

## Editorial

# Costing Life: Air, Water and Food

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## Abstract

*Air, Water and Food, are the fundamental requirements for life to exist on this Earth. However, emitting greenhouse gases into the atmosphere is not only causing climate change, but also air pollution. Management accountants can provide policy related decision information on investments and other actions taken to mitigate the impact of greenhouse gases and other air pollutants. Water costs are related to the issues of climate change. It is clear that many industries depend on water in the supply chain for their workforce and production and to maintain a healthy operating environment. However, the average cost of water is so cheap that there's no incentive to conserve or protect it. Should the water price be reflective of its value or is water a basic human right? All these arguments should be backed by reliable cost calculations, and price demand forecasts, clearly an area for management accounting involvement.*

*Finally, the paper addresses the issue of 'food', i.e. how big business has taken ownership of the genetically modified (GM) 'seeds' required to grow the food. By using patents, they have taken away a farmer's right to save seeds for the next season. The paper argues that management accountants need to undertake the calculations that favour humanity, rather than profits.*

## Keywords

**Cost of Climate Change**  
**Cost of Air Pollution**  
**Price of Water**  
**Genetically Modified (GM) Seeds**

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## Introduction

The origins of management accounting can be traced to Commerce along the 'Silk Road', where traders calculated the cost of the venture and the profit they could make by undertaking such trade. Then with the advent of the industrial revolution, cost accounting became recognised as a profession in the 'works' departments of the many factories that sprung up in that period. Once again, the objective was profit maximisation, and cost accountants calculated the 'cost' of a product manufactured in this world of industry. Cost accounting morphed into 'management accounting' where forecast of future profits were made. Management accountants provided information to general management as to the best mix of products and services that would enhance the future profitability of their organisations.

In more recent times we have come to know that 'profit' alone, ignoring all other 'externalities' (such as the needs of the environment and society) is not enough. There is no point earning large profits if it damages the rivers, pollutes the air and underpays the labour that toils to produce the goods and services demanded by our consumerist society. Worst still is when this labour is housed in sub-standard and unsafe 'sweat-shop' factories and in many cases even child labour is exploited.

But the most serious effect of this unrelenting chase to achieve maximum profits is the damage it is causing to this earth, and the ability of future generations to survive. The release of green-house gases and the damage it is causing to our climate is a scientific fact. Only politicians who are either after the funding and clout of big-business, or simply too ignorant to understand the science, try to run the argument that the climate change that we see all around us, in every country, is not caused by mankind. Management accountants can play a role in the area of 'carbonomics' by using tools such as *Life-Cycle Costing (LCC)* to show the carbon emission impact of marketing our products; from the initial mining of the base raw material needed for the product; to the fuel needed to manufacture the product; to the transportation required to deliver the product to the point of sale; to the

final waste disposal of the product after its useful life. Clearly, management accountants have to look beyond profits made by just only selling the products; to what damage this unrelenting chase for efficiency and productivity is causing to the Earth's environment. Another almost irreversible effect of this relentless chase after profits and a consumerist lifestyle is the effect it is having on air pollution; caused by vehicle emissions and industrial pollution. The effects can be seen worldwide, but no more so than in China and India where this pollution is visible and unhealthy. There are many days where the Chinese government advises the residents of Beijing to stay indoors due to air pollution.

If the air is a problem, what about the water? There are stories of parched farmland. Companies are worried that the global demand for water will soon outstrip supply. The next world-war may not be for territory, or even oil, but for water. Some business leaders and economists say that the solution is simple, make people pay more for the most precious commodity on earth. Already water is being costed and priced, and the differential cost of water around the world is quite significant.

Air and water have been life sustaining issues since the dawn of life on earth. So has food. Recently an issue that will affect our future generations to sustain itself has come about. This time not to our atmosphere, or to our water, but to the plant seeds that are the basic building blocks of the food we eat and the very soil that is needed to nourish it to life.

In the pursuit of profit on a global scale, companies that once created chemical weapons for war, first used that chemistry after the war to produce 'fertilizer' for lands that for centuries did not require such due to crop diversity. These lands have now become 'drug addicts' requiring larger and larger 'shots' of fertilizer. Next, the chemistry was used to create 'Genetically Modified' (GM) food in which have property rights attached to them, and thus the ability to make a 'profit' for those large companies like Monsanto that 'manufactured' these GM seeds.

This paper has been written to summarise these 'costing life' issues facing the cost and management accounting profession.

## The Cost of Air

### Cost of Greenhouse Gases

The balance of scientific evidence indicates that the world is facing significant risks associated with the potentially damaging consequences of climate change (Ratnatunga, 2007). The international economic/regulatory response has been the *Kyoto Protocol*, under which countries have agreed to strive to decrease their carbon emissions (Ratnatunga *et al.* 2011).<sup>1</sup> The Kyoto Protocol developed three alternative market mechanisms for reducing carbon emissions that would enable developed countries with quantified emission limitation and reduction commitments to acquire greenhouse gas reduction credits. Two of these are carbon emissions reduction project-based mechanisms referred to as: (1) Joint Implementation (JI) by at least two developed countries and (2) Clean Development Mechanism (CDM) which has to be implemented in the region of developing countries. Both create carbon units called Emissions Reduction Units (ERUs) and Certified Emissions Reductions (CERs),<sup>2</sup> respectively, which can be traded in an Emissions Trading Scheme (ETS) or a carbon market which is the third market mechanism. An ETS facilitates developed countries to meet their targets of emissions limits and reductions by purchasing carbon units from others.

Those countries with mandatory or voluntary emissions reduction targets, have two policy tools with which to encourage organisations and individuals to reduce their carbon emissions: (1) a carbon tax and/or (2) a carbon price. A straight carbon tax has an impact on costs of production, but if it is passed on to consumers will result in escalating prices, but with little impact on the carbon footprint of organisations. Those countries opting for a carbon price will need to set up a *cap-and-trade* scheme to pass on these pollution limits to business entities which are told how much

<sup>1</sup> The author has used carbon in this paper for simplicity and readability purposes, although the reduction required is actually of six greenhouse gases (GHGs) in terms of their carbon dioxide equivalents (CO<sub>2</sub>e).

<sup>2</sup> Each ERU or CER represents one metric tonne of CO<sub>2</sub> equivalent (tCO<sub>2</sub>e) either removed from the atmosphere or saved from being emitted.

carbon they can emit (the *cap*). In most such schemes, the government will allocate ‘carbon permits’ (represent the rights to pollute) - either free or at an issue price - to companies. The amount of the allocation would be equal to the company’s current pollution, less the reduction target that the country is seeking. If companies emit more than their cap they can buy carbon permits, such as ERUs or RECs, from other businesses that come in under their cap (the *trade*). Trade takes place in an over the counter market, or via a Carbon Credit Exchange trading market. The emergence of a market which determines a price for *the right to pollute*, has resulted in a new *carbonomic* era, in which economic decisions are made based on organisations’ GHG emission targets. Ratnatunga and Balachandran (2009) list a number of areas in which management accountants can calculate the cost of carbon emissions and provide decision information on investments and other actions taken to mitigate the impact of greenhouse gases on the environment.

### Cost of Air Pollution

In addition to the indirect impact of greenhouse gases on human beings due to the changes in the climate; there is the direct impact of air pollution on human life itself. Air pollution is costing advanced economies, plus China and India, an estimated US\$3.5 trillion a year in premature deaths and ill health; according to a new report by the Organisation for Economic Cooperation and Development (OECD) (Enviroinfo, 2014). The report warns that the costs will rise without government action to limit vehicle emissions and industrial pollution caused by mankind’s never ending thirst for consumer products and services. In OECD countries, around half the cost is from road transport, with diesel vehicles producing the most harmful emissions. Traffic exhaust is a growing threat in fast-expanding cities in China and India, as the steady increase in the number of cars and trucks on the road undermines efforts to curb vehicle emissions.

The OECD (2014) calculates the cost to society across the OECD’s 34 members at about US\$1.7 trillion, based on the value people attach to not having their lives cut short by cancer, heart disease or respiratory problems. This is where cost accounting meets medical science. The report puts the cost at nearly US\$1.4 trillion in China and nearly

US\$0.5 trillion in India. More than 3.5 million people die each year from outdoor air pollution. From 2005 to 2010, the death rate rose by four per cent world-wide, by five per cent in China and by 12 per cent in India.

The report underlined the fact that there is no public policy case for applying preferential tax treatment to diesel. It also supports taking action to reduce road transport pollution which could include tightening emission standards, expanding urban bicycle-sharing and electric car programs, and extending road charge schemes to reduce congestion.

According to Mr. Angel Gurría, the OECD Secretary-General:

*“The price we pay to drive doesn’t reflect the impact of driving on the environment and on people’s health. Tackling air pollution requires collective action. There is no environmental justification for taxing diesel less than petrol. Air pollution is destroying our health and the planet. Phasing out tax incentives on diesel would be a step towards reducing the costs to both and in fighting climate change.”* (Enviroinfo, 2014).

More sophisticated techniques of calculation the costs of air pollution have existed in Europe. In 2005, the Clean Air for Europe (CAFE) programme estimated that emissions of regional air pollutants across all sectors of the EU-25 economy caused damage to human health and the environment worth EUR 280–794 billion in the year 2000. By 2011, a key finding of the EEA (2011)’s report was that, despite past cuts in emissions, air quality still needs to improve - concentrations of certain air pollutants still pose a threat. In addition to estimating the damage costs from the ‘traditional’ regional air pollutants (e.g. nitrogen oxides, sulphur dioxide, particulate matter, etc.), based upon the CAFE programme’s approach, the EEA (2011) report also estimates the damage costs caused by emissions of heavy metals, organic micro pollutants and the greenhouse gas CO<sub>2</sub>.

The report makes it possible to address a variety of questions relating to cost and management accounting, for example:

- Which industrial sectors and countries contribute most to the estimated damage costs of air pollution?

- How many facilities account for the largest share of air pollution's estimated damage costs?
- Which individual facilities are responsible for the highest estimated damage costs?

The EEA (2011) report and its main findings briefly describe the methods applied and their limitations. It is important to note that the report does not assess whether a facility's emissions are consistent with its legal requirements to operate. Nor does it address air pollutants released from 'diffuse' sources, such as transport, and consequently it does not assess the total damage costs caused by air pollution across Europe. Finally, the report focuses on the air pollution costs caused by industrial facilities. The recognised economic and social benefits that they generate (such as products, employment and tax revenues) are not addressed. Such calculations are the typical 'cost-benefit' analyses that management accountants are trained to undertake.

The key findings of the EAA (2011) report are given below. The report quantifies in monetary terms the cost of damage to health and the environment from air pollution released in 2009 from European industrial facilities. The main findings are as follows:

- The cost in 2009 of damage caused by emissions from industrial facilities is estimated as being at least EUR 102–169 billion.
- A small number of individual facilities cause the majority of damage costs. Fifty per cent of the total damage cost occurs as a result of emissions from just 191 or 2 % of the approximately 10, 000 facilities that reported data for releases to air. Three quarters of the total damage costs are caused by the emissions of 622 facilities - 6 % of the total number.
- Of the industrial sectors included in the pollutant register, emissions from power generation contribute the largest share of the total damage costs (estimated as at least EUR 66-112 billion). Excluding CO<sub>2</sub>, the estimated damage costs from this sector are EUR 26-71 billion.

- Countries such as Germany, Poland, the United Kingdom, France and Italy, which have many large facilities, contribute the most to total damage costs. However, when damage costs are corrected to reflect the output of national economies, the ordering of countries changes significantly. The emissions from a number of eastern European countries (Bulgaria, Romania, Estonia, Poland and the Czech Republic) are then more important in terms of their damage costs.
- The damage cost resulting from emitting one kg of organic micro-pollutants (e.g. dioxins and furans) is significantly higher than the damage cost from releasing one kg of CO<sub>2</sub>. The enormously larger amount of CO<sub>2</sub> emitted (around a trillion times greater) means, however, that CO<sub>2</sub> emissions contribute the most to total damage costs (followed by regional air pollutants, heavy metals and organic micro pollutants).

The EAA (2011) report provides a list of the most polluting individual facilities. Not surprisingly, the facilities whose emissions impose the highest damage costs are generally among the largest facilities in Europe, releasing the greatest amount of pollutants.

Clearly, ranking facilities according to their aggregate damage costs provides little indication of the efficiency of production at a facility. One large facility could pollute less than several smaller ones that generate the same level of service or output. Equally, the opposite could also be true. The efficiency and effectiveness calculations that cost and management accountants undertake would be invaluable in making these comparative efficiency vs. pollution estimates.

### **The Cost of Water**

Central Valley, California has long been one of the most bountiful farming regions in the USA. Though it has less than 1% of America's farmland, according to the U.S. Geological Survey, it supplies a quarter of the nation's food. However, for the past three years it has suffered the worst drought in almost anyone's memory. In January 2014, with California's river and reservoir levels at record (or near record) lows, California Governor Jerry

Brown declared a state of emergency. By March the drought was so severe that the state and federal governments, which both run systems that transport water from the Sierras to the valley, cut off supplies to farmers. That left many of them with two unpleasant options: Buy water on the spot market for up to four times the normal price or cut back sharply on planting.

Officials say that more than 500,000 acres of otherwise rich, arable land in Central Valley will likely be left fallow this year. Acres of fruit and nut trees will die from lack of water. And in keeping with the laws of supply and demand, food prices have already risen.

Water, as any physicist will tell you, doesn't simply vanish from the earth. It exists in a state of flux: as glacial ice, cloud vapour, salted sea, the sweat of a brow. In whatever phase, the water leaving one domain - by evaporation, precipitation, consumption, or flow underground - inevitably shows up someplace else. The drought in California resides in the same earthly sphere as the storms that have battered the United Kingdom this year in the wettest winter on record.

The water scarcity problem is real, serious and global. Since the 1970s, droughts worldwide have gotten longer and more intense over wider areas, according to the UN's Intergovernmental Panel on Climate Change (IPCC). Throw in the effects of air pollution, overconsumption, and relentless population growth, and there is little for the political left and the right to debate: We have a genuine, burgeoning, boundary-crossing crisis over water (Dumaine, 2014).

Climate scientists, NGOs, and geologists have been warning about freshwater scarcity for some time. Now the issue is in corporate boardrooms. The *Fortune magazine* in its May 19, 2014 issue, reported the following corporate concerns: (1) PepsiCo's CEO Indra Nooyi told the that, "The world water crisis is one of the most pressing challenges of our age."; (2) Coca Cola lists "water scarcity" as a risk factor behind only "obesity concerns," which the company warns might reduce demand for some of its products; (3) Nestlé chairman, Peter Brabeck-Letmathe, who heads the 2030 Water Resource Group, a public-private collaboration among leading beverage companies, development banks, and several

government agencies in Asia, Africa, and Latin America, has even dedicated a personal blog to global water issues. All of the corporations above, to be sure, have an obvious stake in the issue. Nestlé is the world's largest food company by sales and a dominant bottled-water seller worldwide.

Dozens of other industries, however, from chipmaking to fracking to meatpacking, also depend on having plenty of water. Dry pastures hurt grain output, pushing up prices for feed - which, along with smaller herds, has led to [exorbitant prices for meat in the USA](#). It is clear that many industries depend on water in the supply chain, for their workforce and production and to maintain a healthy operating environment.

This is why an increasing number of business leaders, economists, and think-tankers are coming to reclassify water as a kind of buried treasure: a sort of 'blue gold'. Willem Buitter, Citigroup's chief economist, sums up the thinking of many these days: "*Water as an asset class, in my view, will eventually become the single most important physical commodity - dwarfing oil, copper, agricultural commodities, and precious metals*" (Dumaine, 2014).

Dumaine (2014) therefore raises an interesting question for cost and management accountants; *if water is so incredibly valuable, why is it so cheap?*

The *Water Footprint Network*, a non-profit group in the Netherlands has calculated that to produce one half-pound cheeseburger, it takes 968 gallons of water (Hoekstra, et. al., 2011). This looks like an amazingly absurd figure, but when the cheeseburger is broken down to its components the numbers stack up as follows: (1) slice of cheese (24 gallons); (2) wheat bun (19 gallons) and tomato and lettuce (under two) are a relatively small part of the total. The eight-ounce meat patty, by contrast, requires an estimated 924 gallons to produce when the amount of water needed to grow the feed for the animal is included.

And what is the cost of all this water? If all that water somehow came out of a home tap in Perth, Australia (where the water costs US\$6.59 per cubic meter), the water cost to produce that cheeseburger would be approximately \$24 (1 cubic meter is approx

264 US gallons). This excludes all other costs, such as energy to produce that cheeseburger. If water was sourced solely from a tap in New York City, the rate is about US\$3.27 per cubic meter and in Mumbai, India it is about 22 US cents.

However, most of the water that's used in the world doesn't come out of a kitchen or bathroom tap. Seventy percent of it is consumed in agricultural production - and most of that, in turn, is free or dirt-cheap (provided by rain, well water, and government agencies). When farmers do have to buy water on the spot market, it's sold in acre-feet (enough to cover an acre of land with a foot of water) and a lot cheaper than the municipal tap. So in the absence of drought, pestilence, and other agricultural plagues, farmers can produce those cheeseburger components for very little water cost.

Obviously, cheap water is good if you're a parent feeding a family on a modest income. But many business leaders, economists, and other academics say water is so inexpensive that there's no incentive to conserve or protect it. The price in the U.S. - once agricultural, industrial, and residential use is averaged out - is a ridiculously cheap four one-thousandths of a US cent per gallon, according to the American Water Works Association, a Denver group that has been studying water issues since 1881 (Duffy, 2011).

One could argue that the answer to water scarcity is simple: Let water's price swim closer to its value (Dumaine, 2014). Let the invisible hand do its job, and water prices will rise, demand will fall, and this precious resource will be saved. One argument is that if water's price were truly reflective of its value, investors would pour in capital for projects ranging from desalination plants to gray-water recycling systems to repairs on leaky municipal water pipes. These would help us increase the global supply of freshwater as the world's population soars.

The counter argument is that the very idea of treating water as a commodity like oil or gold might set off uncontrollable consequences. Access to clear water is a human right, many contend - and, this was underlined by the UN, which passed a resolution in 2010 confirming the same. Letting market forces take over, moreover, could put in jeopardy billions of

people who barely have enough clean, drinkable water to begin with.

Further, in developed countries, local politicians reject the notion of raising voters' water bills. Family farms might be driven out of business, food prices would rise - as would the end products for every device that uses microchips, things that take vast amounts of superclean water to produce.

A view that is emerging that takes into account both human protection and the free market is that policies should be introduced to preserve a certain amount of water for everyone for free (or at almost no cost) and have a mostly free market for the rest (Dumaine, 2014).

*"Water needed for drinking, cooking, and basic hygiene as a basis for survival must be available even for a person unable to pay," wrote. But "there must be limits: Water to fill a private swimming pool or to wash a car, for instance, is not a free public good; rather, it should be a normal commercial good covering at least the full cost of infrastructure, not subsidized or even distributed for free."* (Nestlé Chairman Brabeck-Letmathe on his blog quoted by *Fortune magazine* in its May 19, 2014 issue).

This is radical talk, no doubt. The question is whether the global water situation is so dire that we need a radical solution to address it. All proposed solutions should be backed by reliable cost calculations, and price demand forecasts, clearly an area for management accountant involvement.

In China these radical solutions have already been implemented. The country has 19% of the world's population and only 7% of its freshwater. Tianjin, a city of 7.5 million on the northeast coast, now has a per capita water supply lower than Saudi Arabia's. Rivers in the country, meanwhile, are dying. In the 1950s the country had 50,000 rivers. Since then industry and agriculture have siphoned off so much water that only 23,000 remain - and many of them are unfit for drinking. A few years back the Yellow River Conservancy Commission, a Chinese government agency, concluded that a third of the water in this massive, 8,000-mile system was *too polluted even for agricultural use*.

So China is taking a leap into the water-pricing pool. In early January, 2014, the government announced that by the end of the year it would roll out a wide-reaching program in which the wealthiest urban consumers would pay higher amounts for water. In the USA, drought-racked San Diego - where a typical residential user now pays about \$40 a month for water, one of the highest rates in the nation - recently put in place a tiered pricing system as well. The city is also hiring IDE Technologies, an Israeli firm, to build a \$922 million desalination plant, which would be the largest in the Western Hemisphere when complete. Here in Australia, a bone-dry nation, a different tack is being taken. The government has established a cap-and-trade system, similar to the one used for carbon, which is encouraging industry to conserve water and invest in water-saving projects.

Whether such local-market price tinkering will make more than a dent in the global water crisis is too early to tell. Water scarcity, caused naturally or otherwise, has already brought businesses and local communities on a collision course, as Coca-Cola discovered in 2008 in the arid Indian state of Rajasthan. Farmers there angrily claimed that Coca-Cola's bottling factory in Kala Dera drew too heavily from aquifers. To irrigate their fields of barley, millet, and peanuts, the growers complained that they had to drill deeper and use heftier pumps to water their fields - raising the cost of their water. Coca-Cola denies the claim and has tried to work with the community to solve the problem. Even so, the controversy lives on.

One challenge with investing in water is that there's no global market for it as there is with oil, copper, and other commodities. It may be a \$600-billion-a-year industry, but companies have had a tough time making money in it. A typical reason for concern in getting into this business expressed by companies is that there is no market price for water because decisions are made by politicians on how water should be priced, not the market.

Economists nonetheless view water as an increasingly important commodity in international trade because when nations trade grain, produce, or even timber, they are in effect trading water, since agriculture is so water-intensive (Allan, 2011). This concept - dubbed the *virtual water trade* - will become increasingly important as water grows scarcer.

Allan (2011) states that food security is totally connected to water security. He believes that if we are going to have cheap food, we have to help farmers save water.

## The Cost of Food

The cost of food, which includes: (1) the plant, livestock and fish used for its production; (2) the logistic required for its distribution; (3) the place required for its purchase for consumption and (4) the logistics required for dealing with its solid and liquid waste has been of interest to cost and management accountants for many years. That livestock has an 'owner' been an undisputed fact in today's food chain. Even fish in the sea have an 'ownership' in that once caught they belong to the fisherman. And plants, if grown in a farm are 'owned' by the farmer. But what about the building blocks of these plants, the seeds – *can the genes of these seeds have an owner?*

In May 2013, the U.S. Supreme Court began hearing arguments in a seed patent infringement case that pitted a small farmer from Indiana, 75-year old Vernon Hugh Bowman, against biotech goliath Monsanto. Reporters worldwide dissected the legal arguments and gave opinions on the impact a Monsanto loss might have, not only on genetically modified crops, but on medical research and software.

What most of them didn't report is the absurdity - and the danger - of allowing companies to patent living organisms in the first place, and then use those patents to attempt to monopolize world seed and food production.

The basics of the case are as follows. Monsanto sells its patented Genetically Modified (GM) 'Roundup Ready' soybean seeds to farmers under a contract that prohibits the farmers from saving the next-generation seeds and replanting them. Farmers like Mr. Bowman who buy Monsanto's GM seeds are required to buy new seeds every year. For years, Mr. Bowman played by Monsanto's rules. Then in 2007, he bought an unmarked mix of soybeans from a grain elevator and planted them. Some of the soybeans turned out to have been grown from Monsanto's patented 'Roundup Ready' soybean seeds. Monsanto sued Mr. Bowman, won, and the court ordered

the farmer to pay the company \$84,000 (*Monsanto v. Bowman*, 2011). Mr. Bowman appealed, arguing that he unknowingly bought soybeans grown from Monsanto's seeds, not the seeds themselves, and that therefore the law of "patent exhaustion" applies.

The Supreme Court delivered a unanimous decision that rejected the appeal (*Bowman v. Monsanto*, 2013). The decision was hailed by some as a major victory for intellectual property rights; whilst others worried about the implications for agriculture, the very foundation of civilization. The question of the resultant prices for farmers and consumers was never considered by the Court.<sup>3</sup>

The seeds had been designed to withstand application of the herbicide glyphosate, which Monsanto markets as Roundup. Farmers who plant such 'Roundup Ready' crops are required to sign an agreement with Monsanto stipulating that they will buy new seeds from the company each year, rather than using the products of the plants' reproduction.

Monsanto is an aggressive protector of its patents: According to a report by the Center for Food Safety (2005, 2007):

*Farmers have been sued after their field was contaminated by pollen or seed from someone else's genetically engineered crop; when genetically engineered seed from a previous year's crop has sprouted, or "volunteered," in fields planted with non-genetically engineered varieties the following year; and when they never signed Monsanto's technology agreement but still planted the patented crop seed.*

Monsanto says it does not "exercise its patent rights where trace amounts of our patented traits are present in farmers' fields as a result of inadvertent means." The court was widely seen as completely sympathetic to Monsanto's side: "Why in the world," asked Chief Justice John Roberts, "would anybody spend any money to try to improve the seed if as soon as they sold the first one anybody could grow more and have as many of those seeds as they want?" (*Bowman v. Monsanto*, 2013).

<sup>3</sup> The nine justices of the Supreme Court have been called "friendlier to corporate interests" than any court since 1946 (Paul and Cummins, 2013).

Justice Elena Kagan echoed Roberts's sentiment in her opinion, concluding that, if *Bowman* were to prevail, "The undiluted patent monopoly ... would extend not for 20 years as the Patent Act promises, but for only one transaction. And that would result in less incentive for innovation that Congress wanted." (*Bowman v. Monsanto*, 2013). But the court refrained from using the occasion to issue a sweeping decision on patents. "Our holding today is limited," Kagan wrote, "addressing the situation before us, rather than every one involving a self-replicating product. We recognize that such inventions are becoming ever more prevalent, complex, and diverse. In another case, the article's self-replication might occur outside the purchaser's control. Or it might be a necessary but incidental step in using the item for another purpose." (*Bowman v. Monsanto*, 2013).

Despite this explicit limitation, Monsanto's statement sounded triumphant, tying the protection of its patent to the efforts of entrepreneurs everywhere - even to the survival of the species:

*The court's ruling today ensures that longstanding principles of patent law apply to breakthrough 21st century technologies that are central to meeting the growing demands of our planet and its people. The ruling also provides assurance to all inventors throughout the public and private sectors that they can and should continue to invest in innovation that feeds people, improves lives, creates jobs, and allows America to keep its competitive edge.*

It's safe to say that the majority of the general public would have loved to have seen the small farmer from Indiana knock Monsanto down a peg. Last year, a Monsanto ally threatened to sue the state of Vermont if legislators passed a law requiring labels on all foods containing genetically modified organisms (GMOs). Lawmakers capitulated, despite the fact that voter support was running at more than 90 percent. Later in the year, Monsanto and large food corporations spent \$46 million to defeat a citizens' initiative in California that would have required mandatory labelling of GMOs.

What the company doesn't mention when touting the effects of its technology is the price paid by others for its profits (which



were \$1.48 billion in the January to March 2013 quarter, up 22 percent from a year ago). According to the Center for Food Safety (2013), "From 1995-2011, the average cost to plant one acre of soybeans has risen 325 percent." Roundup Ready soybean seeds were introduced in 1996. The costs of planting other crops have skyrocketed as well, as consolidation in the seed business has left 53 percent of the global market in the hands of three corporations: Monsanto, DuPont, and Syngenta. In that period prices shot up 516 percent for cotton, and corn seed prices rose by 259 percent. In fact, seventy percent of the corn and cotton grown in the U.S. is Roundup Ready (Neuman and Pollack, 2010). In 2010, the spike in prices prompted an antitrust investigation of the seed industry, focused on Monsanto. That inquiry was closed in November 2011, with no charges being brought (American Antitrust Institute, 2012).

Roundup itself has been linked to rising food prices, or at least the potential to drive costs up. Sartorato, et. al., (2011) have highlighted the growing phenomenon of glyphosate resistance, whereby overuse of Roundup creates aggressive, herbicide-immune superweeds, which have to be deracinated or treated with even more toxic chemicals. If such plants continue to spread across farmland, labour costs could rise and yields decline, making grain more expensive.

Most fundamentally, *Bowman v. Monsanto* (2013) confronts us with the question of whether living things should be subject to patent protection. The USA Supreme Court first allowed this in 1980, when the organism in question was a bacterium engineered to break down crude oil. Compared with its treatment of *Bowman*, the court then was considerably more sceptical towards the idea of private companies patenting human genes, as raised by the recently argued *Assn. for Molecular Pathology v. Myriad Genetics* (2013). But though it is unsurprising that mankind's biological endowment should be treated more respectfully than that of a soybean, human life has long depended on the healthy functioning of agriculture.

As the Center for Food Safety (2013a) points out, the right to save seeds "has been central to farming for over 10,000 years." It's striking that the court was not more troubled by the privatization of what was once in large part a

common store of value - namely, the ability of nature to reproduce. "It is miserable for a farmer to be obliged to buy his Seeds," George Washington once said, providing the epigraph for the Center for Food Safety (2013b) recent report "Seed Giants vs. U.S. Farmers"; "to exchange Seeds may, in some cases, be useful; but to buy them after the first year is disreputable."

It must be noted that Monsanto's patented seeds didn't achieve their present level of popularity through farmer choice alone. The company's expansionary policies of acquisition and licensing, as well as a shift in public university research from conventional seed breeding to biotech applications, have left many farmers unable to find high-quality non-GM seed. The implications for biodiversity should concern us - to say nothing of the potential health effects of the widespread use Roundup - even if we do not agree with Bowman's "blame-the-bean" defence.

Although the press and public have fixated on the sticky legal details of the case; Mr. Bowman's predicament is part of a much bigger problem. The real issue is this: *Why have we surrendered control over something so basic to human survival as seeds? Why have we bought into the biotech industry's program, which pushes a few monoculture commodity crops, when history and science have proven that seed biodiversity is essential for growing crops capable of surviving severe climate conditions, such as drought and floods?*

The problem is that the business and legal community has turned seed, which is the heart of a traditional diversity-rich farming system across the world, into a powerful commodity, used to monopolize the food system. Monsanto, DuPont and Syngenta have pressured farmers to replace diverse, nutritional seeds, seeds that are resilient because they've been bred by small-scale farmers to adapt to local climates and soil conditions, with monocultures of genetically engineered seeds. In the U.S. these crops are predominately corn and soybeans. According to the report, entitled "Seed Giants vs. U.S. Farmers," 93 percent of soybeans and 86 percent of corn crops in the U.S. come from patented, genetically engineered seeds (Center for Food Safety, 2013b).

Monsanto profits handsomely from selling its patented seeds. But the real profits are in selling farmers its proprietary pesticides, like Roundup. Farmers can spray huge amounts of Roundup on Monsanto's Roundup Ready soybeans, killing everything except the soybean plants. It's a win-win for Monsanto. And it is sold as a win to farmers, who have been told that by following the Monsanto method, they will increase their yields and make more money. Monsanto even claims that its GM crops are the answer to world hunger.

But little of what Monsanto has promised, to farmers and the world, has proven true. Since farmers first began buying into Monsanto's scheme in 1995, the average cost to plant one acre of soybeans has risen 325 percent (Center for Food Safety, 2013b). Corn seed prices are up by 259 percent. Those increases don't include the cost of the lawsuits Monsanto has aggressively filed against farmers the company claims have violated patent agreements. By the end of 2012, Center for Food Safety (2013b) calculates that Monsanto had received over \$23.5 million from patent infringement lawsuits against farmers and farm businesses.

Clearly big businesses like Monsanto have profited enormously from GM modified foods and related fertilizers and pesticides. *But what about the rest of humanity?* What has humanity gained from this aggressive monopoly of seeds and crops? It appears that for humanity, rather than profits, it is the losses that continue to mount. Monsanto promised that its GM crops would help the environment by reducing the need for pesticides. But according to the US Department of agriculture (USDA), farmers used up to 26 percent more chemicals per acre on herbicide-resistant crops than on non-GE crops. And as several dozen aggressive "superweeds" have become resistant to glyphosate, the primary herbicide used on GM crops, the biotech industry is ramping up its war on weeds with a new generation of GM crops that can survive spraying with 2,4 D, paraquat, and other super-toxic herbicides (Sartorato, et.al., 2011).

As for GM crops being necessary to feed the world, that promise has also been debunked. In 2010, the Food and Agriculture Organization of the United Nations (FAO) warned that the loss of biodiversity will have a major impact on the ability of humankind to feed itself in the

future. The fable that GMOs are feeding the world has already led to large-scale destruction of biodiversity and farmers' livelihoods. It is threatening the very basis of our freedom to know what we eat and to choose what we eat. Our biodiversity and our seed freedom are in peril. Our food freedom, food democracy and food sovereignty are at stake (IUCN, 2011).

It's time we ask ourselves: *How long are we going to let Monsanto bully farmers and politicians into controlling the very source of life on earth?* How long will we tolerate the growing monopolization and genetic engineering of seeds by an aggressive cabal of chemical and pesticide corporations who pose a deadly threat to our health, our environment and the future of our food? And when does "how long" become too late?

## Summary

Air, Water and Food, are the fundamental requirements for life to exist on this Earth. However, mankind is not sustaining this planet by emitting large amounts of greenhouse gases into the atmosphere that is not only causing climate change, but also resulting in dangerous levels of air pollution in some cities. Management accountants can calculate the cost of carbon emissions and provide decision information on investments and other actions taken to mitigate the impact of greenhouse gases on the environment. Management accountants are also needed to calculate the cost to society resulting from ill health, loss of productive capacity etc. as a result of air pollution. Such calculations can have a significant impact on policy decisions. For example, Management accountants can demonstrate that there is no public policy case for applying preferential tax treatment to diesel. Such life enhancing decisions include taking action to reduce road transport pollution such as tightening emission standards, expanding urban bicycle-sharing and electric car programs, and extending road charge schemes to reduce congestion. By doing 'Costing for Life' calculations policy makers can address a variety of questions such as (1) which industrial sectors and countries contribute most to the estimated damage costs of air pollution?; (2) how many facilities account for the largest share of air pollution's estimated damage costs? and (3) which

individual facilities are responsible for the highest estimated damage costs?

Water costs are related to the issues of climate change, with areas that normally have ample water experiencing droughts and dry area experiencing heavy rainfall and flooding. Dozens of industries, from beverages to chipmaking to fracking to meatpacking, all depend on having plenty of water. Dry pastures hurt grain output, pushing up prices for feed - which, along with smaller herds, has led to exorbitant prices for meat. It is clear that many industries depend on water in the supply chain for their workforce and production and to maintain a healthy operating environment. This raises an interesting question for cost and management accountants; *if water is so incredibly valuable, why is it so cheap?*

Seventy percent of water is consumed in agricultural production - and most of that is free or dirt-cheap (provided by rain, well water, and government agencies). The average cost of water (combining agricultural, industrial, and residential use) is so inexpensive - four one-thousandths of a US cent per gallon - that there's no incentive to conserve or protect it. One argument is that if water's price were truly reflective of its value, investors would pour in capital for projects ranging from desalination plants to gray-water recycling systems to repairs on leaky municipal water pipes. These actions would help us increase the global supply of freshwater as the world's population soars. The counter argument is that water is a human right; and that the very idea of treating water as a commodity like oil or gold might set of uncontrollable consequences. All these arguments should be backed by reliable cost calculations, and price demand forecasts, clearly an area for management accounting involvement.

Economists view water as an increasingly important commodity in international trade because when nations trade grain, produce, or even timber, they are in effect trading water, since agriculture is so water-intensive; i.e. if we are going to have cheap food, we have to help farmers save water. But water and air is not the only components required for producing food. What is required also is the 'seeds' to plant and germinate. For centuries farmers kept seeds from their current harvest, to plant for the next cycle. They also

undertook 'crop diversity' to keep the soil naturally fertilized. But Chemical companies such as Monsanto have changed all that. First, because of chemical fertilizers, crop diversity was abandoned. The problem was that the soil became so 'drug addicted', larger and larger doses of fertilizer was required. Next, these same chemical companies introduced 'Genetically Modified' seeds, in which they held patent rights. Farmers were not allowed, under contract, to save GM seeds for the next season. They had to buy seeds afresh every season, increasing the profits of such companies. Despite the right to save seeds has been central to farming for over 10,000 years, the US Supreme Court found in favour of the Chemical companies. Management accountants much ask themselves an ethical question: "*in the pursuit of profit why have we allowed companies to take control over something so basic to human survival as seeds?*" Management accountants need to work closely with governments and NGOs to undertake the calculations that *favour humanity, rather than profits.*

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