NAWAPA, Agriculture, And the Food Crisis

by Wayne Voelz

Wayne Voelz is a land development project manager who spoke at LaRouchePAC's conference on the North American Water and Power Alliance (NAWAPA) in Pasadena, Calif., on Dec. 4, 2010. ***EIR*** *published the transcript of an LPAC-TV interview with him in our issue of Jan. 14, 2011. This article was posted to the LaRouchePAC website on March 18.*

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Wayne Voelz addresses a LaRouchePAC conference on "Building NAWAPA," in Pasadena, Calif., Dec. 4, 2010.

The main source of food for the population of the world is agriculture. The term agriculture, as broadly defined by the FAO (UN Food and Agriculture Organization), also includes livestock husbandry, managed fisheries (aquaculture), and forestry. The majority of agricultural production depends on the availability of three critical resources in the proper ratios: arable land, water, and power in the form of electricity and fossil fuels. This article focuses on the alarming decline in the availability of these critical resources, the causes, and solutions that can be applied through the implementation of the NAWAPA (North American Water and Power Alliance) program. Originally proposed to Congress by the Ralph M. Parsons Company in 1964, championed by Sen. Frank Moss (D-Utah) for years, it was ultimately dismissed, due to the overriding dynamic caused by the Kennedy assassination coverup and consequent Vietnam War, which drove a major shift in economic policy away from development and physical productivity, toward monetarism and environmentalism.

Arable Land

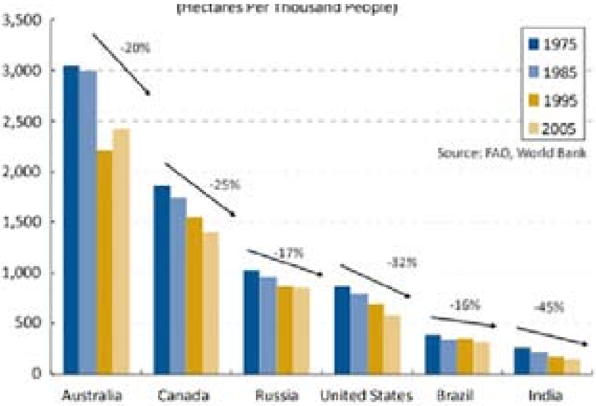
Arable land is defined as the total land area available for the cultivation of temporary and permanent crops for the purpose of providing food and fiber for human use and feed for livestock. *Temporary crops* are defined as those that need to be replaced after being harvested, like meat, grain, and produce. *Permanent crops* are those that occupy land for longer periods and need not be replaced after each harvest, such as dairy production and fruit and nut orchards.

Figure 1 reflects the decline in arable land per capita in several countries between 1975 and 2005.

Notice the United States has had the greatest decline (–32%) followed by Canada at (–25%). It is expressed in hectares/1,000 people. Converted to acres, the United States in 1975 had approximately 2 acres/person devoted to agriculture; by 2005 that number had declined to 1.25 acres/person. Today we are closer to 1 acre/person.

On the surface, that may appear sufficient for food production, if we think in terms of a kitchen garden; but not all arable land is used directly to produce food. There are two primary divisions of agriculture: crop production and animal production, and each of these has two sub-categories, food products and non-food products. Generally, more land is required for the production of animal products due to a conversion factor: plants must be converted, through metabolic processes, into meat, milk, eggs, and so on. Animals also require more physical space to effect the conversion, as in pastures, feed lots, dairies,

FIGURE 1
Arable Land Per Capita Is Decreasing
(Hectares per Thousand People)



and chicken houses.

To put this into perspective, consider the following illustration. On average, a dairy cow needs to consume 14 lb. of feed and drink 8 gal. of water to produce 1 gal. of milk. It takes 1.2 gal. of milk to make 1 lb. of cheese, 1.4 gal. of milk to make 1 gal. of ice cream, and 2.5 gal. of milk to make 1 lb. of butter. At that rate, 35 lb. of feed and 20 gal. of water are needed to produce enough milk to make a pound of butter.

To extend this example, a typical American eats 29 lb. of cheese per year, which requires 34.8 gal. of milk production, which requires 487 lb. of feed production, and 280 gal. of water. Now, consider the amount of land and water needed to produce 487 lb. of feed in terms of alfalfa hay (487 lb. is approximately one-quarter ton). An average irrigated acre will produce 6 tons of alfalfa per growing season, requiring 15 gal. of water per square foot or 2 acre feet (652,000 gal.). So, the land required to supply one person with cheese for a year would be .05% of an acre (2,178 sq. ft.), and 27,500 gal. of water (.085 ac. ft.). If we estimate that 200 million people eat cheese in the United States, roughly 10,000,000 ac. and 17,000,000 ac. ft. of water are needed just to grow the feed necessary to produce the 6,960,000,000 gal. of milk required, let alone the space needed for dairies, creameries, storage facilities, distribution centers, and so on.

Energy inputs are difficult to estimate due to multiple variations and combinations of electrical power, gasoline, and/or diesel fuel required for irrigation systems, tractors, and machines used in the production processes. Other considerations would include energy required to process seed, manufacture fertilizer and soil amendments, produce pesticide and herbicide, etc. Current challenges center around rising costs driven by speculation, global demand for oil, and the lack of development of more energy-dense resources, e.g., nuclear power.

In stark contrast, the average annual per-capita consumption of tomatoes is 20 lb. If we analyze the amount of arable land and water required to produce 20 lb. of tomatoes, we find a significant difference. A tomato plant in a commercial greenhouse will occupy 4 sq. ft. of space and use approximately 280 gal. of water during the production cycle. An average total yield will be 40 lb. of tomatoes per plant. Simple division tells us that supplying a person with a one-year supply of tomatoes requires 2 sq. ft. of land and 140 gal. of water.

Per-capita consumption of wheat in America in 2008 was 137 lb. or 2.3 bushels. Yields vary widely depending on irrigation, soil type, and fertilization. In this example we will use 60 bu. per ac. and 1 ac. ft. of water in the form of rainfall or applied irrigation. This works out to 1670 sq. ft. of land and 12,500 gal. of water.

The United States per-capita cotton lint consumption was 37.4 lb. in 2007; if we use 750 lb./ac. as a baseline yield requiring 2 ac. ft. of water, the calculation is 2,172 sq. ft. of land and 32,500 gal. of water.

These are only a small fraction of agricultural products used directly and indirectly by consumers in the United States. In the examples above, the total land needed is 6,022 sq. ft. or 14% of an acre, and total water is 72,600 gallons or 22% of an ac. ft. Extended to the total population of 311 million requires 43.5 million acres of arable land and 68.5 million ac. ft. of water.

Considerations

The question then arises, how much arable land per capita is optimum? Optimum has, at least, two connotations: the ability to feed and maintain the health of the population of a nation, and the ability to grow the economy as a whole. These are not mutually exclusive, but rather mutually reinforcing. The reality is, a constant growth factor is required to support an economy, and this would, in the simplest of terms, seem to correlate, at minimum, with the rate of increase in population. Therefore, we would need an increase in arable land and water or an increase in productivity per acre of existing land, or both, to achieve an economic equilibrium. A third consideration for optimal ratios would be for the health of the crops and animals. When plants and animals are forced to live in too close proximity to one another, health issues arise that require additional inputs to manage—e.g., pesticides, herbicides, and antibiotics, which tend to be unhealthy for people.

The solution, or reaction, has been to intensify production. This has been accomplished by increasing yields per acre through the application of intensive farming practices. These include the use of hybrid seed, intensive irrigation, and the overuse of nitrogen fertilizer. In the case of meat, milk, and egg production, factory farms have become the norm, where animals are allowed standing room only and are fed diets of growth hormones and antibiotics necessary to combat disease fostered by their close proximity. A case could be made for the most efficient use of resources, if one were restricted to existing land, which would to be produce plants for direct consumption, as opposed to feed for animals to be used for consumption.

Extensive analysis of agricultural production criteria and carrying capacity, i.e., the ability of agriculture to support a population, has been conducted by the USDA/NRCS (U.S. Department of Agriculture/National Resources Conservation Service) and the FAO.[1]

An article posted on the NRCS website titled "Global Land Resources and Population Supporting Capacity," by H. Ewaran, F. Beinroth, and P. Reich,[2] describes the various factors related to carrying capacity as relative, determined by soil types and their characteristics, and relative levels of inputs—e.g., irrigation, fertilizers, and labor. **Table 1** summarizes their calculations.

If we use the medium level of inputs and average the six viable soil classes we come up with 3.5 persons per hectare or 1.45 persons per acre. If we average all input levels across the classes we get 4.0 persons/ha, or 1.6 persons/ac. There are varying opinions on the subject; however, there is general agreement that food production should be considered a global problem, given the variation of conditions and requirements.

Causes of Decline

Reasons for the change emanate essentially from increases in population and environmental and economic policy. Agricultural land has been taken out of production and converted to residential and commercial uses, and water resources reallocated. Environmental regulation related to land conservation and endangered species habitat is another factor, as well as market regulation in the form of government programs that essentially pay farmers to take land out of production.

TABLE 1

Idealized Population Supporting Capacity

(Persons per Hectare)

Level of Inputs	Land Quality Classes								
	I	II	III	IV	V	VI	VII	VIII	IX
Low	4	3.5	3	2	1.5	1	0	0	0
Medium	6	5	4	3	2	1.5	0	0	0
High	10	9	8	7	6	5	0	0	0

NRCS, "Global Land Resources and Population Supporting Capacity"

The Case of Phoenix, Az.

Phoenix and its surrounding cities are a prime example of population growth in the Salt River Valley in Maricopa County. In this 30-year period, hundreds of square miles of productive farmland have been converted to roadways, subdivisions, shopping malls, business parks, golf courses, and the like.

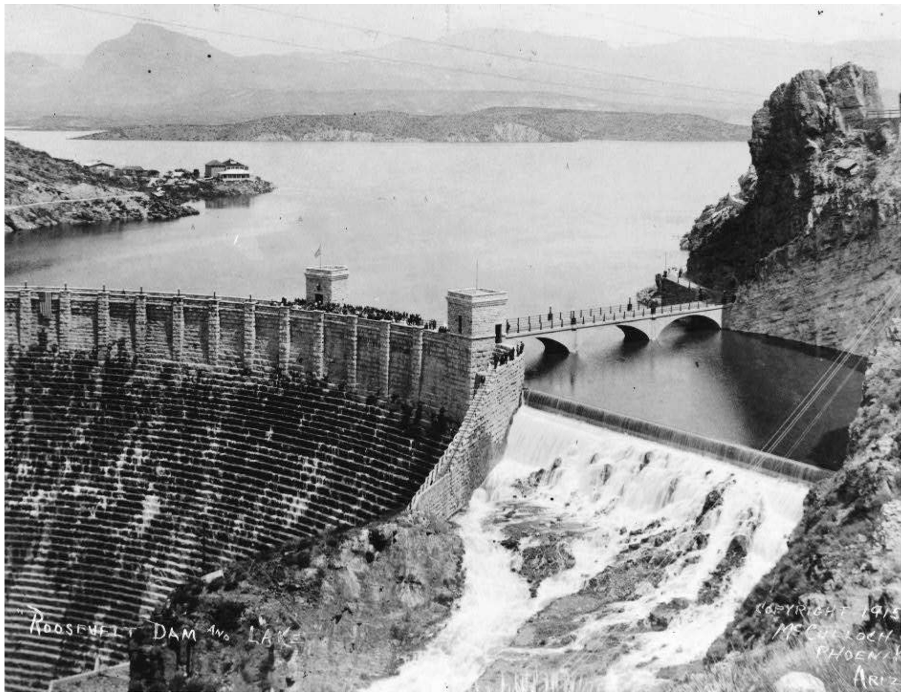
The Salt River Valley is a historical example of man's ability to reorganize the biosphere to his advantage, and of the potential of agriculture in the desert. From 300-1450 A.D., the Hohokam were farmers who inhabited the valley and built 500 miles of irrigation ditches, which irrigated crops and provided water for an estimated 50,000 people. The tribe inexplicably vanished, leaving their complex system behind. Four hundred years later, in 1860, John W. Swilling discovered the ancient canals and formed the Swilling Irrigating Canal Company to rebuild and upgrade the system; it dug the Salt River Valley Canal in 1867. The revitalized system provided the second platform for economic development in the valley.

Over the next decade, the system was expanded and improved, but depended entirely on runoff from snow and rainfall in the mountains above the Salt River. Storage facilities were needed to capture runoff as a buffer against drought conditions and to provide flood control. For another decade, efforts were made by communities and private companies to fund a dam on the Salt River, in the Tonto Basin 80 miles northeast of Phoenix but were unsuccessful. People were starting to look to the Federal government to help fund water reclamation projects.

Congress passed the National Reclamation Act in

1. http://www.fao.org/docrep/006/y4683e/y4683e05.htm#TopOfPage
2. http://soils.usda.gov/use/worldsoils/papers/pop-support-paper.html

1902 for the purpose of constructing monumental water projects to irrigate the West. The Salt River Valley Water Users Association was formed in Maricopa County in 1903 and began construction of the Roosevelt Dam in 1906. In 1909, electricity generated from the hydroelectric plant built with the dam was delivered to the Phoenix Light and Power Company, which had provided revenue to offset the cost of construction. It was the first multi-purpose water and power project to be initiated under the Act. The Salt River Power (SRP) system is comprised of 7 reservoirs, with a total storage capacity of 3.6 million acre feet. Water is distributed through 131 miles of canals.[3]



Library of Congress

The Roosevelt Dam and lake in Arizona, constructed by the Salt River Valley Water Users Association beginning in 1906. It is shown here, completed, in 1915. This and other water projects in the region made it possible to develop agriculture in the desert.

By 1912, there were 253,000 acres under cultivation, with a population around 30,000, or roughly 8.5 acres per person. The population of Maricopa County in 1975 was just under 1 million, with 454,000 ac. in agricultural production. In 2005, the population had grown to 3.5 million, with only 224,000 acres in agricultural land, a net loss of 230,000 productive acres.[4] Of course, the water supply that supported that farmland has typically been reallocated to the municipalities comprising the metro-plex and is no longer available to agriculture.

In the case described above, an abundance of land exists in southern Arizona that could be brought into production to replace land lost to population growth, but water is not available to make that possible. Certain areas that have been historically productive by pumping ground water for irrigation are being abandoned, as aquifers are drawn down and the cost of pumping becomes prohibitive.

Another phenomenon occurring in recent years is the subdividing of agricultural land in rural areas into smaller parcels of 5 or 10 acres, for hobby farms commonly used for horse pasture or as a buffer against neighbors. In many cases this has been a strategy farmers have been forced to adopt to raise money, to offset the rising cost of operating.

In the last decade, during the speculative housing bubble, tens of thousands of acres of peripheral existing and potential farmland were purchased at prices up to 100 times the agricultural value, taken out of production, and platted as residential and commercial subdivisions that were never completed. It would seem that much of that land could be returned to agriculture; however, adequate water supplies either did not exist or have been reallocated.

By comparison, the total population of the United States grew from 275 million in 1997 to 305 million in 2007, a net gain of 30 million people. During the same period, total agricultural land declined by 33 million acres or 51,500 square miles.[5] At first impression, this appears to be a net loss of 1.1 acres/person, but there should have been a net *gain* of 1.5 acres/person, if we used the averages proposed above. So the total loss to

3. "History of SRP," http://www.srpnet.com/about/history/timeline.aspx

4. Arizona State University Global Institute of Sustainability, http://ecologyexplorers.asu.edu/get-started/land-changes/

5. USDA, Economic Research Service, http://www.ers.usda.gov/statefacts/us.htm#FC

the economy is 2.6 acres times 30 million people or 78 million acres.

Solutions

Lyndon LaRouche has clearly outlined his conception of physical economy and economic platforms within the context of the need to identify and develop ever-increasing higher orders of energy-dense power sources, to recover resources that are more difficult to develop and utilize.

Our most basic and essential economic platform is the framework within which we produce food. We have not only exhausted the supply of our fertile and relatively easily cultivated farmland, but have been systematically relegating it to lower-priority uses, even though buildings and streets do not require arable ground. Now we are faced with the prospect of developing land with higher input requirements in every form. The most critical of these are water and power. Water and power are the common denominators to all human activity and we have pretty well picked all the low-hanging fruit and drunk all the fresh, easily accessible water.

Had NAWAPA been adopted and implemented as proposed in the mid-'60s, it would have been completed and in full service by the mid-'90s and most probably would have more than solved the water and land shortfalls we are confronted with today. NAWAPA will provide enough water and power to the Western states to reverse the deficits of the last 30 years.

A summary statement from a 1967 Parsons presentation outlines potential benefits to the Southwest states:

- NAWAPA would deliver more than 40,000,000 ac. ft. of freshwater annually to California, Arizona, Nevada, New Mexico, Colorado, Utah, and Texas for agriculture, industry, and municipal development.
- NAWAPA would provide 75,000 kilowatts of electrical power for expansion and development.
- NAWAPA would create nine lakes which could be used for recreation and fishing.
- NAWAPA would provide for placing into production some 15,000,000 acres of irrigable land.
- NAWAPA would regulate and stabilize river flows throughout the Southwest.
- NAWAPA would create a chain of lakes and canals that would be conducive to far-reaching and far-sighted conservation programs.

These and similar figures of potential benefit to these states are also discussed on an earlier blog post, "Engineering Our Southwest Biosphere" (http://www.larouchepac.com/node/17652).

A serendipitous benefit of the system as a whole, to the biosphere in general, will be the improvement of rainfall patterns generated by widespread distribution of water to areas that were previously arid. This has been fully discussed in a recent *EIR* article by the LPAC Basement Team, titled "NAWAPA, from the Standpoint of Biospheric Development."[6] NAWAPA has the potential to catalyze, in the form of natural precipitation, an additional 2.7 times the amount of water distributed by the system. The benefits of this are practically incalculable.

With the implementation of NAWAPA as a prototype, integrated with Extended NAWAPA (similar projects proposed around the planet), mankind will intentionally and systematically shift from being affected by processes in his environment, to creatively directing those processes to our advantage, thereby increasing our chances for surviving and thriving in the universe.

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6. http://www.larouchepub.com/eiw/public/2010/2010_30-39/2010-31/pdf/04-12_3731.pdf