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A PROPOSAL TO MAKE GRAIN STORAGE FINANCIALLY FEASIBLE

By

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A report submitted in partial fulfillment

of the requirements for the degree

of

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in

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INTRODUCTION

The United States has a National Oil Reserve but not a food reserve. Just as the oil reserve is designed to buffer unforeseen disruptions in the critical supply, the nation should also have a food reserve for the same purpose.

The United States and other developed nations have little or no food reserve beyond the typical demands between growing seasons. Marvelous production achievements in agriculture beginning in the early 1960s and known as the “Green Revolution” are now leveling off. Food production, suffering from such negative side effects as reduced water tables, is being outstripped by population growth (Bourne, 2009).

In 2006/8 the U.S. and world drawdown of wheat and other grain stocks, together with agricultural events such as droughts in various parts of the world, caused grain reserves (or grain stocks) to hit historically low levels. The resulting lack of supply created significant disruptions, including record high prices (Figure 1) (Good and Li, 2010, USDA - Foreign Agricultural Service, 2011), countries refusing to export, riots, and famine (CNN.com, 2008). The need for higher world grain stocks seems clear. Higher grain stocks should result in lower price volatility and higher food security in the U.S. and internationally.

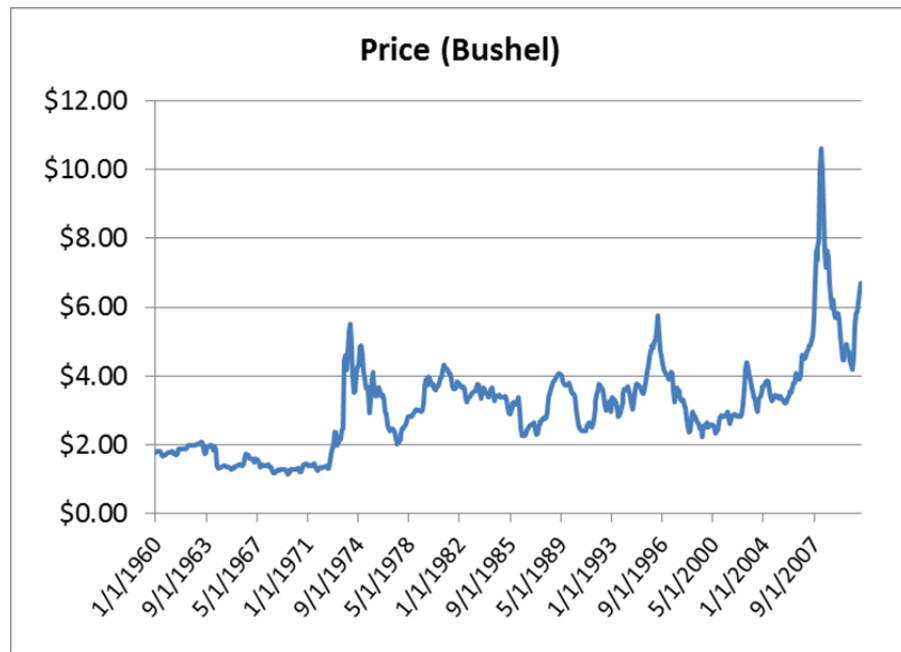


Figure 1. The price history of wheat from 1/1/1960 through 1/1/2011. (FARMDOC, 2011)

BACKGROUND OF THE PROBLEM

Food storage for security

It only seems natural that we would feel more secure when we have personal reserves, whether it is money, a full tank of gas, or a pantry full of food. It also makes sense to have those or similar reserves as a nation.

In 2010 I visited the Grain Elevator & Processing Society (GEAPS) Conference in Kansas City to learn as much as possible about current grain storage techniques. As I visited a display sponsored by a long-term storage silo manufacturer, I told the representative that my interest was in “long-term” grain storage. He indicated that his product was manufactured for that purpose. I then asked him what the maximum amount of time was that grain could be suitably stored in one of his newly constructed facilities. He responded that it could easily be “as long as six months or even longer.” I realized that I was not asking the right question so I then said, “How about 10 years? Would it work for that time frame?” A bit startled he looked at me somewhat askance and said, “Ten years? Why would *anyone* want to store grain for that long?”

Storage is not profitable

It is difficult to promote grain storage in the U.S. and elsewhere because storing food is not profitable. As Keynes said,

The competitive system abhors the existence of stocks, with as strong a reflex as nature abhors a vacuum, because stocks yield a *negative* return in terms of themselves. It is ready without remorse to tear the structure of output to pieces rather than admit them, and in the effort to rid itself of them. (Keynes, 1938; italics in original)

Over time any economic profit created by agricultural innovation is quickly removed as other producers acquire the new innovative processes. Food is a commodity, and producers are generally considered “price takers,” not “price makers.” That means the profit margin for commodity production is very small, and storage simply adds to costs. In the highly competitive agricultural environment, added costs put producers at a disadvantage. It is easy to see why commercial business minimizes stocks but what about individuals? If keeping reserves gives one a feeling of greater security why do so few individuals store food?

Disconnecting from previous generations

It is beyond the scope of this paper to analyze why the general public seems to store very little food supplies. However, historical events leading up to the recent tsunami disaster in Japan, which occurred on March 11, 2011, seem to offer some insight into human behavior that might be applicable to this question.

Hundreds of stone tablets are found on the northern coast of Japan warning of tsunamis. But over time, in spite of these centuries’ old warnings, many people built their homes and villages in harm’s way. The March 11, 2011, tsunami stopped 100 meters below the marker shown in Figure 2, sparing the small village of Aneyoshi (Fackler, 2011). Yet Aneyoshi represents one of only a few villages that escaped the tsunami’s destruction in spite of the centuries’ old warnings written on 100s of ancient stone warning markers that dot Japan’s northern coast.



Translated, the inscription on this stone tablet reads:

"High dwellings are the peace and harmony of our descendants . . . Remember the calamity of the great tsunamis. Do not build any homes below this point."

Figure 2. Ancient Japanese Tsunami Warning

In this March 31, 2011 photo, A centuries-old tablet that warns of danger of tsunamis stands in the hamlet of Aneyoshi, Iwate Prefecture, northern Japan. Hundreds of such markers dot the coastline, some more than 600 years old. Collectively they form a crude warning system for Japan, whose long coasts along major fault lines have made it a repeated target of earthquakes and tsunamis over the centuries. (AP Photo/Vincent Yu)

Writing for the *Newsvile.com*, Jay Alabaster(2011) quotes Fumihiko Imamura, a professor in disaster planning at Tohoku University in Sendai, a tsunami-hit city. "It takes about three generations for people to forget. Those that experience the disaster themselves pass it to their children and their grandchildren, but then the memory fades."

But in some villages longstanding warnings were heeded. The tightly knit community of In Aneyoshi, Japan, the community intentionally built their houses above the stone marker.

"Everybody here knows about the markers. We studied them in school," said Yuto Kimura, 12, who guided a recent visitor to one near his home. "When the tsunami came, my mom got me from school and then the whole village climbed to higher ground." (Alabaster, 2011)

Without a serious food shortage in the United States most individuals have zero experience with the results of real hunger. For the most part, it is likely that Americans at

least are way past the three generation threshold suggested by Dr. Imaura above. Lack of storage on the part of individuals may be as simple as those individuals not having experienced any real food shortage for generations. Developed countries, and notably the United States, would seem to fit into this description.

Food is perishable

In addition, food is perishable. Storing food has its limitations in time. As an asset with a limited life, food requires special handling and care to avoid and minimize deterioration. Wait too long and run the risk of the asset losing value or losing the asset altogether. Managing for the perishable nature of food only adds to storage costs.

Some foods, however, can be stored for lengths of time suitable for long-term storage. For example, recent research at Brigham Young University has concluded that if stored properly many grains, including wheat, can last 30 years or longer (Weaver, 2008).

The “Green Revolution” is nearing its end.

The so called “Green Revolution,” which has increased food production to extraordinary high levels since the early 1960s, has met the needs of the steadily expanding modern world population. Norman Borlaug, a primary contributor to this Green Revolution is credited by former President Jimmy Carter with reducing world hunger and saving hundreds of millions of lives through his innovations in grain production (Carter, 2009).

Calculations by the Earth Policy Institute show that up until 1996 the world was making progress on reducing world hunger (Earth Policy Institute, 2007). However, since 1996 the amount of chronically hungry and malnourished people has been steadily rising

(Brown, 2011). The Green Revolution, appears to be close to maxing out its production increasing capacity and coming to an end (Bourne, 2009). In the future a new round of innovation will be required to keep up with relentlessly increasing world population, and until then pressure on existing stocks and ongoing production is mounting.

Today, thoughts of famine or even the most elementary food shortages are virtually unknown in developed countries. In the United States, for example, the focus is not on the basic acquisition of food but issues of taste, quality, production methods, nutritional value, and other food properties. Yet, in the 2006/8 timeframe, the world had not seen grain stocks so low for at least 30 years (USDA - Foreign Agricultural Service, 2011).

Commodity Currency

Major world currencies have no backing other than public confidence and the commitment by underlying governments to limit money creation. Currencies with no backing, known as “fiat” currencies, are intrinsically worth only the paper they are printed on. Many governments have responded to the deflationary financial crisis of 2008 by increasing the money supply, and in some cases to levels not seen before (US Treasury, 2010). This, coupled with fractional reserve central banking and high national and international debt levels, has created currency inflation risks.

For years many countries relied on gold and silver as currency itself or as reserve backing for currency for exchange and international settlements. Commodity-backed currencies, based on precious metals, have been common in the past and appear to be on their way to becoming popular again in the United States. The State of Utah, for example, is passing legislation to introduce U.S. minted precious metals coins as legal tender (Currency

Amendments, 2011). As many as twelve other states either have or are initiating similar legislation (Clark, 2011)

STATEMENT OF THE PROBLEM

The problem is that the United States and the world need stored food supplies but it is not profitable to store such supplies. In addition, world fiat currencies have no intrinsic value and tend to be unstable. We propose a means of creating an economic reason to store food by creating a free market grain-backed currency that could be traded domestically and internationally. Our proposal (for now we call it the Garrett Proposal) would encourage grain stockpiling by removing many of the costs associated with storage and giving producers a financial incentive to produce food for storage.

The Garrett Proposal

The Garrett Proposal consists of issuing a new additional currency (not a replacement currency) or warehouse receipts which would effectively act as a currency, which would be 100% backed by grain in storage. The proposal is summarized as follows:

(a) Congress authorizes a competitive commodity backed currency or Commodity Reserve Currency (CRC), as well as an independent non-profit authority (akin to the Federal Reserve Bank), which is authorized specifically to manage all aspects of the CRC. For now we will call it the Commodity Reserve Currency Manager (CRCM). The CRCM's controlling task will be that it alone is authorized to issue CRC, buy and sell commodities for CRC storage, and approve construction of special storage facilities for the long-term storage program. (b) A tax incentive (tax shelter) is approved by Congress to build long-term storage facilities in the

U.S. through the CRCM. This tax incentive then uses private money to construct storage facilities. (c) Grain producers are issued new electronic currency (CRC), backed directly by stored grain. The currency is issued with a credit card-like technology and the CRCM is the clearing center for all transactions. (d) The CRCM is funded by charging transaction fees similar to major credit cards. These fees also provide income to storage facility owners and pay for other storage costs. The CRCM can also receive additional income from open market transactions of commodities with predefined limitations. (e) Any nation wishing to participate then creates its own CRCM-like entity which collaborates internationally. The new currency could be phased in as legal tender. (f) The CRC would allow for additional commodities such as precious metals and other commodities over time. (g) The Garrett Proposal would allow for a “call” feature given to state or national authorities during food shortage emergencies. (h) The “call” feature allows and authorizes governmental authority to conduct regular audits to: (1) insure supplies of grain are at pre-determined levels, and (2) insure circulating currency matches with the 100% reserve requirement since governmental authorities would need to purchase to distribute in times of emergency.

Objectives

We will attempt to demonstrate the need for national and international food storage and show the possibility of a grain-backed currency which would largely create a financial incentive to overproduce in the short run to build up the stocks. We will argue that it can be financially feasible to hold substantial stores of grain in storage by using the stored grain as a backing for an exchangeable currency. To this end, we will review literature related to the following topics:

1. The need for storage of grains both domestically and internationally. This will include the impact on agriculture in the following areas:
 - a. The Malthusian Debate,
 - b. The waning of the “Green Revolution,”
 - c. Disasters and catastrophes, and
 - d. The increase in natural disasters due to climate change.
2. Commodity reserve currency proposals
 - a. Commodity currencies proposed by Benjamin Graham and others, and
 - b. Other views of the Graham plan.

Topics we will not cover in this paper will include impacts on policy, electronic means of exchange, the operation and mechanics of the CRCM, and more. We conclude in this paper that further study is needed and reserve these topics and others for that study.

ANALYSIS

The Malthusian Debate

Two hundred years ago, Thomas Robert Malthus, in *An Essay on the Principle of Population* (Malthus and Flew, 1970, 240-244), declared that the human population would always grow at an exponential rate, while food production would only grow at an arithmetic rate. He argued that the consequential famine would always check human population growth.

World population increases are running consistently higher than 1% per year until at least 2020 (Census, 2010). UN projections say there will be 8 billion humans by 2025 and that demand for grain for human food will increase by 47% in the developing world by the year 2020. At the same time, current livestock producing cost estimates forecast the potential demand for grain for livestock to jump 101% during the same period (Manning, 2000).

The rate of food production is not fixed, however. Ronald Bailey (2000) argues that humanity can and does escape the Malthusian trap through human innovation and mental progress. Basically, we are outrunning Malthus' predictions because we are intelligent beings and have invented ways to produce more food as demand has risen -- at least for now.

One such human innovation is the "Green Revolution," which doubled the world's grain outputs. For example, Green Revolution methods enabled India's farmers to become self-sufficient, in spite of predictions that they would not meet consumption demands

(Bailey, 2000). India even exported surplus grain in the early 1980s as a result of the dramatic increases in production directly related to Green Revolution methods and technology (Bailey, 2000). The phrase “Green Revolution” was coined by William S. Gaud, Administrator of the U.S. Agency for International Development in 1968 and is based on the advanced application of fertilizer, pesticides, irrigation, and better developed seeds to increase yields (Bourne, 2009). The Green Revolution was largely the work of American plant breeder Norman Borlaug, who won the Nobel Peace Prize in 1970 for his efforts. By then, his Green Revolution techniques had travelled beyond India to benefit food production worldwide (Hesser, 2009).

The Waning of the Green Revolution

The advances of the Green Revolution, especially plant breeding, created a massive increase in food production. However, some regard these practices as not sustainable, and harvest rates are leveling off (Manning, 2000, Bourne, 2009). In Punjab, one area most positively affected by the Green Revolution, yield growth has essentially flattened since the mid-1990s, partially because their 1.3 million wells have depleted the underground water supply.

An important part of the Green Revolution has been the use of irrigation to maximize outputs. Irrigation draws from surface water or pumping from underground water supplies. Water, especially pumped water from non-recharging or slowly recharging aquifers, is running dry around the world. An example is the Saudi Arabian wheat production. After 20 years of self-sufficiency, Saudi Arabia announced in 2008 an end to wheat production. The reason is the depletion of their underground water source. By 2012

Saudi Arabia will be importing 100% of their wheat supply for 30 million people (Brown, 2011, 21). Saudi Arabia is not the least bit alone in their water problems. Since 40% of the world's grain crops come from irrigated lands, meeting demand becomes even more difficult as water tables decline.

In an article entitled, "The End of Plenty," Joel Bourne, Jr. (2009) addresses the projected end of the Green Revolution and its potential impact on the world as populations increase and current production technologies hit maximized levels. He sees the dramatic price increase in wheat, corn, and rice between 2005 and 2008 as a sign that food consumption has been exceeding food production, thus depleting stockpiles. As a result, in 2007 stockpiles fell to only 61 days of global consumption, the second lowest recorded level. From a market technical standpoint, the price advance shown in Figure 1 represents a "breakout" to the upside in pricing that is significant. After at least 40 years or more of low grain pricing, that breakout signals a long-term trend change that is likely to be with us for many years to come (Bourne, 2009).

As the Green Revolution reaches its maximum output, the world will run up against the top of its current technology production envelope. To continue to forestall the Malthusian prediction, new technologies are needed. However, any new technology faces the heightened challenge of increasing agricultural production in spite of such Green Revolution legacies, as a reduced water table and salinized, waterlogged soils. Shortness of time is a concern. To quote Bourne (2009): "We . . . need another green revolution, and we need it in half the time."

The need for fall-back solutions such as storage becomes more and more important. Just as any financial budget must have a reserve for unforeseen emergencies, the world will need the same for food emergencies. To have a food reserve in place as agricultural resources fail, would do much to promote food security until new technologies or another Green Revolution is in place. Policy makers who have a vision of this are likely to receive support as world food conditions deteriorate.

Disasters and Catastrophes

Natural disasters act to reduce both the supply of food and the capacity for its adequate distribution. Floods and storms, drought, volcanoes, and earthquakes with their resulting tsunamis numbering hundreds per year disrupt the supply of agricultural products and thus provide a strong argument for food storage. Today one severe drought is enough to disrupt international trade in food (Smith, 2004). Multiple droughts in widespread areas can be expected to create even greater disruption, further augmented by increased globalization of markets.

Floods and storms have been the most frequent natural disasters in the first part of the twenty-first century, comprising 70-75% of the total disasters (Smil, 2008). Next most frequent are earthquakes, tsunamis, and extreme temperature events such as droughts, fires, heat waves, and frost (Smil, 2008).

Flooding

Floods account for about one-third of all recorded disaster events (Smith, 2004). A large proportion of damage by flooding is to agriculture, as in India where “almost 75% of

direct flood damage has been crop losses” (Melik, 2011). In Bangladesh, river bank erosion of farmland and villages destroys crops and leaves up to one million people homeless and landless every year (Smith, 2004). The year 2010 offers one of the most dramatic examples of the impact of flooding as a massive flood the size of both France and Germany combined has inundated Australia (Melik, 2011). As of this writing, the full agricultural impact of this flood is still unmeasured. One can just imagine the loss of production and food at this point.

Storms themselves, in addition to the resulting floods, can damage or wash away crops, and tropical storm surges can salinate fields. Annually, hail causes about U.S. \$1.3 billion in crop losses (Smith, 2004).

Drought

Drought differs from other more sudden environmental hazards in that drought develops slowly and may last for years. In addition, the severity of a drought’s impact may vary, depending on the resources of the affected countries (Smith, 2004). As a multi-based phenomenon, drought can be categorized as meteorological, when precipitation doesn’t meet the long-term average; hydrological, when extended meteorological drought causes lack of surface and groundwater in the area; agricultural, when the stress on soil moisture causes crop yields to drop; or socioeconomic, when severe, continued drought cripples the economy and society (Smith, 2004).

Agricultural drought results in reduced crop yields. In 1988, an agricultural drought in the Midwest United States destroyed more than one-third of the corn crop, a loss of U.S. \$4.7 billion. This caused the world grain storage to fall to a 63-day supply and the resulting

shortage disrupted international trade in food. Drought resulting in famine can ultimately cause mass fatalities from starvation. Additionally, famine can lead to other hazards. Many deaths connected to African droughts are actually caused by disease spread in refugee centers with little water and health care facilities (Smith, 2004).

Grains most important to world nutrition, such as rice and wheat, are some of the most sensitive to dry conditions. Rice, which provides more than half of the daily dietary calories for most of the world, is possibly the most drought susceptible of the important food crops (Boken and Heathcote, 2005). For example, in 1876 a drought is credited with the loss of up to 30 million lives in China, India, and other parts of Asia (The Earth Institute at Columbia University, 2010).

Wheat is the third most produced food crop in the world. Wheat productivity generally decreases as temperatures rise above 30°C or 86°F; therefore, it's mostly grown in temperate areas of the world. Wheat provides food for both humans and livestock (Boken and Heathcote, 2005).

Grain storage for use during drought periods is intuitive. It is not hard to imagine the impact if the 2010 drought in Russia had occurred in the U.S. On a level never before recorded in Russia, 40% of the Russian wheat crop was lost due to this rouge drought. Had the same drought hit the U.S. (one of the largest wheat exporters in the world), the impact would be serious and far-reaching. If the same 40% loss impact occurred, the lost wheat supply for the U.S. would be 160 million tons – a loss greater than the entire 100 million ton Russian wheat crop, even in a fully producing year. Moreover, world stocks of grain would

have fallen to levels significantly below the low of 2007-2008, with the resulting of a grain price spike likely much higher than shown in figure 1 (Brown, 2011, 12-13).

Rhythmic fluctuations of atmospheric and ocean masses, like the El Niño Southern Oscillation (ENSO) in the Pacific basin area and the North Atlantic Oscillation (NAO) in the northern hemisphere, are chronic hazards. They can have great impacts on agriculture worldwide, such as the heavy rainfall and flooding ENSO causes in some areas and the drought and crop failure in others (Smith, 2004). The influence of ENSO can cause severe, long-lasting droughts (Boken and Heathcote, 2005).

Socioeconomic Factors

There is a need for more attention to drought planning in anticipation of agricultural trends like those in sub-Saharan Africa (Motha, 2005, Wilhite, 2005). Wilhite (2005) recounts the significant progress of drought planning in the past and makes a case that there is much more to do. Drought affects all sectors of the economy. If drought planning is done in advance and measures are taken to prepare for drought, including emergency storage, then natural resources and policy resources can be implemented to mitigate much of the economic and other damage caused by drought.

Earthquakes

Earthquakes account for 10% to 15% of disastrous events (Smith, 2004). There are also several secondary earthquake hazards, including landslides, avalanches, tsunamis, and soil liquefaction (when water saturated soil loses its strength, due to strong shaking, and behaves like a fluid). The economic cost of an earthquake can be very high. After the 1993

earthquake in Maharashtra, India, over 50% of agricultural assets, like animals and equipment, were destroyed, making it difficult for survivors to recover (Smith, 2004).

The United Nations Food and Agricultural Organization (FAO) reports of the Indian Ocean earthquake and tsunami of 26 December 2004, estimate that 30% of Indonesian farmland in the north east coast was affected and 70% in the west coast, with about 20% permanently damaged (Srinivas and Nakagawa, 2008). The tsunami impacted the countries of Thailand, Sri Lanka, and Maldives in similar ways. Generally, it was found that seawater intrusion of up to 3 km had contaminated inland waters and affected the medium -- to long-term fertility of the soil (Srinivas and Nakagawa, 2008). The 2011 Japanese tsunami farmland damage is yet to be determined; but graphic video of the event, showing seawater moving miles inland, has shown the destructive power of these events on coastal agriculture assets.

Volcanoes

Throughout history, volcanic eruptions have had powerful and devastating effects on human life. Since 1600 A.D., about 260,000 people have died as a result of volcanic eruptions, including those who died in the resulting famines (Schmincke, 2003). Volcanic eruptions continue to affect humans today; about 60 of the approximately 550 active volcanoes on Earth erupt every year.

Many factors determine the level of damage caused by a volcanic eruption, including volcanic mass flows, tsunamis caused when debris falls into the sea, eruption columns and ash clouds, volcanic gases, and ash fallout. Volcanic ash, in particular, can cause substantial damage to agriculture (Schmincke, 2003). Smil (2008) also identifies two scenarios of

volcanic eruption that would create major socioeconomic consequences: (1) if an eruption released an enormous volume of acidic gases that lowered the area temperature, reduced photosynthesis, and damaged health (as happened in Iceland in 1783-4); and (2) if the volcano triggered a landslide that would cause mega-tsunamis.

Volcanic eruptions can have global climatic effects. SO_2 (sulfur dioxide), which is expelled into the stratosphere, causes temperature change. Volcanoes are responsible for a significant amount of the sulfur in the atmosphere. However, there are still many questions about how volcanoes influence long- and short-term climate change (Schmincke, 2003).

An extremely important factor to consider is the human population density and proximity to the volcano. This is of far more significance than the eruption magnitude (volume of substance erupted). For example, the eruption with the largest volume of magma in the last century didn't cause any human deaths, because it happened in a distant area of Alaska. Yet there are major cities located near active volcanoes. At-risk cities for volcanic disasters include Tokyo, Japan; Quito, Ecuador; Mexico City, Mexico; Naples, Italy; and the Seattle Tacoma area, U.S.A (Schmincke, 2003).

Though volcanoes cause fewer disasters than earthquakes or severe storms, volcanic explosions can still create many hazards, including threats to agriculture caused by volcanic ash (Schmincke, 2003) (Smith, 2004). Even light ash falls can hold toxic chemicals that contaminate farmland and water. Heavy falls can cover crops. After Mount Pinatubo erupted in 1991, ash covered agricultural land up to 30 km away and affected 500,000 farmers. Volcanic ash can also affect weather globally (Smith, 2004). Volcanic activity causes about 5% of all tsunamis (Smith, 2004).

In his book, *Catastrophe – A Quest for the Origins of the Modern World*, David Keys (1999) discusses the impact of the most spectacular of catastrophes ever known, the 535 A.D. climate event. The actual cause of the event is controversial, some suggesting a comet or asteroid impact while others think a massive volcano. Keys points to the eruption of a volcano proto-Krakatoa which occurred at the same place as Krakatoa, which occurred in 1883, but on a much more massive level with a climate impact lasting over a decade (Keys, 1999). A ten-year diminishing of the sun's light levels as recorded in tree ring studies around the world, confirm the event. It is not difficult to imagine the depth of impact on world agriculture should the 535 AD event occur in our day. Keys suggests that an event of that magnitude would likely create massive starvation and take the lives of many millions of earth's inhabitants, likely hundreds of millions (Keys, 1999).

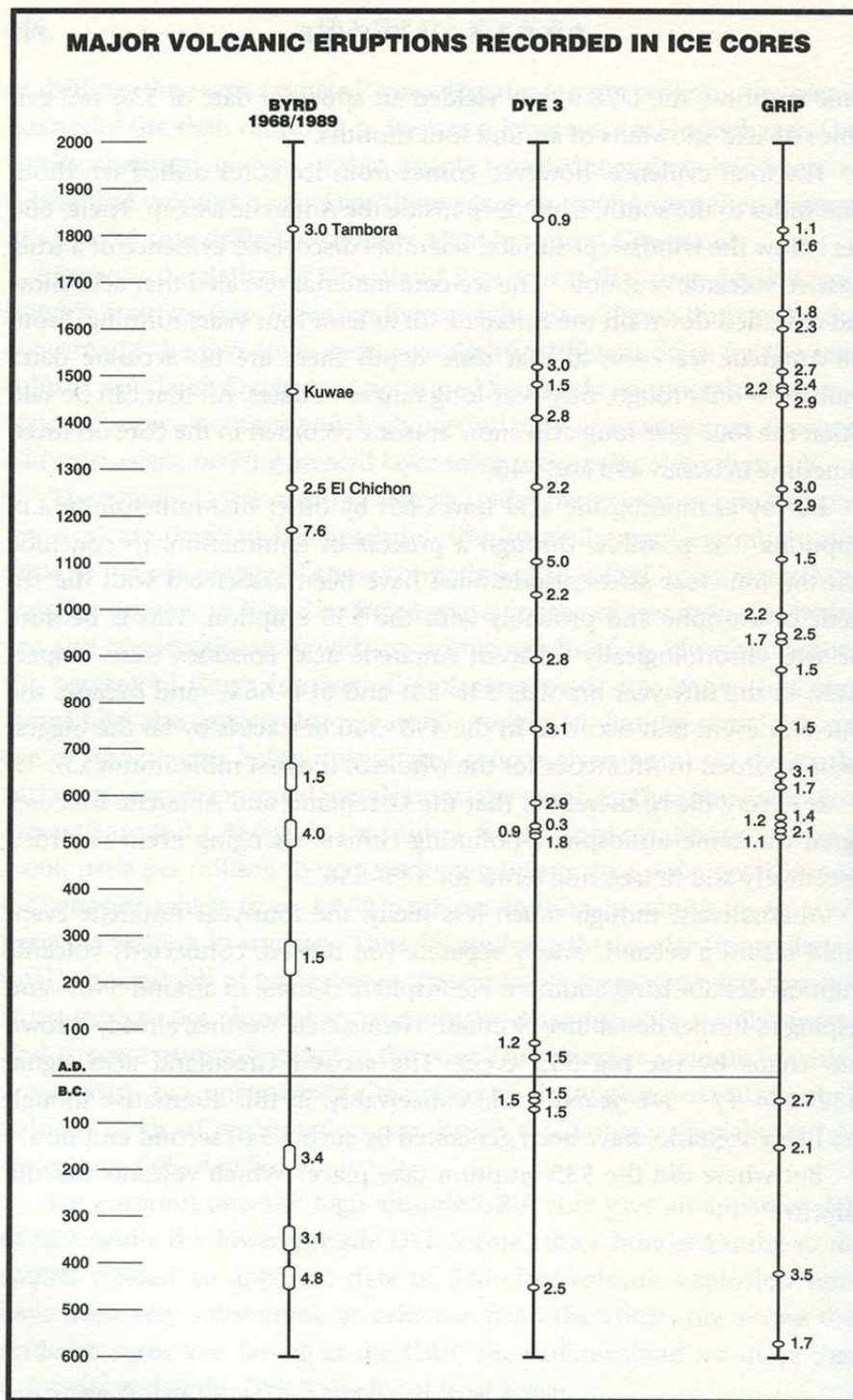


Figure 3. Years of volcanic-originating acid precipitation. Source of data: C. U. Hammer et. al., *Climate Change*, Volume 35, 1997; and H. Clawson et.al., *Journal of Geophysical Research*, volume 102/C12 1997. (Keys, 1999, p. 248)

One of the most important charts (Figure 2.) in the Keys book that relates to our study is found on page 248 and includes the results from three separate ice core studies: two conducted in Greenland (GRIP and DYE 3) and one in Antarctica (Byrd 1968/1989). “Buried . . . below the surface of the Greenland and Antarctic ice caps is a telltale layer of ice contaminated by sulfuric acid of volcanic origin . . .” (Keys, 1999, 245). These studies measured the “volcanic-originating acid precipitation,” which accompanies large volcanoes that likely had large impacts on climate and subsequently agriculture. Although confirmation of the actual agricultural impact is uncertain, it is reasonable to conclude that major agriculture impacts likely occurred. For example, the year 1816 is referred to as “the year without a summer” which was one year after the volcano Tambora erupted. Tambora is one of the last shown events in the Byrd ice core sample (Trigo et al., 2009). (See Figure 2.)

The following poem illustrates some of the impacts of Tambora.

It didn't matter whether your farm was large or small.
 It didn't matter if you had a farm at all.
 Cause everyone was affected when water didn't run.
 The snow and frost continued without the warming sun.
 One day in June it got real hot and leaves began to show.
 But after that it snowed again and wind and cold did blow.
 The cows and horses had no grass, no grain to feed the chicks.
 No hay to put aside that time, just dry and shriveled sticks.
 The sheep were cold and hungry and many starved to death,
 Still waiting for the warming sun to save their labored breath.
 The kids were disappointed, no swimming, such a shame.
 It was in 1816 that summer never came.
 -- Eileen Marguet (Marguet, unknown)

The 1453 South Pacific eruption, known as the Kuwae, is projected to have dimmed the sun's light for as long as three years, as well as stunted tree growth around the world

from Europe to China. During subsequent years, corn tithes (a form of taxation) in Sweden went to zero as the eruption likely affected a global climate change with severe impact on agriculture (Pang, 1993).

Table 1 below is our summary of the occurrences of significant volcanic activity and their average frequency from the ice core studies shown in Figure 2. These do not represent all volcanic activity, only that activity large enough to be picked up in the ice core samples and recorded in the illustration.

<u>Ice Core Study Name</u>	<u>Byrd</u>	<u>Dye3</u>	<u>GRIP</u>
Total events in 2600 years	10	19	26
Average years between events	260	137	100
Average of years between events	166		

Table 1. Significant volcanic activity and calculated frequency of acid precipitation.

This calculation shows that a major event as shown in ice core studies, happen as frequently as every 100 to 260 years on average. The last major event, showing in the Dye3 Study, occurred approximately 190 years ago (Keys, 1999, 248) (see Figure 2). This data, even as rudimentary as we show here, supports the need for food storage. Our conclusion is that significant volcanic events occur on average of about 166 years (see Table 1), and a significant acid producing event hasn't occurred for 190 years.

Disaster rate increase due to climate change

According to the U.S. Climate Change Science Program, "...in about 30 years, CO₂ concentrations are expected to have increased about 60 ppm (from today's 380 ppm to

about 440 ppm), and temperatures over the contiguous United States are expected to have increased by an average of about 1.2 degrees Centigrade.” (Backlund et al., 2008). These figures are alarming for their implications of a rising sea level, but with respect to agriculture, the dire predictions of rising temperature and increasing atmospheric CO₂ will, to some extent, offset each other, and little change in agricultural production is expected for the next 30 years (Backlund et al., 2008). This is a global prediction and does not ignore the fluctuations that will no doubt continue to occur locally.

The U.S. Climate Change Science Program (2008) goes on to say: “However, the outlook for the next 100 years would not be as optimistic if rise in temperature and CO₂ continue, because the C₃ [plant growth] response to rising CO₂ is reaching a saturating plateau, while the negative temperature effects will become progressively more severe” (Backlund et al., 2008, 70). Long term climate outlook suggests a need for storage to counteract decreased agricultural yield and thus reduced food availability. Although food storage does not solve the climate change problem it would provide a short-term temporary supply while other climate change solutions are investigated.

Grain Storage requires an excess above ongoing demand. Such an excess may already be on hand, however; and demand for storage, if financially feasible, would use that capacity. There is evidence (Figures 3 and 4) that excess wheat for storage exists today and that the U.S. has the production capacity to increase output by about 10%.

USDA. projections for world and U.S. year-end stocks show a wheat surplus for both the U.S. and the world and that, in the case of world stocks, it may increase by more than 20% over the next ten years (ERS/USDA, 2010). It therefore appears that wheat storage

would be feasible today and in the near future. Moreover, there are approximately 30 - 40 million acres that are idle, or 9 - 10%, below what is currently planted (Orden and Blandford, 2009, Vesterby, 2001) indicating a production reserve that could be tapped.

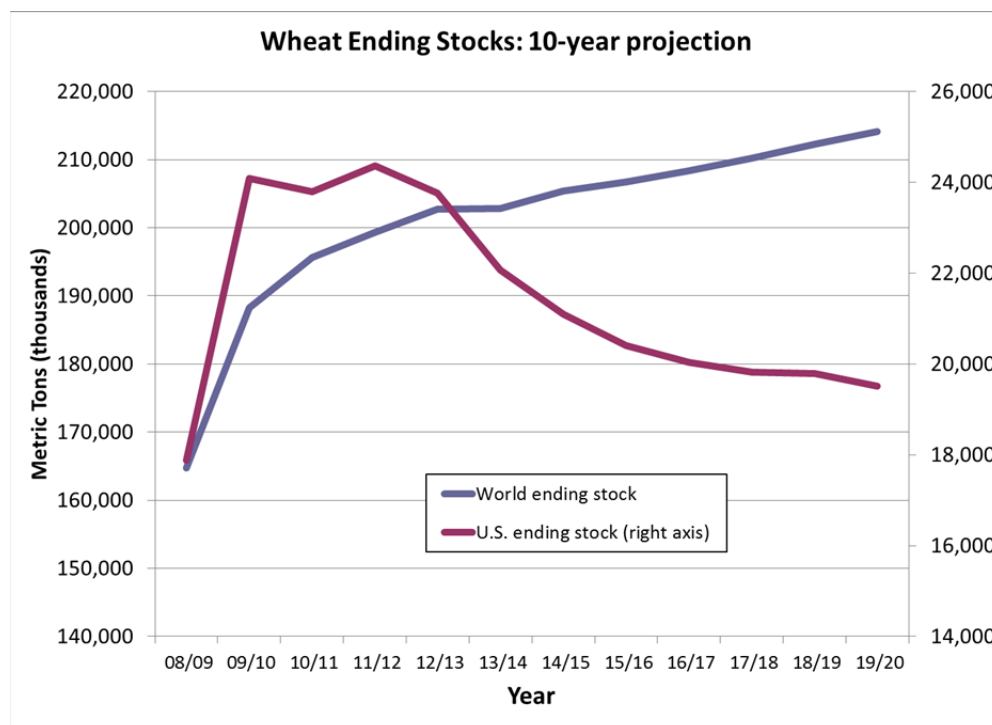


Figure 4. USDA projected global and U.S. wheat surplus for the years 2010 to 2019. Data are from International Agricultural Projections Datum: Supply and Use Tables, 2010-2019, OCE-2010-1, 2010

A way in which the current climate change projections do support food storage is in predicting increasing numbers of “extreme events” (Backlund et al., 2008), with “extreme events” being the types of natural disasters known to negatively affect food security and international food markets, some of which have been mentioned above.

Public Policy

Limiting agricultural production

The U.S. is currently producing grain at less than full capacity. In the past, the role of federal policy was large, beginning with federal restrictions first imposed during the Great Depression. In 1933, at the height of the Depression, Congress passed the Agricultural Adjustment Act (AAA) as part of President Franklin D. Roosevelt's New Deal (Gregory, 1935). Designed to raise commodity prices by removing cropland from cultivation, the act produced the desired effect by the next year, 1934. The removal of approximately 45 million acres raised prices and increased farm cash income by \$1,700,000,000 over 1932 levels (Gregory, 1935). Commodity price support through cropland idling continued in the U.S. until 1996, when the Federal Agriculture Improvement and Reform (FAIR) act (1996) replaced the practice with other subsidy types. Today such governmental manipulation of agriculture has fallen significantly out of favor, is considered "distortion" of market forces (Anderson, 2009), and is now kept within bounds by World Trade Organization (WTO) (1995) regulations.

Since a substantial grain storage program assumes the existence of adequate grain supply in excess of immediate need, today about one tenth of U.S. cropland – approximately 30 million acres – is idled by the federal Conservation Reserve Program (CRP) (Orden and Blandford, 2009, Vesterby, 2001). The USDA reports that in 2002, of the 442 million acres of cropland in the lower 48 states, 40 million, or 9.0% of existing cropland is idle (see Table 2) (Lubowski et al., May 2006, 4). Moreover, the U.S. has had idle cropland in each land use survey since at least 1945, ranging from 4.5% to 14.7% (see Figure 4 and Table 2).

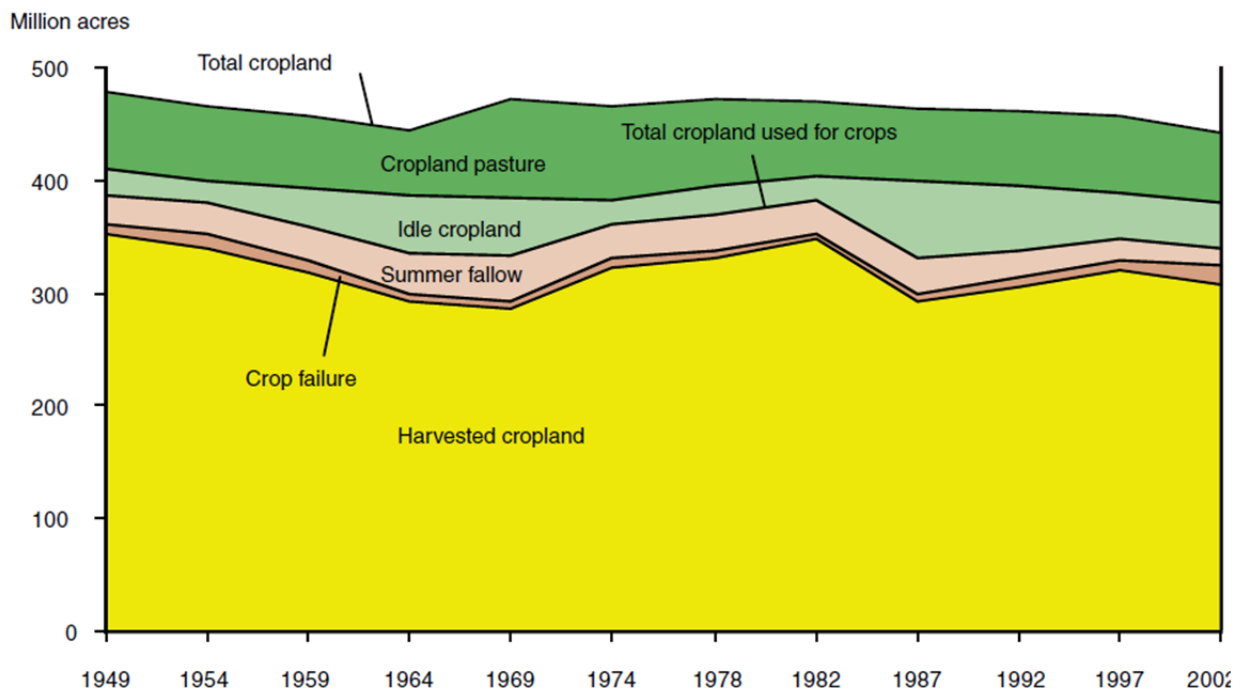


Figure 5. Major Uses of U.S. Cropland.

Sources: Estimates prior to 2002 are from Daugherty, 1991, 1995; Frey, 1973, 1979, 1982; Frey and Hexem; Frey et al., 1968; Wooten et al., 1962; Vesterby and Krupa; Wooten and Anderson, 1957; and Wooten, 1953a. (Lubowski et al., May 2006, 3)

Land Use	1945	1949	1959	1964	1969	1974	1978	1982	1987	1992	1997	2002
Cropland	451	478	458	444	472	465	471	469	464	460	455	442
Cropland used for crops	363	383	359	335	333	361	369	383	331	338	349	340
Idle cropland	40	26	34	52	51	21	26	21	68	56	39	40
Cropland pasture	47	69	66	57	88	83	76	65	65	67	68	62
Percent Idle:	8.9	5.4	7.4	11.7	10.8	4.5	5.5	4.5	14.7	12.2	8.6	9.0

Table 2. U.S. Idle Cropland

(Lubowski et al., May 2006, 5)

Commodity Reserve Currency

The Ever-normal Granary

Benjamin Graham's (1937, 1944) books are foundational to understanding the concept of linking commodities to currencies. His first book, *Storage and Stability – A Modern Ever-normal Granary*, proposed in 1937 the concept of linking 20 basic commodities to currency (Graham, 1937a). The preface of the work, written by Graham in October 1937, lays out the volume. In it Graham outlines the purposes of his proposal, which are primarily "to cope with glut and storage [and] is vested with the allied function of reasonably stabilizing prices." Graham considered his proposal, to tie a basket of commodities to back currency, as driven at least partially, by the economics of the day. Below is a paragraph from his preface which could be extracted from our own financial crisis of 2008. Graham's view of the problems of 1937 could easily be superimposed on 2011.

The idea of storage as a solution of economic problems at least has the support of common sense. It is diametrically opposed to the topsy-turvy Alice-in-Wonderland reasoning that has marked so much of our depression thinking and policy. It rejects the argument that prosperity may be promoted by scarcity; that purchasing power may be showered in a gentle rain of greenbacks from heaven; that collapse due to excessive debt may be remedied by incurring new and larger debts; that our foreign trade may be strengthened by deliberately weakening our currency. The Storage concept leads us away from all these absurdities into the region of the tangible, the sound and the well-established. (Graham, 1937b)

Readers of Graham's book will sense the parallels of our first Great Depression with those of our current Great Recession. We think that times, although not duplicative, are

strikingly similar as well as government reactions. As Mark Twain is reputed to have said, “History does not repeat itself, it rhymes” (Volokh, 2005).

Graham believed that the Gold standard was being undermined, that paper currency, “bristles with dangers and difficulties as yet unexplored,” and that currency backed by “stored basic commodities” would possess an “intrinsic soundness” that would be better than gold or paper currencies. (Graham, 1937b)

Graham also believed that there was a fundamental and solid principal in the commodity basket concept. For example, he believed that “stored plenty, as the concrete source of an ever-rising living standard for all the people of this land,” was an additional fundamental part of the plan. He wrote that the concept “is the essential insurance that storage affords against drought and flood and all visitations of nature.” Moreover, commodity storage “has incalculable value as an element of our military defense.” He also pointed to the storage plan as contributing strongly toward solving international trade and international debt problems. (Graham, 1937b)

Alvin Johnson, in the forward to the book written by Graham (1937), describes the commodity reserve. He writes:

The invention is of such startling simplicity that everyone who examines it must feel that he once had the idea himself. Base the money on the commodities themselves, safely stored away in warehouses. You put in commodities and take out money, or put in money and take out commodities just as formerly you exchanged gold for gold certificates or gold certificates for gold. Gold and paper based on it fluctuated in their value as measured by power to purchase staple commodities. Mr. Graham’s standard cannot fluctuate in purchasing power because it consists of the commodities themselves (Johnson, 1937).

Johnson points to the idea that since wheat and similar commodities are in the pool, they “bear a positive relation to human life, while the value of a fixed amount of gold might

conceivably dwindle to nothing” (Johnson, 1937). In other words, stored commodities represent what we actually use and consume in living while gold is, for the most part, simply used as a monetary tool. However, his assertion that the standard “cannot fluctuate in purchasing power” seems overly optimistic in hindsight. Commodities do fluctuate in relation to each other while some commodities may cease to be used and others gain importance.

Further, he cites a feature of the plan that is similar to our own proposal, that Graham’s commodity reserve does not require abandonment of the currency in use but a gradual shift and in many respects a free market shift to the commodity currency. Johnson feels that Graham’s proposal will gradually “drive out the bad money” (Johnson, 1937).

The contribution of *Storage and Stability* to our proposal is key. Graham’s long evaluations of the key points, of using commodities to back currency, are directly applicable to our idea. The important difference is that Graham proposed using a basket of commodities, while we propose just a few at first, starting with one such as wheat. Graham’s proposal foresaw price stability as a key reason for his proposal. Depression-era price instability was taking a toll on the U.S. agriculture industry. Although price volatility remains today, our priority is on storage for the sake of preparedness and the ever rising risk of shortage. Price stability may be a pleasant side effect but price stability is not a primary objective in the Garrett Proposal. Our objective is first to prepare for the unforeseen rising risks of population expansion, disaster, and rising risks of production. We look to the new currency portion of our proposal to create a financial incentive to store,

where currently there is none. Graham points to that also, but not as a primary reason to link currency to storage.

World Commodities and World Currencies

Graham's second book on the subject was written in 1944. The preface was written by Graham in September 1944 just months before the end of the WWII. The book opens with an important quote by then Under Secretary of the Treasury, Daniel W. Bell that appears to be one of Graham's justifications for his ongoing commodity reserve proposal.

Bell writes:

To help society achieve more fully the promises of abundance implicit in our capacity to produce; to help maintain output and employment at a level more nearly corresponding to our true productive potential; and to secure this at a price that a peaceful democracy can pay -- that will constitute the greatest task of practical statesmanship in the post-war world (Bell, 1943).

Graham's work then focuses on the issue previously proposed but with the added implications of World War II. Graham, in the first paragraph of the preface, states, "Thus the book is essentially the application to the international sphere of the proposals developed in *Storage and Stability*, published in 1937" (Graham, 1944b). It is then the same proposal but reemphasized and modified to be much more aimed to the international application of the commodity reserve idea.

Graham appears to justify the proposal by now shifting somewhat the priorities of the program. He states in the second paragraph of the Preface that the reserve has importance in major areas of economic policy. "The first, obviously, is the building up of raw-material stockpiles for national safety and well-being." No doubt the influence of WWII clearly showed the importance of emergency stores. He goes on to point out that using

stockpiles for peace was his aim. In addition, his aim now shifts to “the establishment of a sound, adequate, and stable world currency.” Graham goes on to recommend that industrial materials be added to his buffer stocks proposal and that all be incorporated into the international monetary system. He believes that “. . . we could thus achieve the fourfold objective of foreign-exchange stability, reasonable price stability, protective stockpiles, and – most important of all – a balanced expansion of the world’s output and consumption of useful goods” (Graham, 1944b).

In the conclusion of *World Commodities and World Currencies*, Graham summarizes his previous book. “In *Storage and Stability* we summarized the terms of our plan in a single sentence: ‘It proposes to accord a composite group of basic commodities exactly the same monetary status as was formerly given to gold’” (Graham, 1944a, 121). The commodity unit again is the central theme of Graham’s proposal, except the proposal now shifts to an international arena.

International Commodity Stockpiling

“In mid-1945, Stanford University accepted a grant of funds from Benjamin Graham and the Committee for Economic Stability to cover costs to be incurred by the Food Research Institute in ‘an over-all evaluation of the Commodity-Reserve Currency proposal’ as set forth in Graham’s *World Commodities and World Currency*, published in 1944” (Bennett, 1949, Foreword and Acknowledgements). The above quote is from *International Commodity Stockpiling As An Economic Stabilizer*, a book by Merrill K. Bennett (1949), which describes the objective of the work and its origins.

International Commodity Stockpiling As An Economic Stabilizer is a review of Graham's proposals. In Note E of his book, Bennett also summarizes the high points of Graham's program in a concise manner that we quote below. This again reprioritizes the program or may reflect the view of the authors as to what they think is important.

Prior to listing some similar proposals he writes:

No proposal thus far put forward, however, seems to have incorporated all of the features of Graham's CRP. Those features were: (a) it requires international agreement and action; (b) it embodies the buffer-stock concept – steadying prices by non-private purchases for ad sales from commodity stockpiles; (c) it deals with commodity units – predefined basket of commodities – rather than with individual commodities; (d) it contemplates a maximum of automaticity in operation, with relatively little scope for administrative decision; and (e) it incorporates a 'coinage principle,' involving issuance of currency or credit on purchase of stockpile, and retirement of currency or credit on sale of stockpile. To these may be added: (f) its dominant objective, as we interpret it, is reduction of the amplitude of fluctuation of the economic cycles (Bennett, 1949, 178nE).

The Garrett Proposal Compare and Contrast

The six points made above encapsulate the Commodity Reserve Proposal (CRP) and deserve consideration within a compare-and-contrast framework, next to our Garrett Proposal (see Table 2.).

	<u>CRP summary as summarized by Bennett(1949, 178 n E)</u>	<u>Garrett Proposal</u>
a	Requires international agreement and action	Same, but it may begin locally, expand nationally, then internationally.
b	Embodies the buffer-stock concept	Does not require the buffer-stock concept but could, particularly after the full storage compliment is reached.
c	Deals with commodity units – predefined basket of commodities – rather than the individual commodities	Deals with individual commodities, although if the single commodity proves successful it could be expanded.
d	Contemplates a maximum of automaticity in operation, with	Administrative decision would likely be broader during accumulation period. Automaticity would

	relatively little scope for administrative decision. Automaticity in the Graham proposal applies mostly to the mitigation of the business cycle.	be applied mostly to commodity rotation and total stores based on population
e	Incorporates the “coinage principle,” involving issuance of currency or credit on purchase of stockpile and retirement of currency or credit on sale of stockpile.	Envisions an electronic issue of currency or warehouse receipts for production grains put in storage. This currency is not envisioned as a replacement for currency of the underlying countries but a form of competitive currency. It likely will still depend on local currencies to function internationally unless adopted internationally.
f	Dominant objective, as we interpret it, is reduction of the amplitude of fluctuation of the economic cycles	The primary objective is to create a method in which storage can be accomplished with minimal government support, cost, or intervention except for a “call” feature for the release of stored grains in an emergency.

Table 3. CRP vs. Garrett Proposal

Other Views of the Graham Plan

The Case Against An International Commodity Reserve Currency (Grubel, 1965) is an excellent paper to draw attention to the obstacles to an international commodity reserve currency and was written in direct response to a variation of the idea, as put forth by Albert G. Hart, Nicholas Kaldor, and Jan Tinbergen. The Hart-Kaldor-Tinbergen proposal was submitted to the United Nations Conference of Trade and Development in January 1964. Grubel (1965) calls attention to the monetary impact of the proposal in relation to world product, cites the concentration of power which would reside in the proposed Commodity International Monetary Fund (CIMF) remodeled along the lines suggested in the Hart-Kaldor-Tinbergen plan, the gigantic logistical issues involved, and the very large cost to

implement the plan. He further makes a case that fiat money does not include virtually any of the drawbacks and can be controlled in and of itself in a more flexible and compelling way to enhance world trade. He considers a commodity currency a step back in time (Grubel, 1965).

In our opinion, the logistical issues and costs cannot be understated. Anyone reading the Graham books no doubt independently questions these same issues brought up by Grubel. He also puts forth some calculations to support his point about costs. He projects forward to year 2000 and points out the overwhelming stores and costs necessary to make the proposal work. Although the Grubel critique is of a different plan, the author states that the plan is “a variant of the plans proposed by Benjamin Graham and Frank D. Graham during the Second World War” (Grubel, 1965).

One very salient point is made in the last paragraph as Grubel argues, “Relative price changes among commodities will always be necessary for the efficient allocation of resources.” We also feel that a system whose aim is to stabilize price might inadvertently misallocate resources as a negative side effect. This argument supports the Garrett Proposal to the extent that price and maintaining price stability is not the primary issue.

In his paper, *The Case for and Against International Commodity Reserve Currency*, Hart rebuts some but not all of Mr. Grubel’s points. Hart is one of the authors of the original Kaldor-Tinbergen-Hart paper proposed to the UN Conference on Trade and Development. Hart acknowledges some criticism but particularly feels that Grubel’s cost estimates are high and that the point is overemphasized (Hart, 1966).

The paper, *Commodity-Reserve Currency*, by Milton Friedman (1951) is a comparison and contrast of the gold standard, fiat currency (as defined in a previous paper by Dr. Friedman), and the commodity reserve currency monetary systems. He concludes that the commodity reserve system is not a system likely to succeed and is a compromise between a fiat system and a gold standard system which he calls the “extremes.”

Friedman points out that the system may run the risk of being torn between two masters as he writes:

More generally, proponents of commodity-reserve currency are somewhat disingenuous when they claim the availability of commodity stocks to meet special needs as an advantage of the plan. Either the plan is an essential part of the monetary system designed to be stable and to operate under definite rules, in which case the commodity-reserve stocks must be determined by monetary considerations alone, or it is purely an excuse for an *ad hoc* government intervention. One cannot serve two masters at the same time (Friedman, 1951).

Although the Garrett Proposal allows the government a “call” on the commodities in emergency situations, it would not likely disrupt the currency system already in use since it is not aimed to replace it.

Friedman also points out the risk that “For over the long run, agriculture, like the other industries involved, would expand to a larger size than in the absence of the monetary demand” (Friedman, 1951). The Garrett Proposal also works in a similar way except that when the stocks reach their full complement, then the agricultural growth to accumulate stocks slows to normal levels as accumulated stocks reach maximum complement, except to maintain stores to keep up with population growth. This risk Friedman points out is also valid for the Garrett Proposal, and ways to mitigate that risk would need to be invented.

Although Friedman seems sympathetic to the Graham proposal he does point out some weaknesses. Friedman felt that it was effectively too grandiose to be successful even if it did contain many useful and valuable features. His concluding remarks probably best summarize his feelings:

In seeking to gain the countercyclical advantages of a fiat standard while retaining the physical base of the gold standard, commodity-reserve currency seems to me to fall between two stools and, like so many compromises, to be worse than either extreme. It cannot match the nonrational, emotional appeal of the gold standard, on the one hand, or the technical efficiency of the fiat currency, on the other (Friedman, 1951).

The paper, *A Commodity Reserve Currency* by F.A. Hayek (1943), is strongly applicable to this thesis and is the closest thus far to the ideas we put forth. Within this short piece the ideas of a commodity currency are promoted and references to two important books on the subject are listed. Hayek cites Benjamin Graham and Frank Graham and promotes their work of describing a currency tied to a basket of raw commodities. He briefly explains how this would be done and addresses a few of the basic concerns of the idea. His conclusion is that a commodity currency is feasible and carries more benefits than detriments to sound monetary policy. He likens the commodity currency to the virtues of the gold standard which he says are “an international currency without submitting . . .to the decisions of an international authority; made monetary policy in a great measure automatic . . .; and the changes in the supply of basic money . . . were on the whole in the right direction” (Hayek, 1943). He contrasts these virtues with some of the faults of the gold standard, such as the fact that gold has almost no real purpose other than to act as money. Further supply issues, such as when a new country adopts the gold standard, cause embarrassments rather than benefits. He also cites the fact that in times of

difficulty individuals want to hold gold which can increase demand dramatically. The rise and fall in demand for gold itself impacts prices.

Hayek (1943) cites the countercyclical attribute of the CRC as one of its most impressive features: “It is, in fact, one of the great merits of the scheme that it provides an automatic check to any expansion before it can become dangerous.” The countercyclical attribute of the CRC would only be a minor and possibly a non-existent part of the Garrett Proposal.

His enthusiasm for the CRC is reflected in the last sentence of the article: “If this can be combined with the reconstruction of an international monetary system, which would once more secure to the world stable international currency relations and a greater freedom in the movement of raw commodities, a great step would have been taken in the direction to a more prosperous and stable world economy” (Hayek, 1943).

Chapter 3 of the edited book, *Nation-States and Money* (Gilbert and Helleiner, 1999) entitled, ‘*The Scotch Hate Gold*’ (Rowlinson, 1999), is an excellent work discussing what were likely the origins of paper money and explains the historical differences between bills and bank notes in the 1600s and 1700s in Britain. Bills issued by merchants and others in the 1600s served as the first indications of international currency. He recounts how merchants issued bills that specified a specific pay date and a place in the future. These bills circulated freely in countries relieving merchants of sending actual coin long distances. Many bills were issued and circulated in many locations and soon became payment for other transactions. Each time the bill changed hands, it was endorsed and passed on. If there was a default when the bill came due, all endorsers were liable. The result was that

the longer the bills circulated the more secure they became. This information and the history of early English and Scottish banks and their issuance of banknotes comprise the bulk of the article. Banknotes were more place-specific, while merchant bills spanned long distances. He also cites an early English writer who in 1640 recognized that the British pound note had taken the abstract value of the pound, which was more stable than the coin since the coin was subject to clipping and wearing. It would seem likely that a commodity currency would, over time, become even more stable for the same reason.

A parallel between the merchant bills story above and the Garrett Proposal is the fact that the bills were dated and essentially expired when due. A similar type of expiration is essential in a grain storage scheme such as the Garrett Proposal in that the grain must be rotated out of storage into the market, due to the risk of spoilage. Thus both schemes make it difficult to require any less than a 100% of the currency backing commodity on hand at all times, thus it becomes a fully-backed 100% reserve currency.

This article brings to mind that concept of the warehouse receipt (bills) vs. actual government issued and backed currency. Bank notes, with specific pay dates backed by a specific commodity such as gold, are in reality a form of warehouse receipts. The concept is very similar to the Garrett Proposal. Electronic transferrable warehouse receipts are a strong match to the concept of these merchant bills. Moreover, the parallel exemplifies the scenarios that may come about with our proposal in relation to time, currencies, and place.

Rowlinson (1999) further reviews the evolution of the use of currency as a function of banknotes and bill of exchanges, comparing and contrasting various uses and evolution and particularly reviewing how time and place of delivery influenced this development.

This article shows the reality of how currencies developed, e.g., simply as a function of the free market. These paper bills served a very functional and necessary purpose in international trade. Government support was nonexistent.

The Garrett Proposal vs. the Graham CRC

The underlying fundamental motives for the Graham CRC are different than the Garrett Proposal. The Graham plan puts the stored commodities as service to the monetary system and the business cycle. The Garrett Proposal reverses the priority. The monetary benefits of the Garrett proposal are secondary to the stored food. Friedman criticized the Graham proposal on this issue. He said, "Either the plan is an essential part of the monetary system . . . or it is purely an excuse for *ad hoc* government intervention. One cannot serve two masters at the same time" (Friedman, 1951, 217n15). Since the Garrett Proposal is primarily driven by the need for storage to protect life in food emergencies, a "call" of the food in storage is granted to the government. This call feature serves two purposes. First, the call feature enables government to fulfill its mandate to protect its citizens and would allow government to call food from storage in exchange for the national currency paid to the electronic warehouse receipt holder of the food. This would be set up in a way that a premium of some level, say 10% above the current market or the electronic warehouse receipt price, is paid, whichever is greater. The call feature would only be exercisable under specific circumstances, such as a declared food emergency and not a monetary crisis or other emergency that did not create a loss of food availability.

Secondly, the call feature would naturally allow the government authority to have an audit privilege, the results of which would be published publicly and include a

reconciliation of the actual food in storage, with the electronic warehouse receipts in circulation, thereby assuring that the CRC in circulation is 100% backed by the food in storage. In fact, it would be useful if the government were actually *required* to audit the CRC. This audit would also serve to give the public confidence that the CRC is fully backed and that the underlying electronic warehouse receipts can be used and exchanged with confidence. Thus, the audit would bring confidence in both the CRC and the government's ability to assist its citizens in a time of food emergency. The CRC then would serve an additional purpose to assist the government in a primary governmental function, which is to protect its citizens. However, the call feature would not give government authority to run the CRCM, only to assure that the CRC backing was in place.

The Graham CRC is driven by the objective of subduing the business cycle. This is primarily accomplished through:

- (a) the purchase of commodities (increase of the money supply through the creation of warehouse receipts) when the economy cycles down and lowers the underlying prices of commodities, or
- (b) the selling of commodities (lowering of the money supply by retiring warehouse receipts) when the economy cycles up through the selling of commodities.

This then acts to increase money and revive the economic activity or to decrease money and restrain economic activity at counter cyclical times. Although the motive is good this author feels that the motive is insufficient to overcome the barriers to the CRC. In addition, the Graham plan puts the government once again, in control. Currency debasement is likely

to follow again just as during the days of the gold standard when governments issued more currency than was actually backed by the underlying gold.

The Garrett Proposal may incorporate similar aspects of the Graham plan but be limited to a single commodity or fewer commodities, and use much more restrained levels on counter cyclical activity and limit that to primarily the lowering of storage costs. However, any arbitrage activity would have to be done within the confines of the 100% backing in place.

The Graham CRC and subsequent models use a basket of commodities to form an index. This index then forms the basis for the operations of the CRC. Over time, commodities will form either greater or lesser influence in the general economy as technologies change and industry use of one commodity grows or shrinks. When the CRC purchases commodities, the CRC must store the commodities in quantities matching the index and likely modify the index to suitably reflect the current stores. All of this is complex. The Garrett Proposal, on the other hand, begins with one or just a few commodities. It requires no index computation or the issuance of certificates based on an index. It is simpler to begin but can still be expanded if demand requires.

Graham's CRC ultimately ties all currency, both national and international, to the CRC. The Garrett Proposal does not. This then ultimately puts the Graham CRC in the same hands as the current fiat currencies. The Garrett Proposal, at least in the beginning can rely on national in-place currencies for international settlements. The Garrett Proposal places the CRC in the hands of a private organization and limits government to public audits. Moreover, as the Garrett Proposal expands to other nations, international settlements may

then avoid the use of existing national currencies and settle directly between nations using the CRC.

The Graham CRC is an almost overwhelming scale and would put into storage vast amounts of commodities. Friedman said, “. . . it is hard to believe that any nation would deliberately decide to devote so large an amount of its resources to the accumulation of stocks of useful commodities with the definite expectation that they would never be used” (Friedman, 1951, 224). The Garrett Proposal can be started small on a local basis in one U.S. state or a few states joining together. It can be expanded to multiple commodities or just focus on one. Grains would be rotated through the system. The grains would have a definite use as a store for emergency.

SUMMARY AND CONCLUSIONS

Any natural disaster that results in agricultural loss to the point of starvation suggests the consideration of increasing storage. Ice core studies imply that major world volcanic disaster impacts may come as frequently as every 166 years – sufficiently frequent to raise the question of why at least developed countries are not agriculturally prepared with adequate grain storage.

World population continues to grow. Malthusian predictions of populations outstripping agricultural production have yet to come to pass, due to technological innovation which leads to major agricultural advancements such as the 1960s Green Revolution. This author believes that the free market process and demand for food will continue to spur future innovation, and additional agricultural achievements will likely feed the world. However, just as in India, prior to the Green Revolution, starvation and shortage of food may take the lives of many people, in the meantime (Bourne, 2009). Storage could mitigate that, possibly to a large extent as governments call emergency commodity reserves. If the modern world does not innovate quickly, it could face a point of no return wherein storage may not be achievable due to current demands for food.

Climate change appears as a wild card. In 2010 approximately 40% of the Russian wheat crop was destroyed by a heat wave on a level never before recorded (USDA - Foreign Agricultural Service, 2011). Also in 2010, Australia's flooding covered a region the size of France and Germany combined, wiping out massive amounts of agricultural production (Melik, 2011). Some scientists insist that the world impacts of climate change are already

upon us. Ardent environmentalist Lester R. Brown (2011, 10) writes, “. . . I had long rejected the idea that food could be the weak link in our twenty-first century civilization. Today I think not only that it could be the weak link but that it is the weak link” (Brown, 2011, 10).

No one is alive today who remembers the climate or agriculture impact of the Tambora volcano which happened in 1816 or the resulting “year without a summer.” If a similar volcanic natural disaster were to happen in our day with world populations consuming food supplies close to the limit every year, the impact could be severe. Historical evidence shows that the possibility of a year or two without a growing season is real and no doubt will come at some time in the future.

The world financial crisis which began in 2008 has drawn attention to the fact that world fiat currencies are not backed by anything except the good faith of the underlying governments and the confidence of the people. As the United States deteriorates further into debt and deflation the U.S. government continues to create new money and spend it in an effort to revive our sinking economy (US Treasury, 2010). Similar actions by other developed countries raise the same risks. With so much spending and financial stimulus, many believe that future currency inflation is almost a certainty in years to come.

Benjamin Graham’s proposals for a commodity backed currency were widely read and reviewed in the mid-twentieth century including economic journal articles we have reviewed. Graham wrote two books and commissioned a third book written as a form of critique (Graham, 1937a, Graham, 1944a, Bennett and Associates, 1949). The proposal called for a basket of commodities, such as grain, lumber, oil, gold, etc., to be stored to back

a domestic and international currency. His proposal was primarily aimed at stabilizing prices and the business cycle. The concept was revived, polished up, and put forth again by Nicholas Kaldor (1964). Although the proposal was never realized, it did receive significant discussion and critique in economic circles. Much comment and critique was favorable to the proposal; however, criticisms point out the difficulty in implementing the CRC. That fact that it has never come about illustrates the magnitude of the barriers to the CRC.

What seems clear is that linking a commodity to a currency-like transaction system is possible and is considered by some to be ideal enough to replace the fiat monetary system for the U.S. and the world. The Garrett Proposal is a step in that direction, one that can be implemented on a smaller scale, and is motivated by a need beyond that of a monetary system alone, but in addition and more importantly, is motivated by the basic and fundamental security need to eat in a world of shrinking food supplies and rising risks to our food production.

The argument for storage of food seems strong and logical. The method to minimize cost by using stored food as a currency is also logical. Moreover, the practice of using a commodity currency is not new. Warehouse receipts or “Certificates” based on commodities were common for many years in the United States.



Figure 6. U.S. Silver Certificate



Figure 7. U.S. Silver Certificate (enlarged)

The \$1 certificate shown (Figure 5) dated 1957 and in my possession, was redeemable for \$1's worth of silver bullion held by the U.S. Treasury (Figure 6). The practice of actually redeeming the certificate was discontinued in 1964 (U.S. Department of the Treasury, 2011). A commodity currency (in this case the commodity was silver bullion) was more than a proposal. It was an actual practice in the U.S. and other countries for many years. The Garrett Proposal shifts or adds the underlying commodity backing to food and thereby creates an incentive to store food.

RECOMMENDATIONS

This author recommends that nations and states store grain. Reviewed literature confirms that disaster, climate change, expanding populations, and other unforeseen events will likely put a continued strain on the world's food supply in coming years. If national and international stocks remain low, surprise events such as drought, disaster, or other events could push the world into serious shortages, even in developed nations. National security is also at stake. In food emergencies nations and states with adequate food storage will be in stronger positions. Moreover, common sense should prevail in the matter of food reserves, just as in energy reserves.

Further, our research suggests that investigation into the use of grains, as a domestic and international backing for currency may provide an economic incentive to store grain such as in the Garrett Proposal. These conclusions should be investigated and further explored in a thesis for the Royal Agricultural College.

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