested landscapes. Cool-season vegetables, forage, and dairy production are the major outputs. The ecozone totals 213 860 km2 in area, of which about 10% is farmland.

Source: C.A.S. Smith, Agriculture and Agri-Food Canada



5.57 Estimated percentage of agricultural land within major habitats



5.58 Terrestrial ecozones of Canada

5.59 Landforms (Canada)

5.60 Surface materials (Canada)

5.61 Water coverage (Canada)

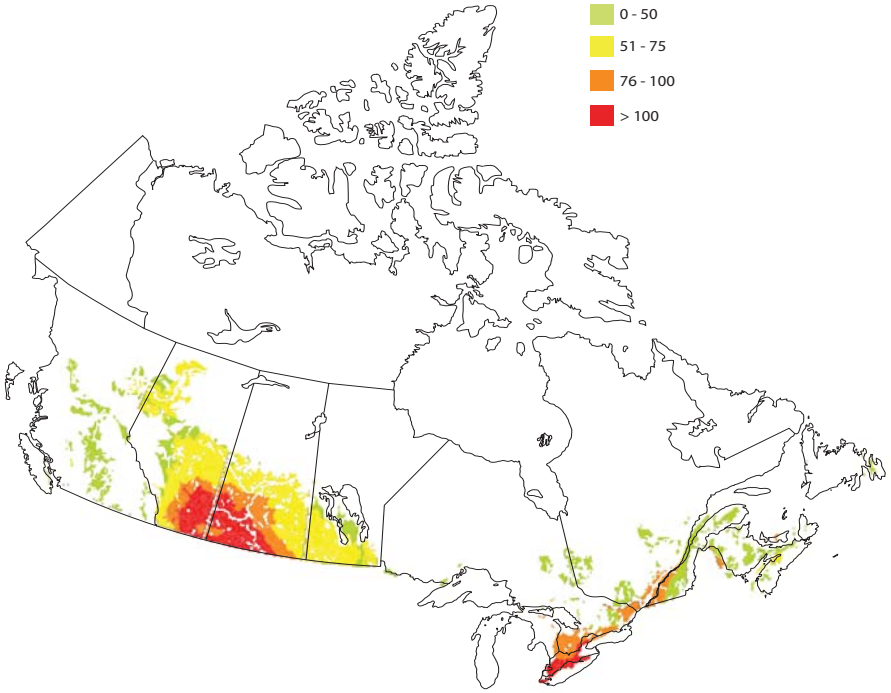
5.62 Cover types (Canada)

5.63 Growing degree days (Canada)

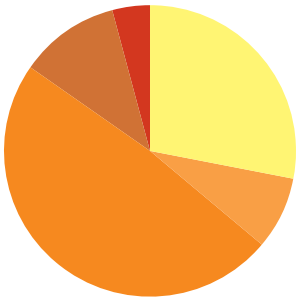
5.64 Population density (Canada)

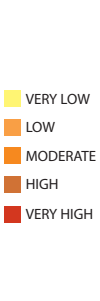
5.65 Vegetation types (Canada)

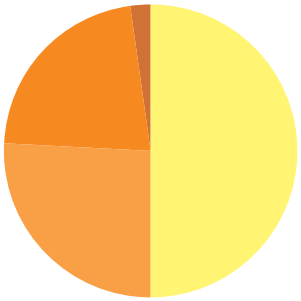
5.66 Soil types (Canada)



5.67 Bare soil days (Canada)



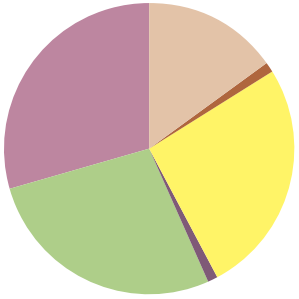


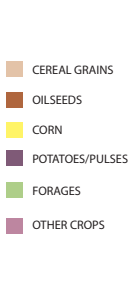


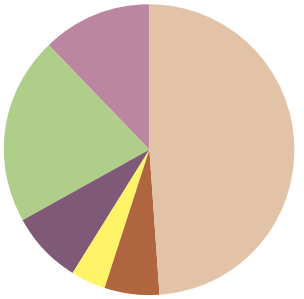
SHARE OF CROPLAND IN DIFFERENT TILLAGE EROSION RISK CLASSES (%), ONTARIO 2001

SHARE OF CROPLAND IN DIFFERENT TILLAGE EROSION RISK CLASSES (%), CANADA 2001

5.68 Tillage erosion risk classes



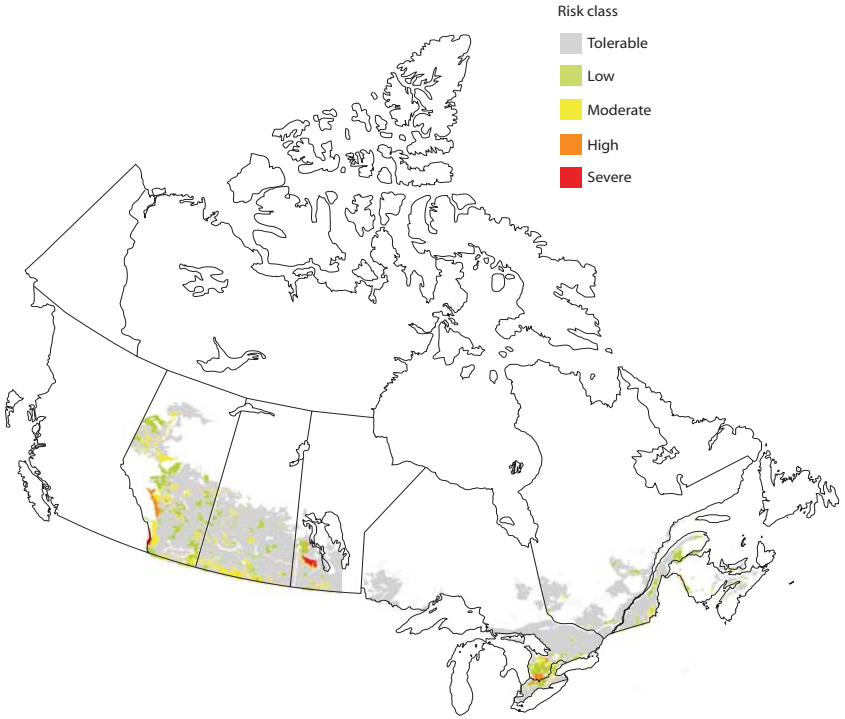




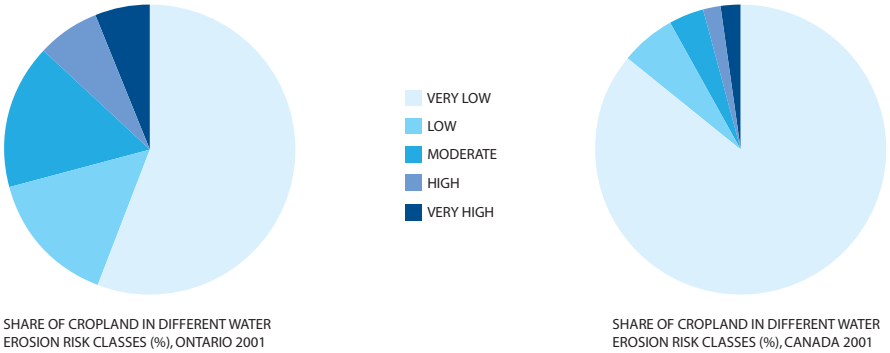
CROPPING PRACTICES: ONTARIO 2001
SHARE OF ANNUALLY CROPPED LAND IN VARIOUS USES (IN %)

CROPPING PRACTICES: CANADA 2001
SHARE OF ANNUALLY CROPPED LAND IN VARIOUS USES (IN %)

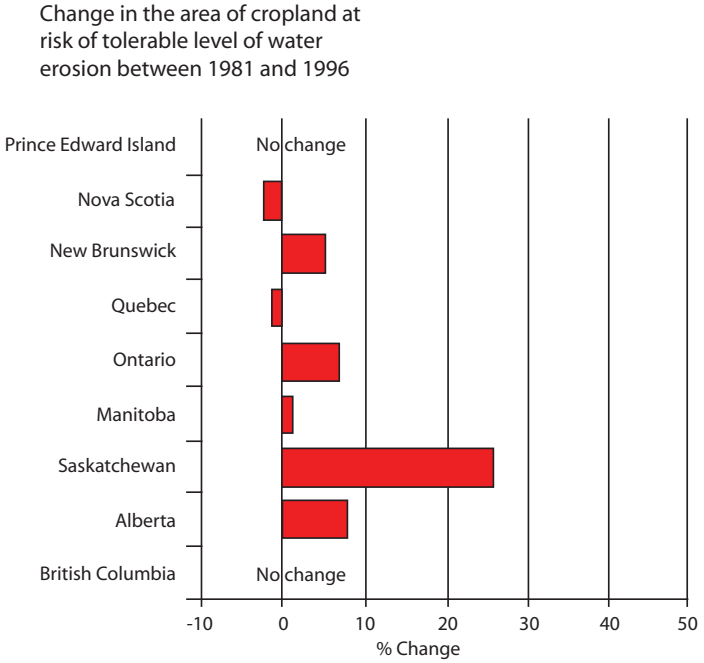
5.69 Cropping practices



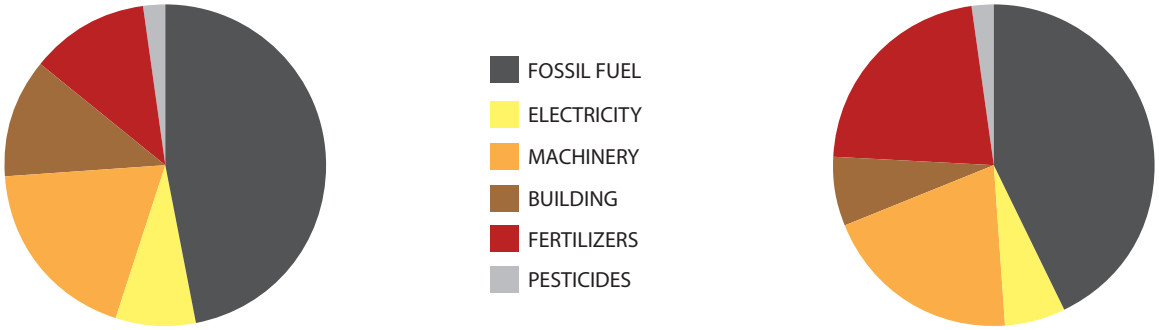
5.70 Water erosion in Canada



5.71 Water erosion risk classes



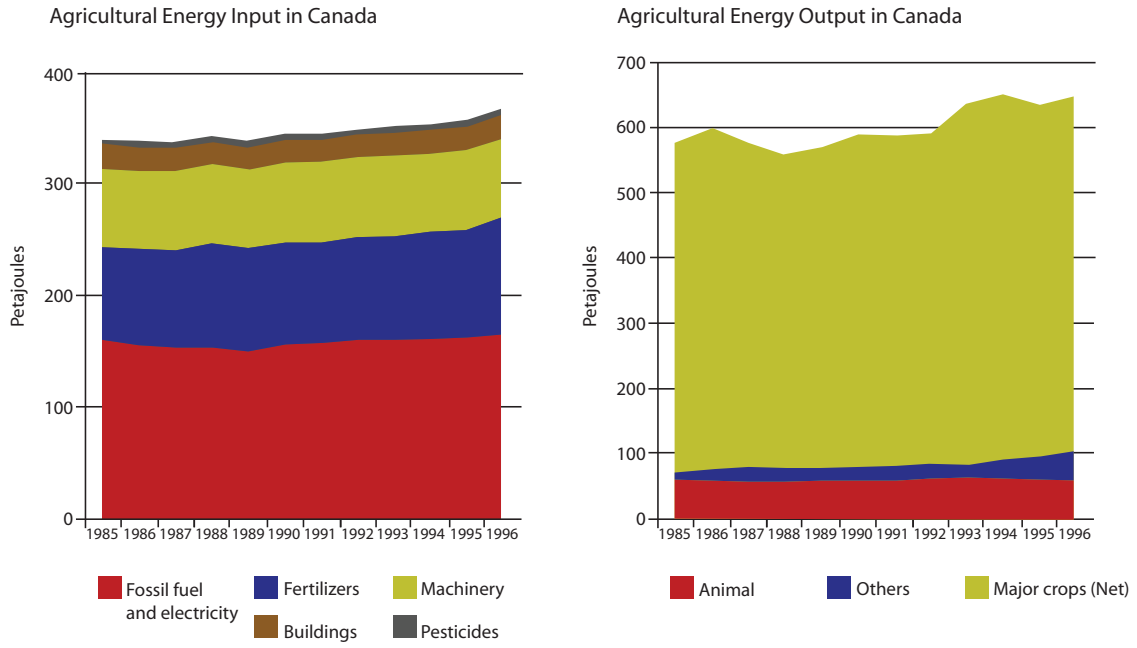
5.72 Change in water erosion levels (Canada)



ENERGY INPUT (%), ONTARIO, 1997-2001

ENERGY INPUT (%), CANADA, 1997-2001

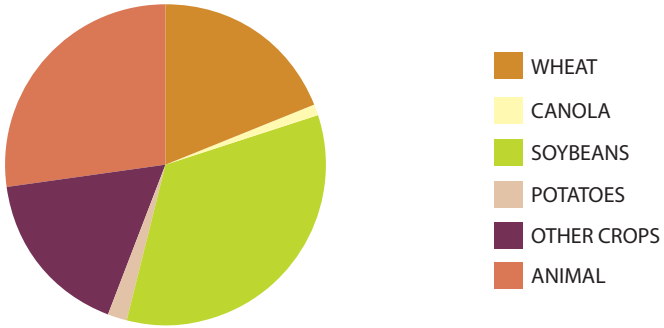
5.73 Energy inputs in agriculture



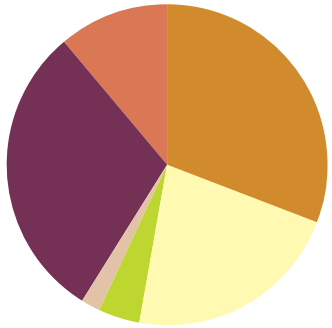
Note: Years represent 5-year moving averages. For example, 1985 represents an average of 1981 to 1985.

Note: Years represent 5-year moving averages. For example, 1985 represents an average of 1981 to 1985.

5.74 Agricultural energy input and output in Canada

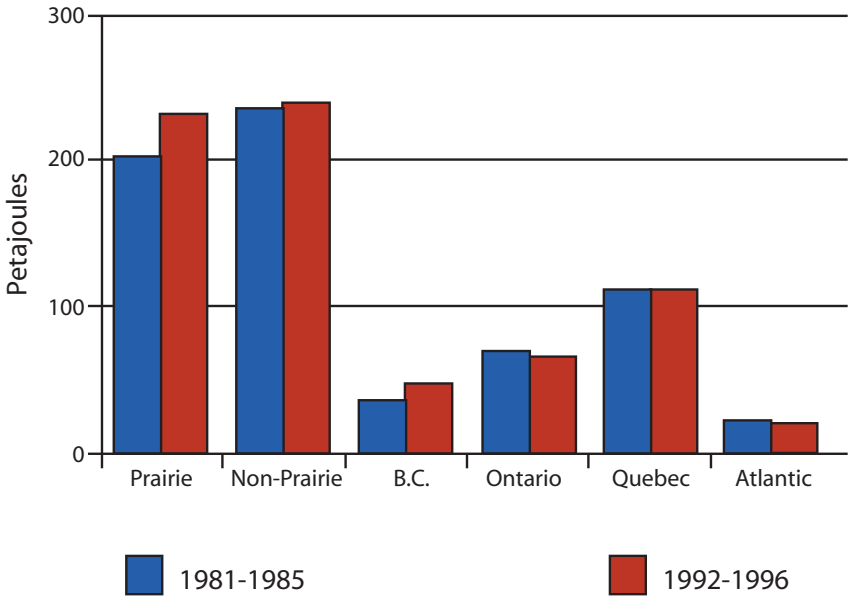


ENERGY OUTPUT (%), ONTARIO, 1997-2001

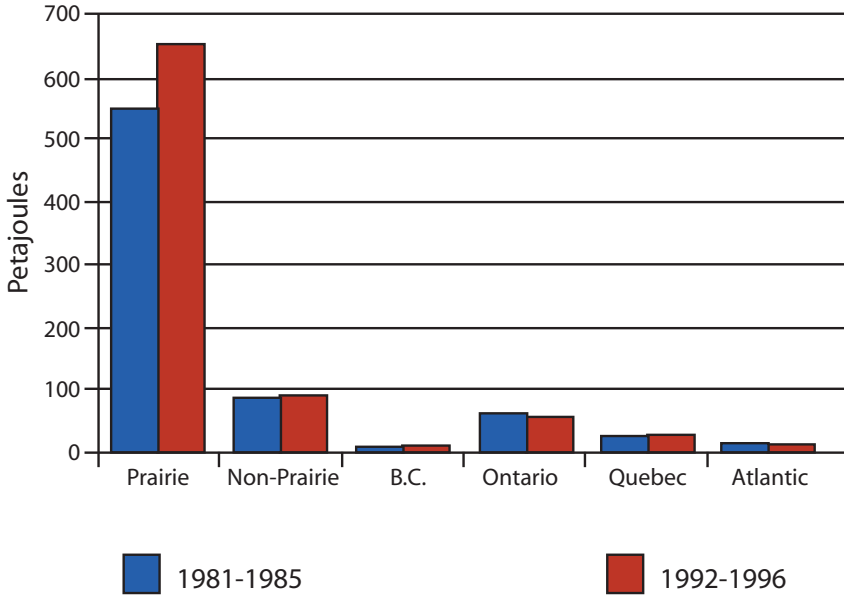


ENERGY OUTPUT (%), CANADA, 1997-2001

5.75 Energy output of specfic crops



5.76 Regional agricultural energy input



5.77 Regional agricultural energy output

The following chapter section is a synopsis of agriculture in Ontario. It is meant to illustrate the heavy dependency/relationship agriculture has with the fertile lands around the most heavily populated area of our country.

STATE OF AGRICULTURE - ONTARIO

Geography

Geographic location

Located between Manitoba to the west and Quebec to the east, Ontario is the second largest province. Extending from Hudson Bay to the Great Lakes and St. Lawrence river, Ontario shares land borders with the United States to the south.

Area

Total: 1,076,395 km^2
Land: 917,741 km^2
Water: 158,654 km^2

Geomorphology

Terrain

There are large areas of uplands, particularly within the Canadian Shield which traverses the province from northwest to southeast and also above the Niagara Escarpment which crosses the south.

Elevation extremes

lowest point: 0m
highest point: 693m (Ishpatina Ridge)

Climate

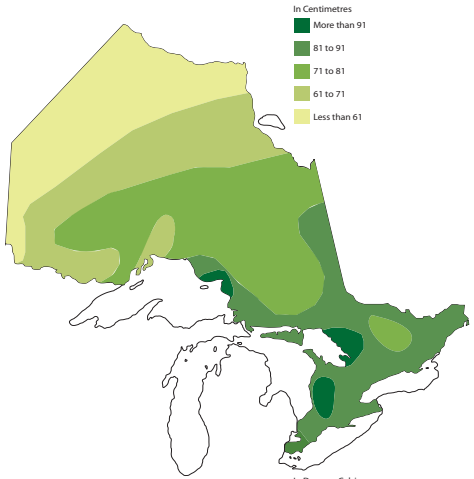
Ontario has three main climatic regions. Southwestern and south-central Ontario, including the southern half of the Golden Horseshoe, is considered a temperate climate when compared with most of Canada with a longer growing season than areas at similar latitudes in the continent's interior. Annual precipitation ranges from 750mm to 1000mm. Most of Central and Eastern Ontario and the southern part of Northern Ontario has warm to hot summers with cold and somewhat longer winters and a shorter growing season. The more northern parts of Ontario have a subarctic climate with long, very cold winters and short, warm summers. Winters are generally very cold, where temperatures below -40°C (-40°F) are not uncommon.

Natural Resources

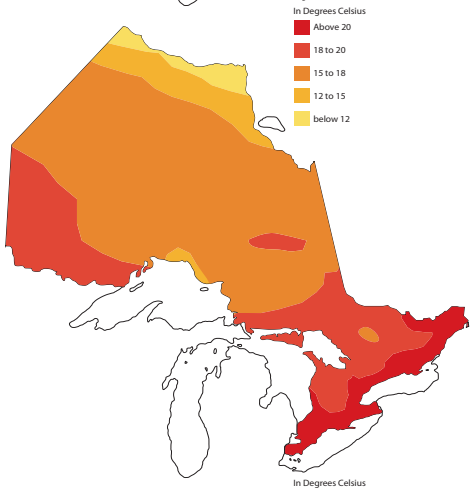
nickel, gold, copper, zinc, platinum, palladium, cobalt, silver., salt, gypsum, lime, nepheline syenite, calcium carbonate, hydropower, petroleum, timber

Natural Hazards

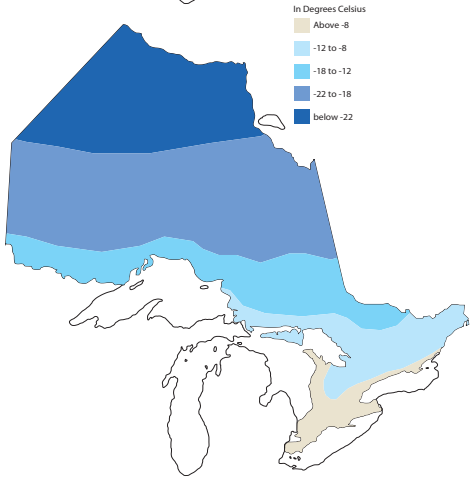
severe thunderstorms, tornadoes



5.78 Precipitation



5.79 Summer Temperature



5.80 Winter Temperature

Land Statistics

Total area	107.6 million ha
Total land area	91.8 million ha
Total farm area	5.5 million ha
Cultivated land	67%
Pastureland	16%
Other land	17%
Average farm area	92 ha

Livestock Population (number of animals)

Poultry	44 million
Cattle & calves	3.5 million
Pigs	2.1 million
Dairy cows	364,000

Farm Characteristics

Total number of farms	60,000
Total number of families	47,000
Total number of operators	85,000
Average age of operators	51
Education level of operators	
Postsecondary & university	42%
Grade 9 to 13	45%
Less than grade 9	14%

Farm income

Total net cash income	$1.6 billion
Total cash receipts	$8.5 billion
Total operating expenses	$6.9 billion
Distribution of farms by revenue class	
Less than $10,000	26%
$10,000 to $49,000	32%
$50,000 to $100,000	11%
More than $100,000	31%

Major Agricultural Outputs

Dairy	$1.4 billion
Cattle & calves	$1.3 billion
Hogs	$946 million
Floriculture & nursery	$842 million
Poultry & eggs	$833 million

Food & Beverage Industry

Total number of establishments	1,932
Total value of shipments	N/A
Food manufacturing	$24.5 billion
Meat products	24%
Dairy products	15%
Fruits and vegetables	13%
Grain and oilseed milling	13%
Other food	6%
Bevererages	N/A

International Trade Statistics

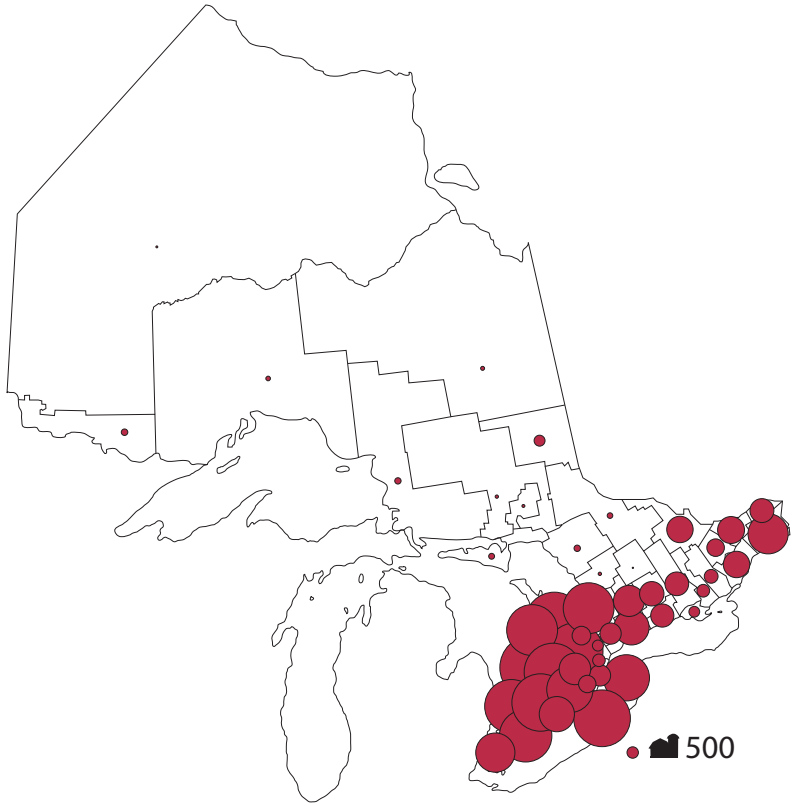
Trade Balance	-($3.3 billion)
Exports	
Total agricultural exports	$7.8 billion
Bulk	6%
Intermediate	21%
Consumer-oriented	73%
Major export markets	
United States	$6.7 billion
Japan	$217 million
Hong Kong	$135 million
United Kingdom	$107 million
Germany	$64 million
Imports	
Total agricultural imports	$11.1 billion
Bulk	13%
Intermediate	15%
Consumer oriented	72%

Source: Agriculture and Agri-Food Canada (2005)

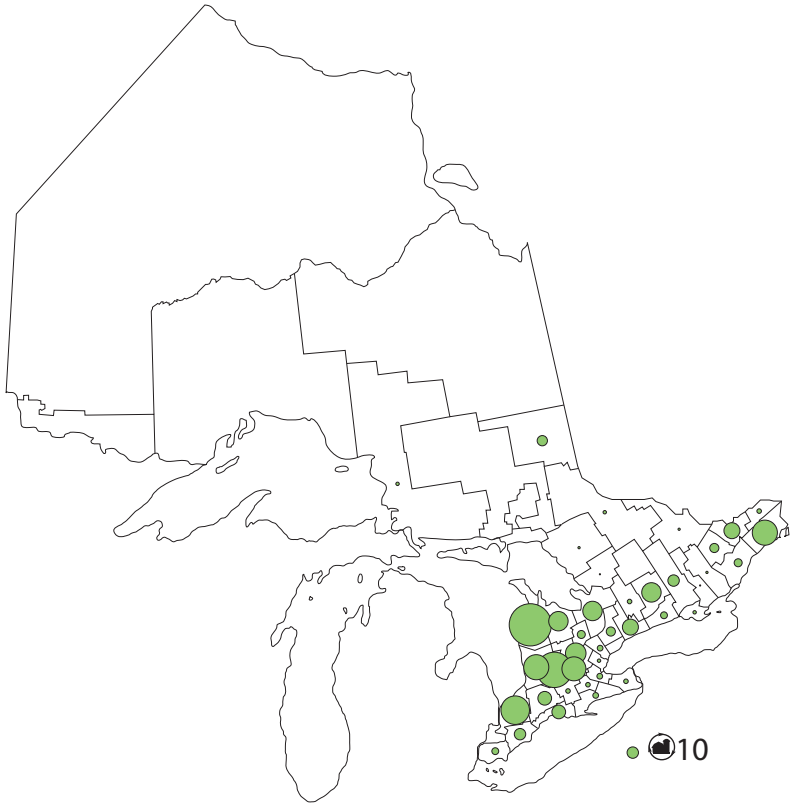
The bulk of Ontario's agriculture is located in the southern areas, primarily within the Ontario peninsula and along the St. Lawrence river. With rich soils, a temperate climate, sufficient precipitation (500-1000mm), and a steady non-irrigated water supply these areas are highly suitable to cultivation. For instance the Lake Erie Lowland Region occupying only 0.25% of Canada's land mass, supports 25% of the population. It should also be noted that the majority of the population resides within this region restricting the availability of arable land that could be placed under cultivation.

1986	1991	1996	2001	Farm characteristics
78	79 ▲	83.1 ▲	91.5 ▲	Average hectares
241	310 ▲	418 ▲	695 ▲	Average pigs per farm
62	64 ▲	68.5 ▲	75.9 ▲	Average cattle and calves per farm
828	1040 ▲	1,340 ▲	1,603 ▲	Laying hens, 19 weeks and older
72,713	68,633 ▼	67,520 ▼	59,728 ▼	Number of farms

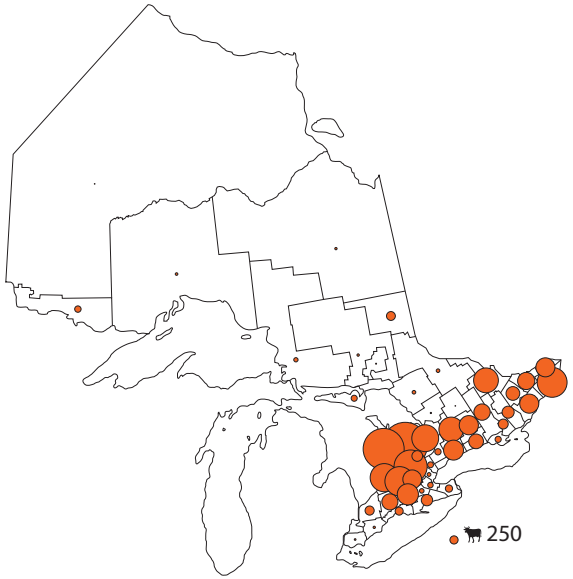
5.81 Numbers indicative of growing intensification of Ontario farming



5.82 Location and distribution of farms in Ontario

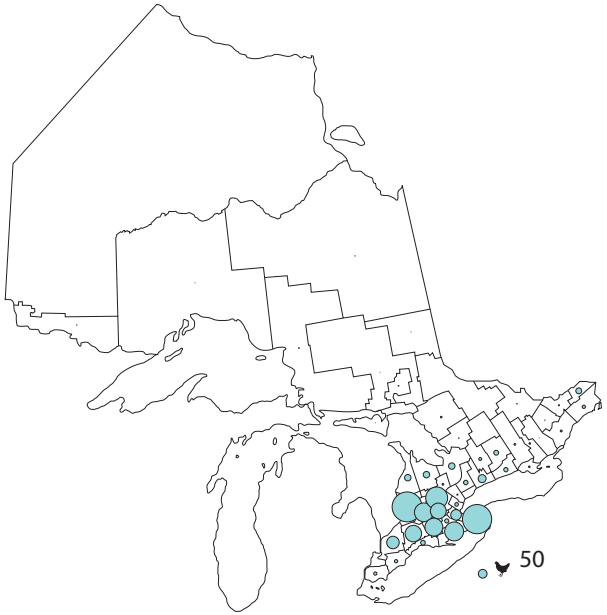


5.83 Location and distribution of organic farms in Ontario

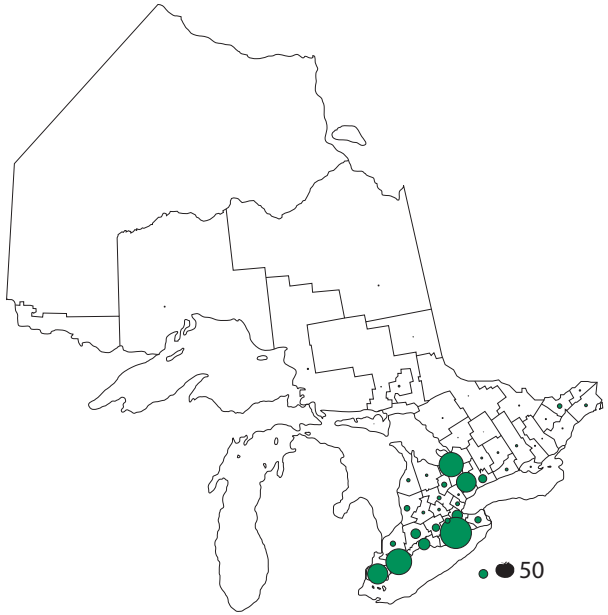


5.84 Location and distribution of cattle ranching and farming in Ontario

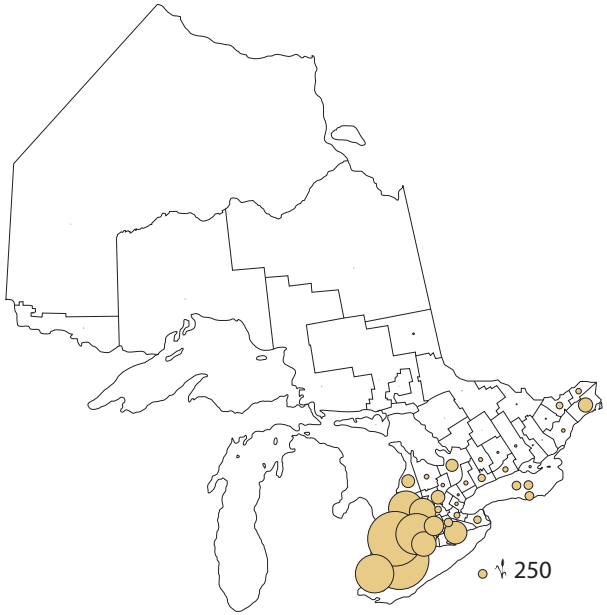
5.85 Location and distribution of hog and pig farming in Ontario



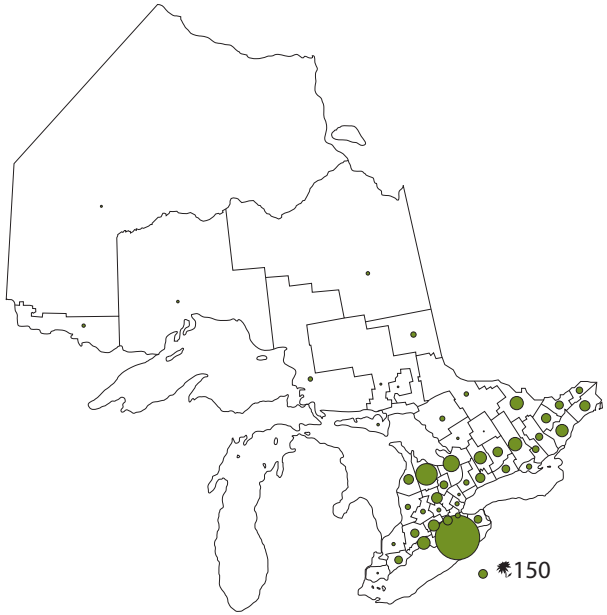
5.86 Location and distribution of poultry and egg production in Ontario



5.87 Location and distribution of vegetable and melon farming in Ontario



5.88 Location and distribution of oilseed and grain farming in Ontario



5.89 Location and distribution of other crop farming in Ontario

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