



Technologies from Space Improve Life on Earth (Sponsored)

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By: BAM Agricultural Solutions Inc in Crops, Technology

Agriculturists need to constantly ask themselves “What is possible?” if we are going to feed 9.5 billion people by 2050. What is possible in crop yield per unit of land and water? What is possible in increasing crop nutritional value and reducing crop wastes? What can help with agriculture’s growing dependence on fertilizers and pesticides? What is possible in slowing desertification of agricultural lands? These are challenging questions to be sure. However, we are finding some compelling answers in an unlikely place: in the zero/micro gravity environment of space. Growing food for deep space flights and colonization of Mars is spawning technologies with applications right here on Earth.



For the past 50 years, agriculture has used chemical fertilizers, pesticides, genetic engineering, and irrigation schemes to significantly advance crop production and meet global food demands. Unfortunately, this production curve has flattened out, so just adding more of these same inputs is proving insufficient. More inputs were never the answer in space, so plant scientists had to find ways for plants to operate at higher efficiencies. **Growing crops in space,**

scientists had to find ways to enable the plant’s natural processes and physiology to better express yield, quality, and resistance to abiotic and biotic stresses. This necessity spawned an advanced ionic nutrient delivery system to improve a plant’s physiological functioning, carbon and energy harvesting, and energy balance management.

This nutrient delivery technology is meant to work synergistically with beneficial microbes, primarily bacterial. This approach of enhanced plant nutrition and beneficial microbes is coined “bio-farming” or “compensatory balanced nutrition.” The word “compensatory” is used because there are times when the plant is respiring more carbohydrates than it is producing due to abiotic and biotic stresses. Nutrition and microbes may be used in the general care and feeding of plants or as a compensatory counterpunch to stresses. These advanced technologies from space are beginning to help plants on Earth become more efficient at harvesting sunlight and dealing with their environment.



After years of research, Zero Gravity Solutions, Inc., BAM Agricultural Solutions' parent company, was issued the patent for this technology platform for manufacturing various combinations of *ionic* minerals in a low pH, high redox solution. Our first commercial product developed from this platform is called **BAM-FX® (Bio Available Minerals – Formula X)**. It is designed to be a most effective way to deliver cationic zinc (7 percent), cationic copper (2 percent), sulfate (25 percent) and ammonium (0.2 percent) in

the exact forms required for optimal transport into the cells of shoots (leaves and stems) and roots. **BAM-FX works like a “key in a lock.”** The multitude of ways plants use zinc and copper are well documented; however, BAM-FX has a host of properties that greatly enhance the transport of nutrients into the cells of plants. BAM-FX can be viewed first as a most-effective ionic nutrient delivery technology. However, ongoing third-party trials are adding the data necessary to further validate our working hypothesis that BAM-FX is also having very positive impacts on a plant's natural functioning (e.g., photosynthetic efficiency, nutrient use efficiency, nitrogen use efficiency, mineral translocation, and abiotic and biotic stress responses). Our understanding is increasing of “how and why” BAM-FX appears to be “enabling” the plant to operate its own natural machinery at a higher level, perhaps much higher.



BAM-FX is being commercialized through existing domestic and international distributors for use by their customers. Other combinations of ionic minerals will be manufactured on the same patented technology platform and rolled out through our expanding distribution network. These products can be used as a stand-alone, or more likely, as part of a broader nutritional program or tank-mix. The end goal is a comprehensive nutritional and beneficial microbial recipe with BAM-FX ionic minerals replacing other sources of such minerals over time. BAM-FX can be used as part of the plant's normal growing cycle or as

a “counter-punch” when the plant is stressed. Incorporating BAM-FX into a plant's nutritional program has been observed to promote higher yields, better product quality and uniformity, and in some cases, even a shortened growing cycle. BAM-FX can be applied as a foliar application, soil/root drench, and/or with other input systems (e.g., irrigation, fertilizers, herbicides).

A transition to more nutrition-based systems does not mean the elimination of NPK fertilizers and chemical pesticides, be they biopesticides or chemical formulas. For example, pesticides will continue to play an important future role due to monocropping and the need for insurance from major disease outbreaks. However, it has been repeatedly observed that a higher functioning

plant may more efficiently utilize fertilizers, water, and/or pesticides. Themes involving nutrition, microbial health, and more efficient water use are certainly gaining momentum. We launched our company, BAM Agricultural Solutions, Inc., to bring space-based science and technology to Earth to participate in this paradigm shift in modern agriculture.

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