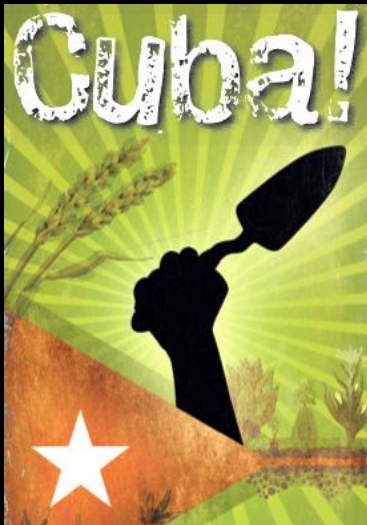


Cuba's Agroecology Design Revolution

Bucky Fuller's Challenge To Create
A World That Works
For Everyone



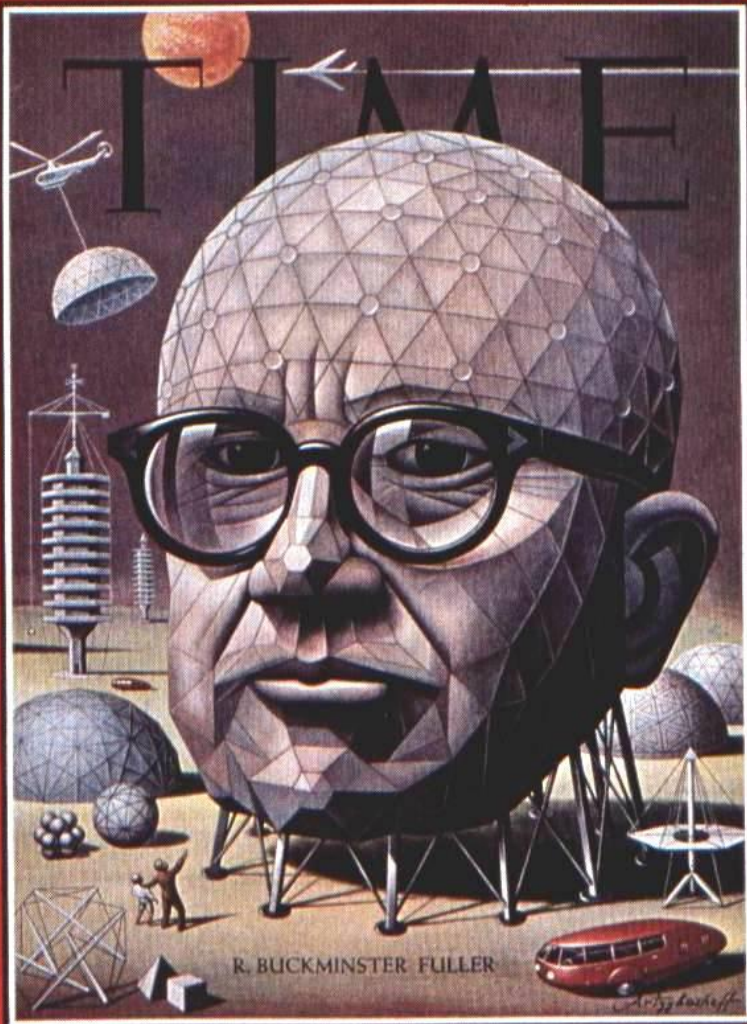
Greg Watson
Schumacher Center for a New Economics
NESEA Build Energy 2015
March 5, 2015



Bucky 101

THIRTY CENTS

JANUARY 10, 1964



R. BUCKMINSTER FULLER

VOL. 83 NO. 2

Saturday Review

March 2, 1968

Buckminster Fuller, when asked by "Who's Who" last year to write a one-sentence statement of his life objectives on the model of de Tocqueville's 152-word "aphoristic declaration," in characteristic fashion wrote the following declaration about himself:

WHAT I AM TRYING TO DO

Acutely aware of our beings' limitations and acknowledging the infinite mystery of the a priori universe into which we are born but nevertheless searching for a conscious means of hopefully competent participation by humanity in its own evolutionary trending while employing only the unique advantages inhering exclusively to the individual who takes and maintains the economic initiative in the face of the formidable physical capital and credit advantages of the massive corporations and political states and deliberately avoiding political ties and tactics while endeavoring by experiments and explorations to excite individuals' awareness and realization of humanity's higher potentials I seek through comprehensive anticipatory design science and its reductions to physical practices to reform the environment instead of trying to reform men being intent thereby to accomplish prototyped capabilities of doing more with less whereby in turn the wealth augmenting prospects of such design science regenerations will induce their spontaneous and economically successful industrial proliferation by world around services' managements all of which chain reaction provoking events will both permit and induce all humanity to realize full lasting economic and physical success plus enjoyment of all the Earth without one individual interfering with or being advantaged at the expense of another.

—BUCKMINSTER FULLER,

Aboard our 1,000-miles-per-minute speeding spaceship Earth within the outer reaches of the cosmically spiraling and expanding Milky Way, the Galactic Nebula.

Modified from 152 to 200 words at the location on spaceship Earth where the first man-made atomic explosion occurred; Alamogordo.

What is Design Science?

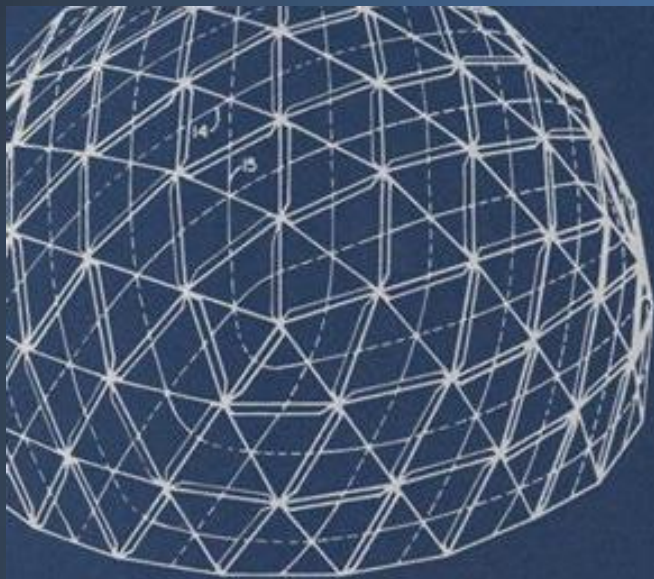


Fig. 23



Fig. 1

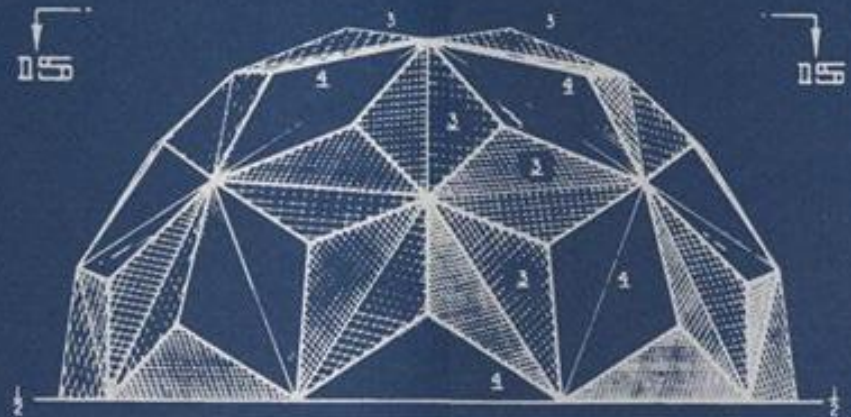


Fig. 13

What is Design Science?

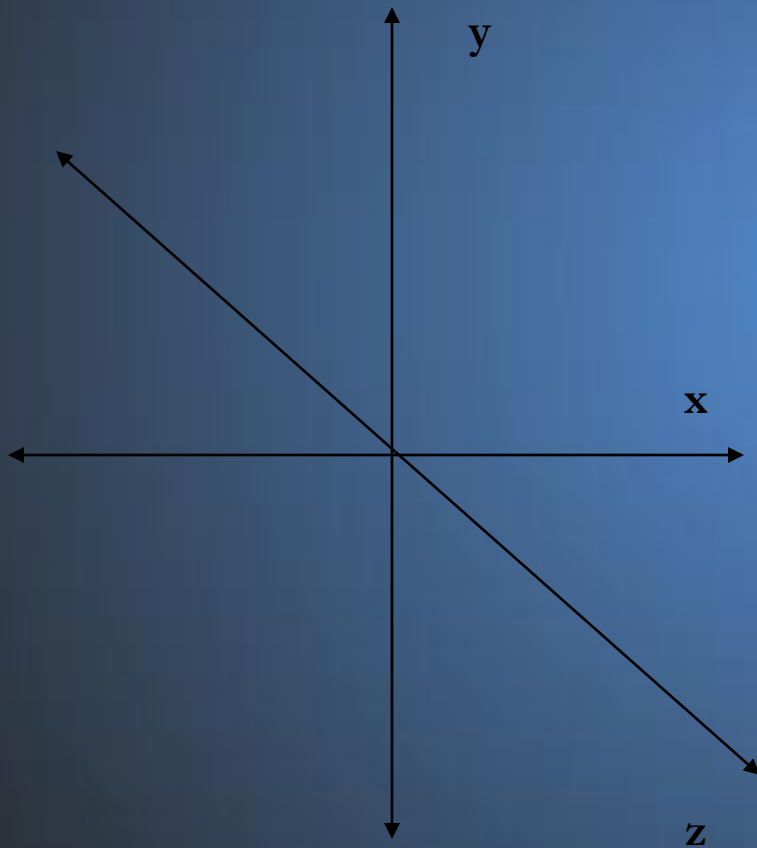
“[Design Science is] “...the effective application of the principles of science to the conscious design of our total environment in order to help make the Earth’s finite resources meet the needs of all humanity without disrupting the ecological processes of the planet”

Buckminster Fuller

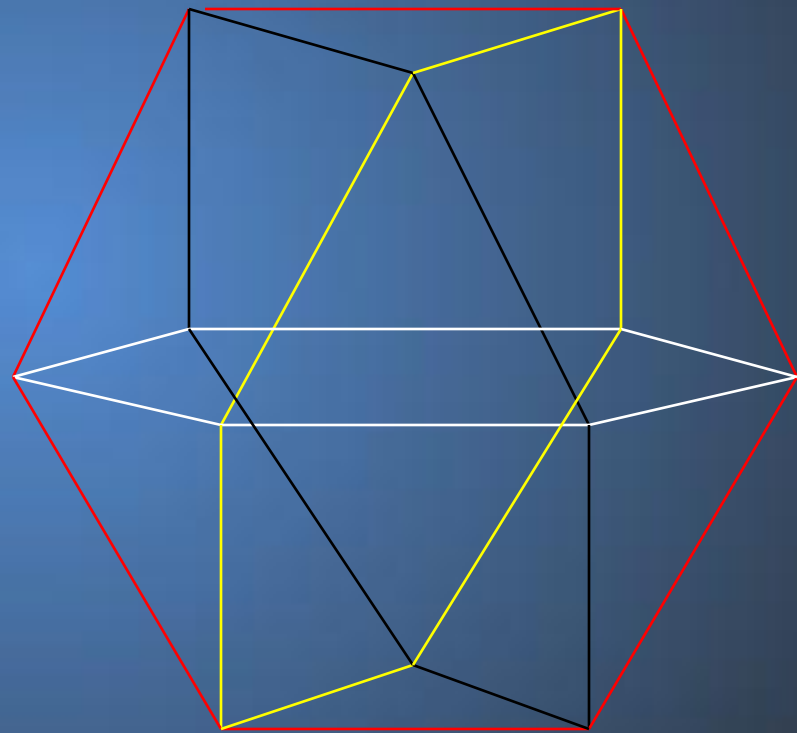
What we know from experience

- Physics has found no straight lines – has found only waves.
- Physics has found no solids – only high frequency event fields
- Universe is not conforming to a three-dimensional perpendicular-parallel frame of reference

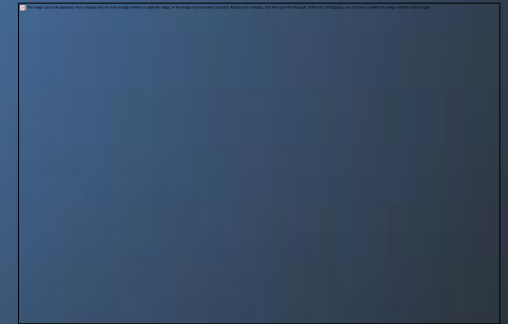
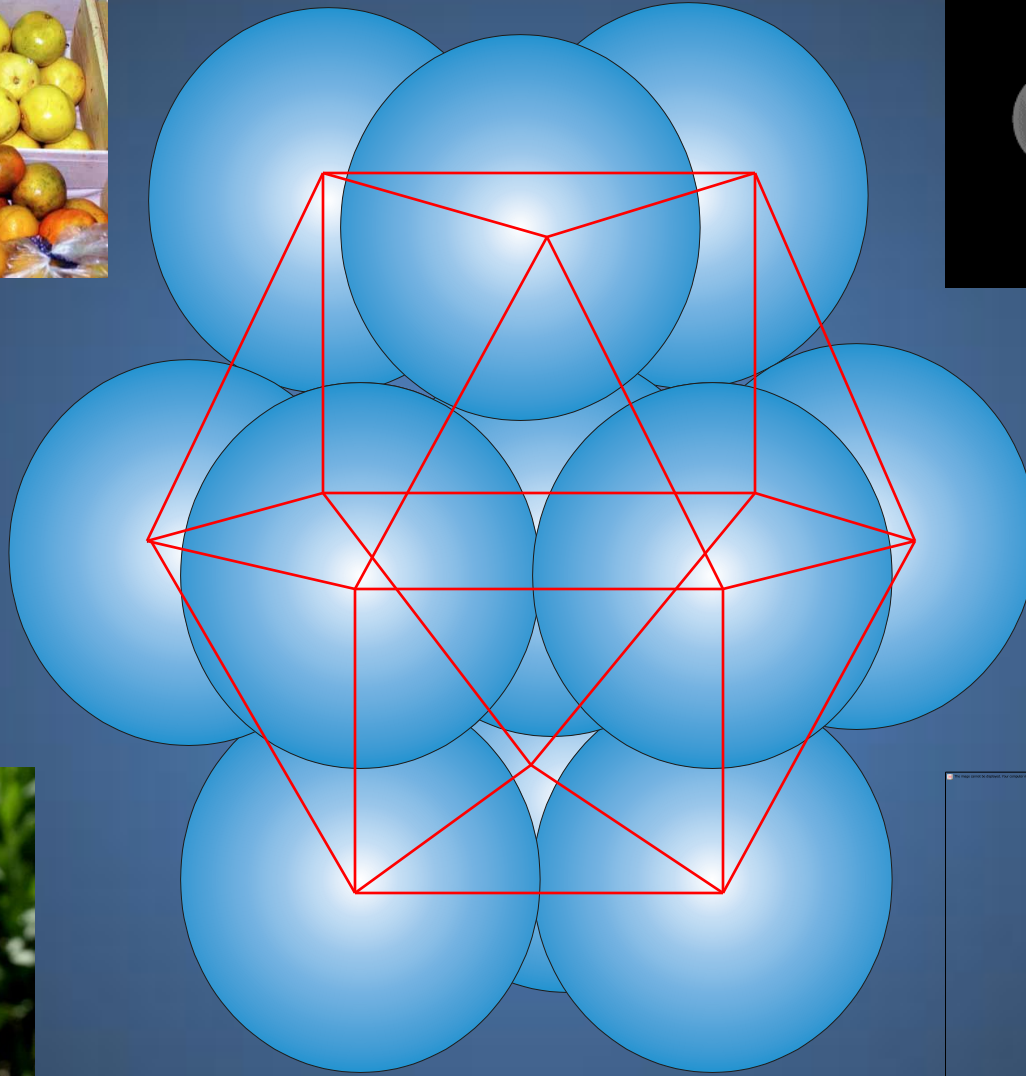
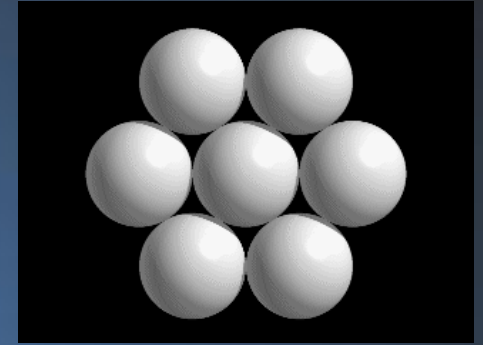
4-Dimensional Coordinate System



Cartesian Coordinates



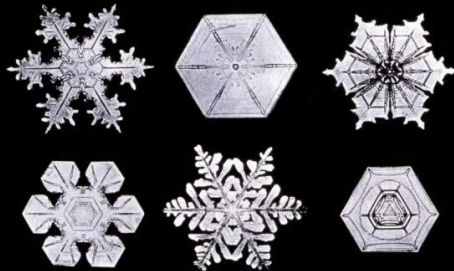
Vector Equilibrium
(Nature's Coordinates)



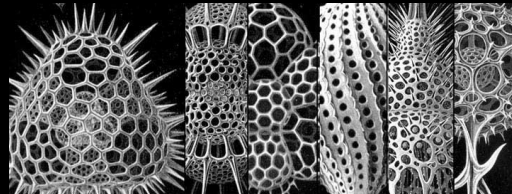
The vectors defining Nature's coordinate system connect the centers of closest packed spheres

Nature's Design Strategy

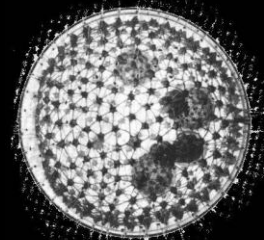
- Minimum Inventory/Maximum Diversity
 - Minimum “toolkit of basic patterned integrities”
 - Maximization of structural forms
- Resilient/Regenerative/Evolving
- Resource conserving
 - Do more with less
 - Gain greatest possible advantage with minimal resource investment



Snowflakes



Radiolaria



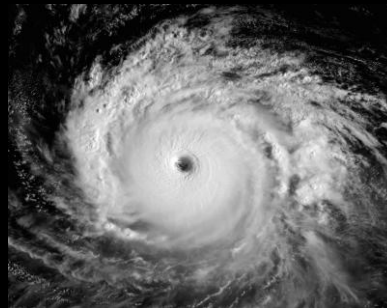
Volvox protozoan

Scalable Design

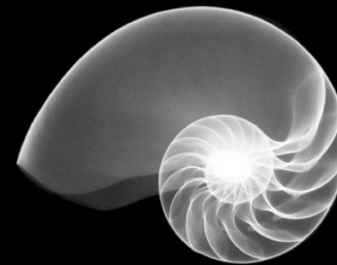
Nature's Design Principles are Independent of Size



Galaxy



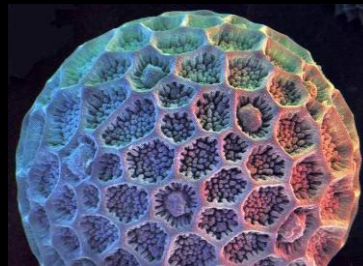
Hurricane



Nautilus



DNA Buckyball



Pollen

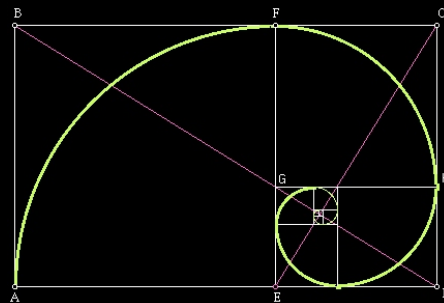


Honeycomb

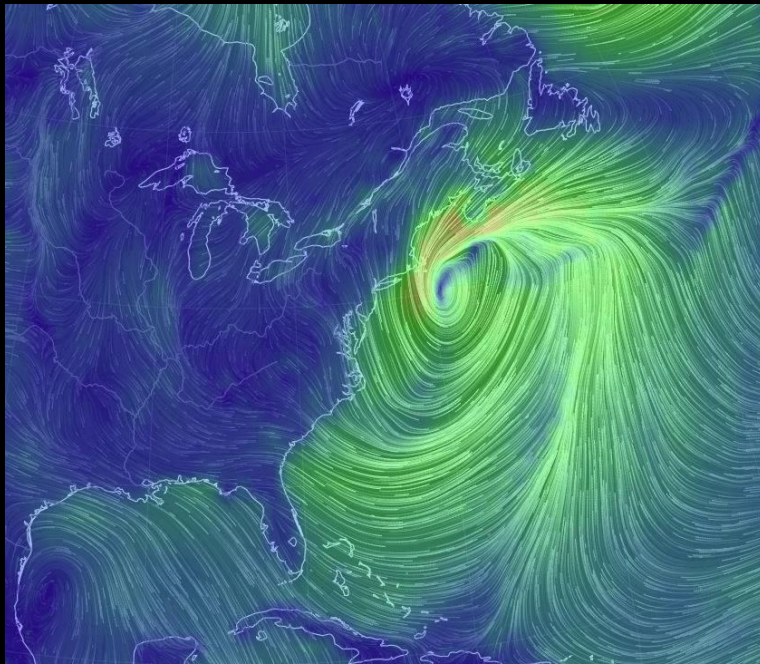
What Is Technology?

“Humans have thus far evolved the industrial complex designing which is only of kindergarten magnitude compared to the complexity of the biological success of our planet Earth. In its complexities of design integrity, the Universe is technology”

R. Buckminster Fuller, Synergetics: Explorations in the Geometry of Thinking



Operating Principles/Language

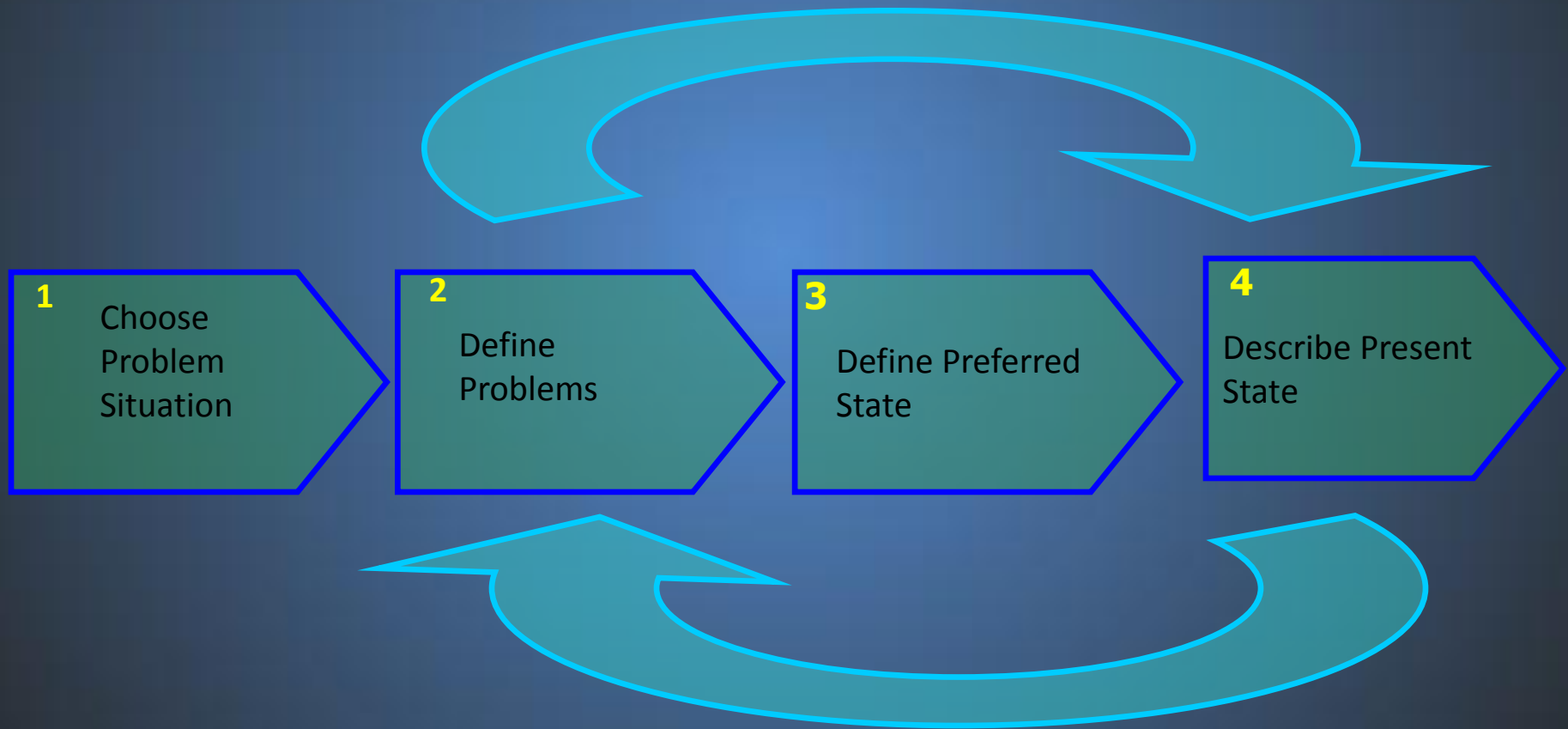


- No such thing as “up” and “down” in a spherical world
 - (In, Out, Around)
- Tension and compression only and always coexist
- Nature tends to emphasize tension over compression
- The wind does not “blow” it is “pulled” from high-to-low pressure systems

Trim Tab Principle

- Using generalized principles to determine the set of actions which can be taken to change the course of a larger system.
- An artifact or action specifically designed and placed in the environment at such a time and in such a place where its effects would be maximized thereby affecting the most advantageous change with the least resources, time and energy invested.

Design Science Planning Process



6
Inventory
Alternatives

10
Develop
Artifacts

5
Design Preferred
System

8
Develop
Implementation
Strategies

9
Document
Process

11
Communicate
Plan

7
Develop
Evaluation
Criteria

12
Initiate Larger
Planning Process

Applied Design Science



Kurilpa Tensegrity Bridge



Oberlin College Green Building



Curitiba Public Transit



European Union Super grid



Biomimicry



Pre-Columbian Amazon

Designing For Survival



REVOLUTION
1989

The
Fall
of the
Soviet
Empire

Cuba's Food Crisis



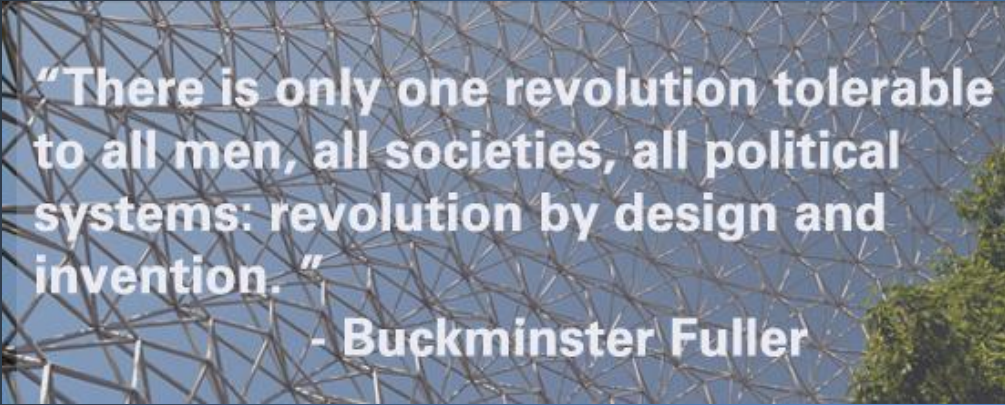
- Collapse of Soviet Bloc in 1989 created an economic crisis in Cuba
- Loss of 60% of the country's GDP
- Loss of its primary source of petroleum
- Decreases in food production:
 - Tubers -96%
 - Vegetables -64%
 - Fruits -73%
 - Rice -68%
 - Beans -62%
 - Cow's Milk -53%
 - Beef -48%
 - Pork -52%

Aftermath of the “Green Revolution”



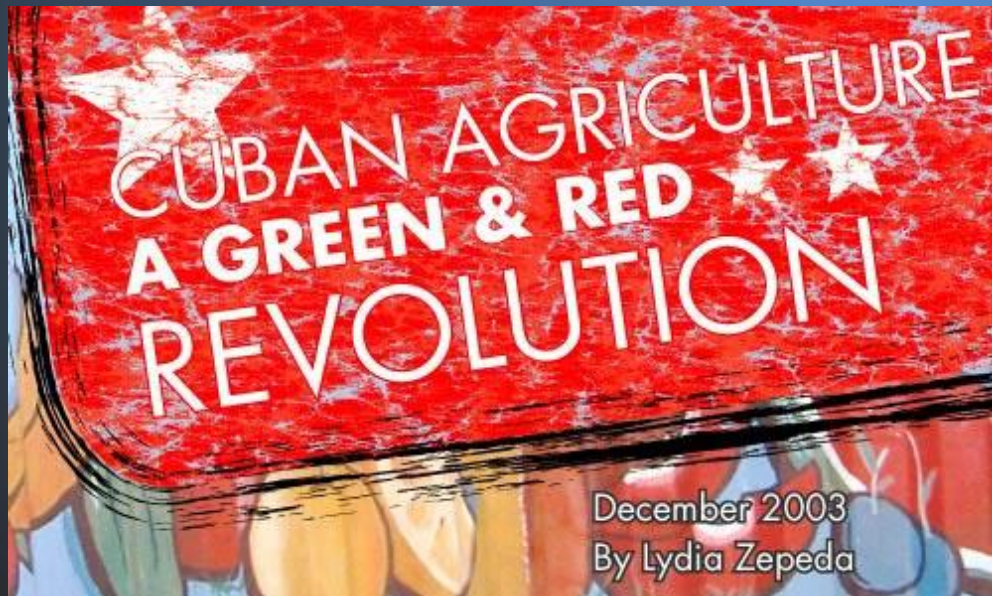
- The average state farm was between 32,000 and 76,000 acres
- 50% of Cuba’s agricultural land was devoted to coffee, tobacco or sugarcane
- Cuban farmers were using double the amount of chemical fertilizers as U.S. farmers
- ~70% of Cuba’s 6.6 m hectares of agricultural land suffers from some level of degradation
- 45%-60% of Cuban soils deficient in organic matter
- 48% of the soils suffer from erosion

Design As Politics



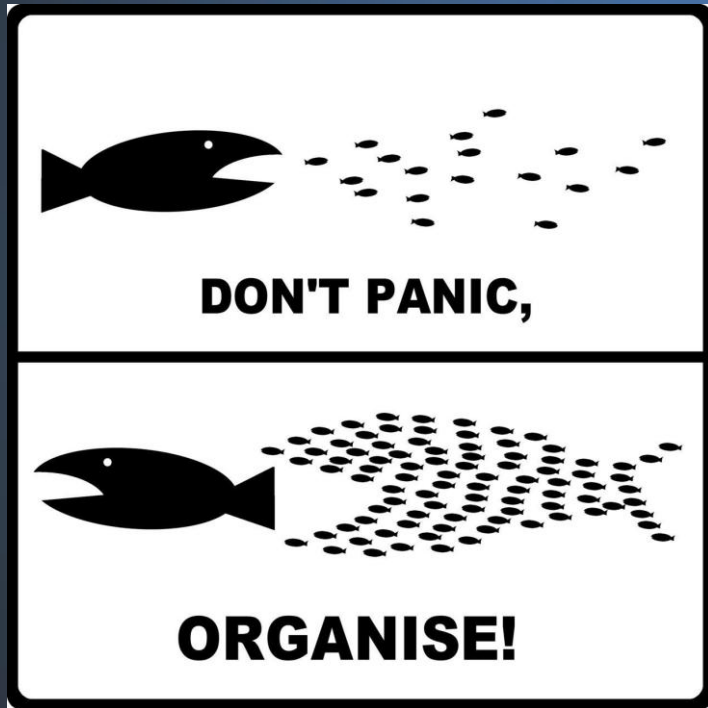
“There is only one revolution tolerable to all men, all societies, all political systems: revolution by design and invention.”
- Buckminster Fuller

Architecture and town planning have been deployed as tools to force people into certain behavioral modes and it has been instrumental in creating the visions of future cities and landscapes, that are needed to mobilize massive amounts of state and corporate power.



Organizing is also a design process capable of mobilizing community power and leveraging change by discovering and using social trimtabs.

Community Organizing



The Dudley Street Neighborhood Initiative has grown into a collaborative effort of over 3,000 residents, businesses, non-profits and religious institutions members committed to revitalizing this culturally diverse neighborhood of 24,000 people and maintaining its character and affordability. DSNI is the only community-based nonprofit in the country which has been granted eminent domain authority over abandoned land within its boundaries.

Cuba's Agroecology Movement

"CRISIS FORCES CUBA TO CONSERVE ..."

In an attempt to ride out the difficult times, the Government is becoming increasingly "green"..."

Kaufman, 1993

"The greening of the revolution: Cuba's experiment with organic agriculture."

Rosset & Benjamin, 1994

"Cuba Goes Organic! ..."

Pushed by the loss of imported pesticides and fertilisers and pulled by a growing awareness of environmental damage caused by intensive agricultural techniques; the Cuban government looked to sustainable, organic methods of cultivation to resuscitate and develop domestic food production."

Weaver et al, 1997

"Food Security and Local Production of Biopesticides in Cuba."

Cuba has embarked on an unprecedented national transition from high-external input to low-input and organic agriculture ..."

Rosset & Moore, 1997

"A revolution in Urban Agriculture ..."

Cubans have combined the revival of traditional farming systems with the development of high-tech methods."

Ritchie, 1998

"CUBA'S ORGANIC REVOLUTION."

Organic agriculture has been adopted as the official government strategy for all new agriculture in Cuba ..."

The Pesticides Trust, 1998

"Fidel's sustainable farmers."

Economist, 1999

"Cuba: towards a national organic regime?"

Today, 65% of Cuba's rice and 50% of its fresh vegetables are produced organically."

Parrott & Marsden, 2002

"An Organic Coup in Cuba?"

Castro says organic is working."

Simon, 1997



Designed Bottom Up by Farmers



SOIL TO SKY

OF AGROECOLOGY VS INDUSTRIAL AGRICULTURE



1 BILLION

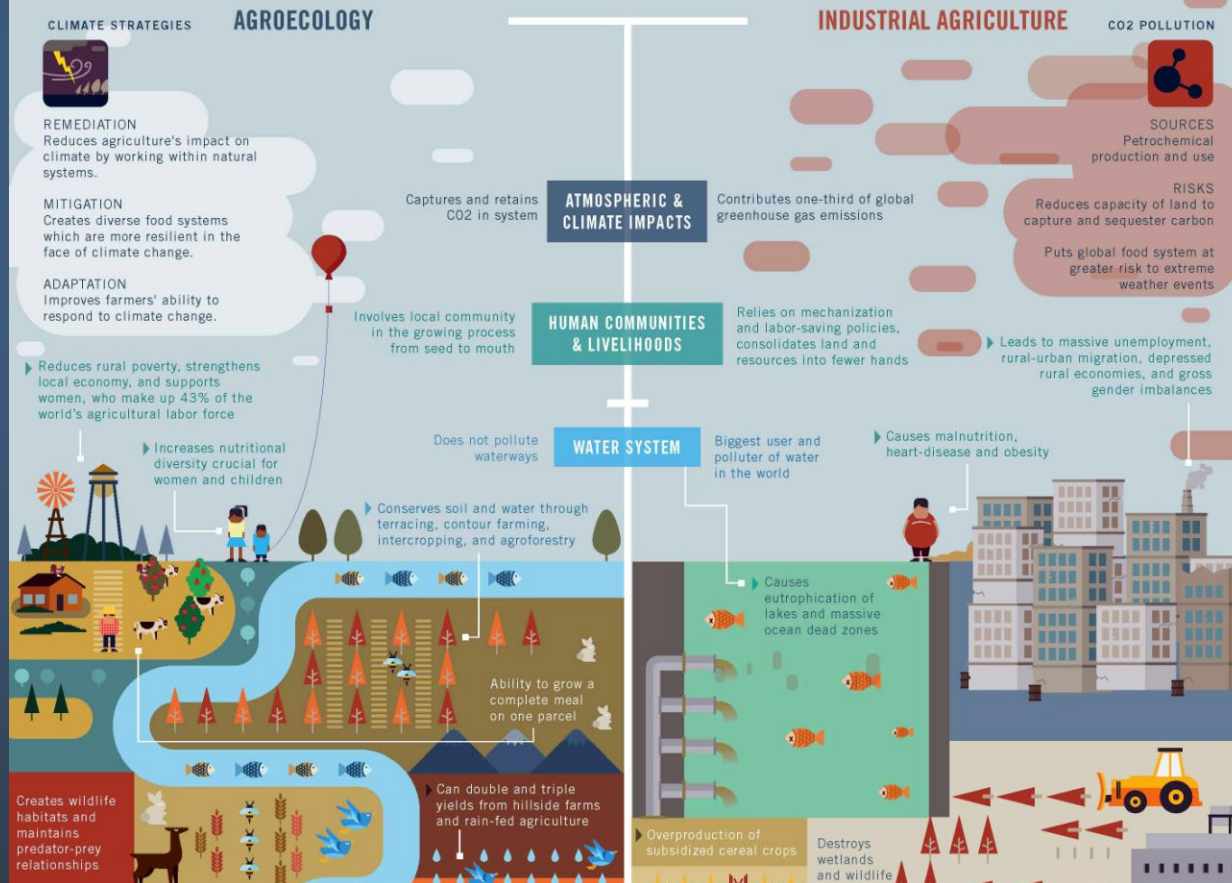
CURRENTLY, 1 BILLION PEOPLE IN THE WORLD ARE HUNGRY. ANOTHER BILLION OVER EAT UNHEALTHY FOODS.



ONE-THIRD

ONE-THIRD OF FOOD PRODUCED IS WASTED. THE PRODUCTIVITY OF NEARLY HALF OF ALL SOIL WORLDWIDE IS DECREASING.

In order to feed our world without destroying it, a holistic type of agriculture is needed, and we have a choice. Here we compare the current high-input industrial system with a renewed vision for agriculture: the agroecological system.



Reintegrates livestock, crops, pollinators, fish, trees, and water for integrated nutrient and pest management

Diverse nutrients cycled back into the system

Embraces complex methods of land stewardship

FIELD LEVEL BIODIVERSITY

FARM OUTPUT & YIELDS

Organic soils retain more moisture and naturally improve crops' drought resistance

Treats soil as the building block and reflection of community/ecological health

SOIL

A single square yard of living soil contains 500 to 200,000 individual arthropods, which aerate and give nutrients to the soil ecosystem.

Helps balance aquifer withdrawals and recharge

AGROECOLOGICAL STRATEGIES can better feed the world, fight climate change and poverty, and protect soil and water while maintaining healthy, livable communities and local economies.

habitats

Relies on increasing amounts of external chemical inputs to boost unsustainable yields, killing soils worldwide

Increases output of waste, pollution, animal feces

Dominates landscapes with genetic uniformity

Increases risk of infestation, plagues, and pesticide-resistant pests

There are no life forms in the soil, which is sterilized, requiring constant chemical input.

Causes soil erosion and compaction resulting in decreased capacity to retain water

Nearly 50% of all soils worldwide are decreasing from industrial agriculture.

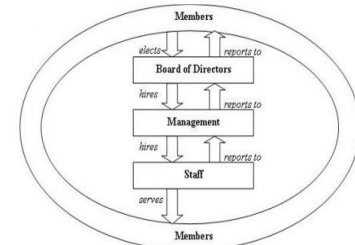
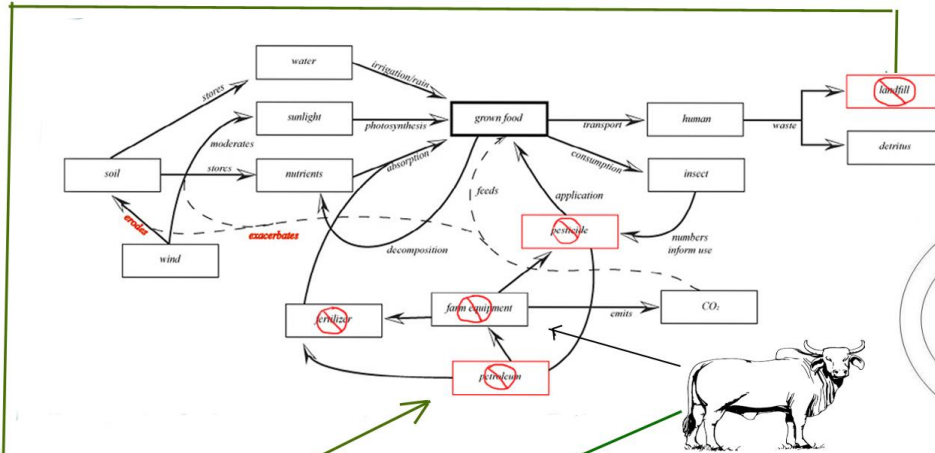
Depletes water tables, causes salinization and pollution of aquifers and soils

INDUSTRIAL AGRICULTURE contributes to climate change, malnutrition and ecosystem degradation around the planet. It has not delivered on its promise to feed the world.

healthy, livable communities and local economies, fight climate change and poverty, and protect soil and water while maintaining

not delivered on its promise to feed the world, malnutrition and ecosystem degradation around the planet. It has

Cuba's Agroecology Movement



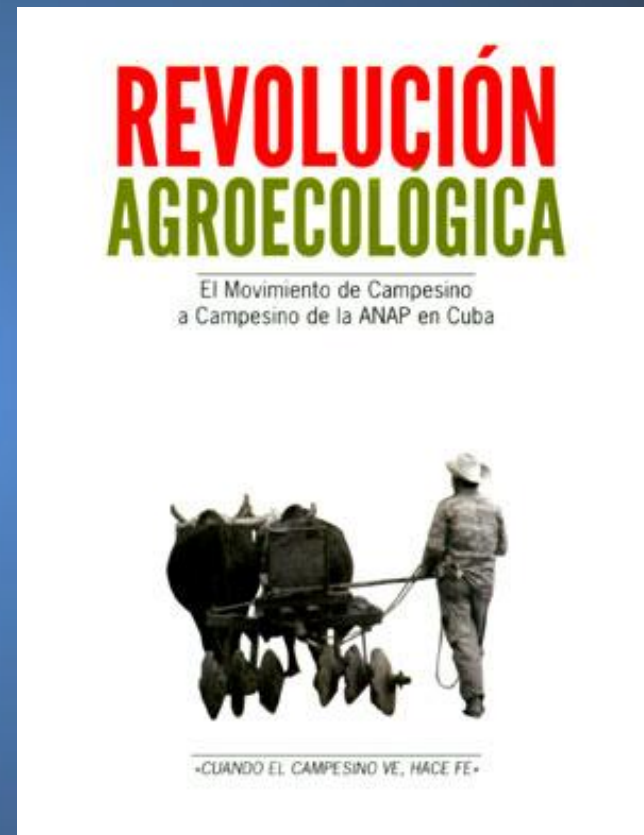
Cooperative Structures



Communication



“Extension”



“Farmer-To-Farmer”

Creating A Movement



- Cuban National Association of Small Farmers (ANAP)
- Members of ANAP are transforming their production by applying principles of agroecology
- Over 100,000 families have joined the agroecology movement since 1997.
- State-owned worker co-ops
- Agricultural Production co-ops
- Credit and Service co-ops

Co-op Status

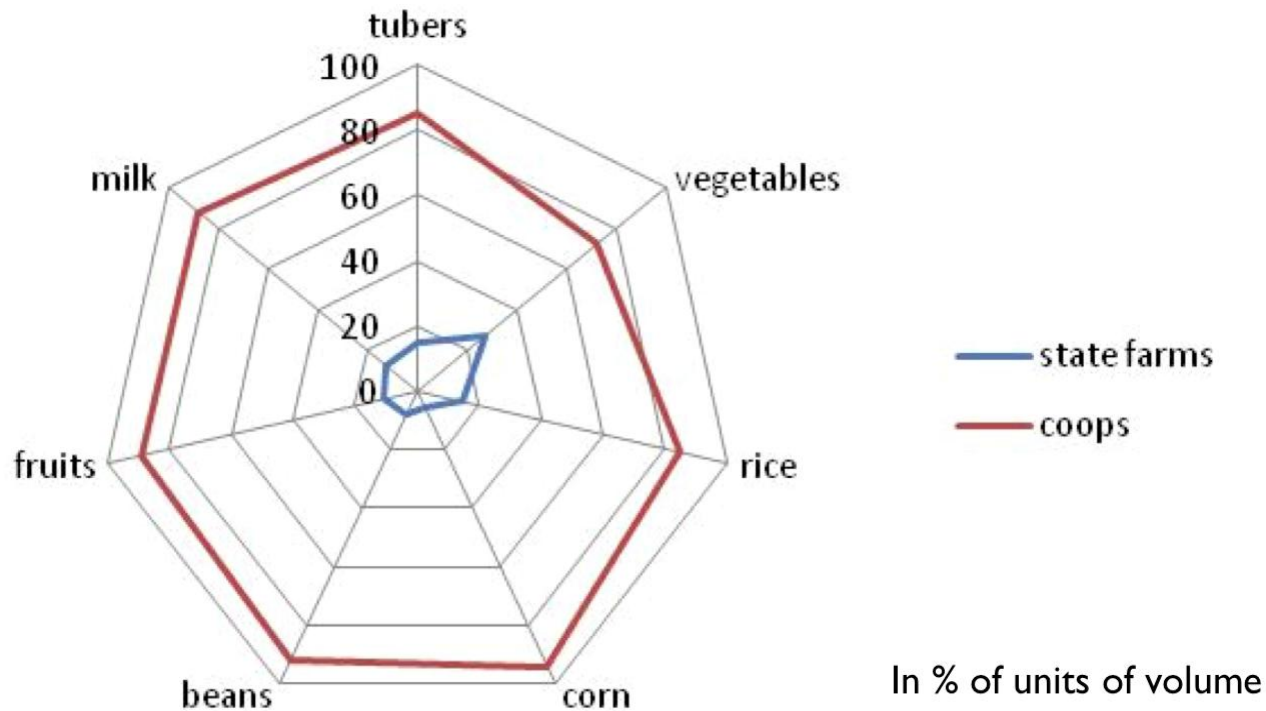
Current situation of coops in Cuba Overview (March 2013)

	# of coops	total members	% of Cuban workforce	% of Cuban agricultural land
CCS	2,526	352,565	7.04%	18.76%
CPA	943	53,916	1.08%	8.91%
UBPC	1,869	160,000	3.19%	28%
Total	5,338	566,481	11.31%	55.67%

Sources: ONEI, ANAP, MINAG

Current situation of coops in Cuba

Production vs. state farms (2012)



In % of units of volume

Source: MINAG

- ✓ Portion of these crops produced by coops: 87%.
- ✓ In 2010, they contributed 77% of overall agricultural production.

Defying the Odds

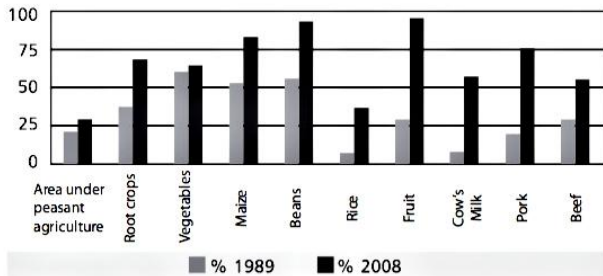


FIGURE 3. Percentage contribution of peasant agriculture to total national production for several food items, and the proportion of Cuba's agricultural land area under peasant agriculture in 1989 and 2008.

Source: data from the cooperatives.

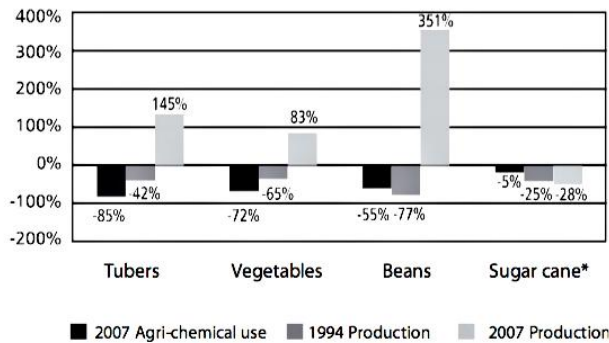


FIGURE 4. Dynamics of agrochemical use (compared to 1988) and production of sugarcane and other basic foods in 1994 and 2007. Data for sugar cane represent yield, not production.

Source: data from the cooperatives.

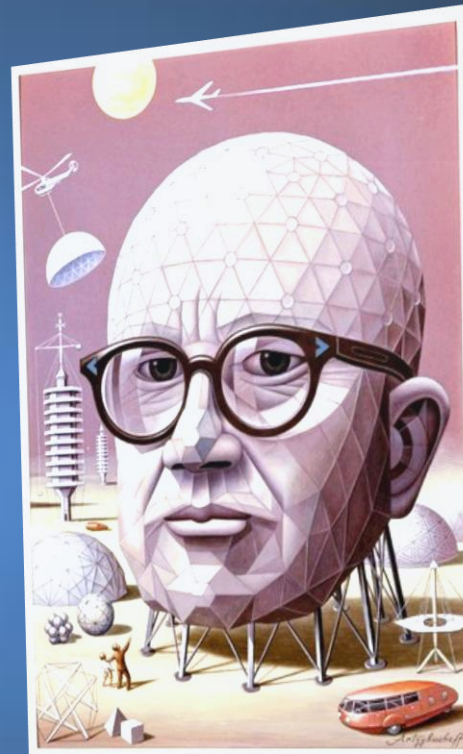
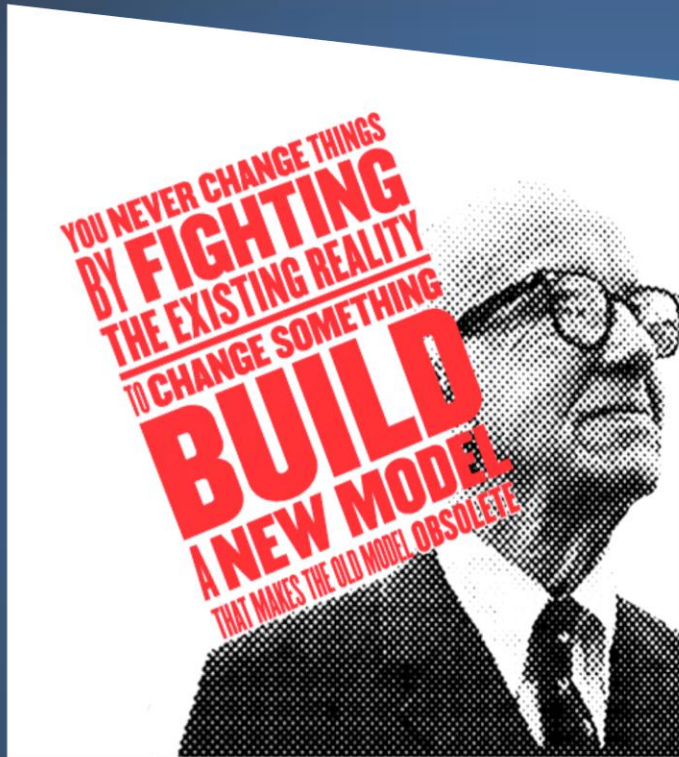


Social Solidarity Economy

“Cuba has disproved the myth that organic agriculture cannot maintain a modern nation.” – Dale Allen Pfeiffer/World Bank



Ecologically & Politically Resilient?



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YOU NEVER CHANGE THINGS BY FIGHTING THE EXISTING REALITY TO CHANGE SOMETHING BUILD A NEW MODEL THAT MAKES THE OLD MODEL OBSOLETE





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