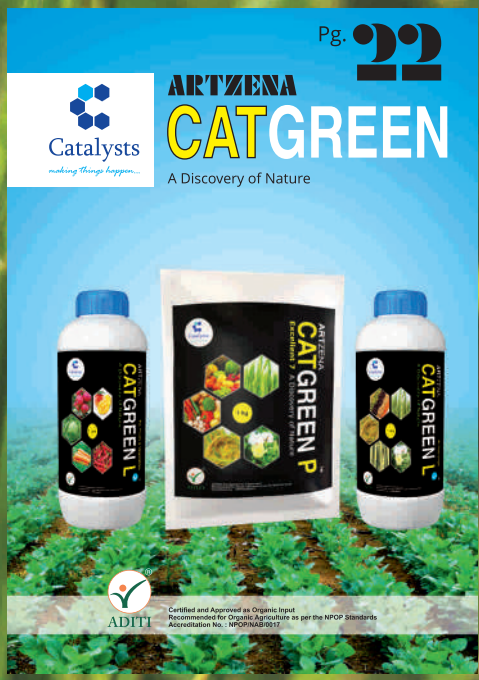
Catalysts

May-June-July-Aug'19

CONNECT

VOLUME 33



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- Reduction of sugar losses due to enhanced process

Enzytreat SGR

A Highly effective broad spectrum antimicrobial solution

Enzydex PS

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- Recycling of biomethanated condensate in fermentation proces
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Process to reduce the concentration of organic compounds (COD) in MEE condensate. More than 80% recycle of MEE condensate to fermentation can be assured. Helps to increase ethanol yield during

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EDITORIAL

Message from the **Managing Director**

Hello Friends,

Welcome to the new addition of Catalysts Connect...

It has been an interesting financial year till now. Whole of the first quarter got consumed in long election process. It was a big relief to get a majority government. Since then starting from a prediction of below average monsoon to floods in many parts of country, situation has remained challenging.

Another big challenge in front of us is sluggish economy. Most of the industries are witnessing muted growth. There have been many lay-offs especially in manufacturing sector. The only positive is that Government of India has started to accept the problem and I am sure they are doing their best to bring economy back on track.

Situation in Industries being serviced by us especially Grain Alcohol have also remained challenging due to increase in raw material costs and the market taking time to adjust to increased prices of ENA. We are observing that market is under correction from last couple of months and we hope situation to improve from here.

Sugar Production is expected to be lower than normal in Maharashtra due to floods in some districts and drought in others. Most of the sugar millers all across India are expected to produce more Ethanol and less sugar by processing B-Heavy Molasses.

We at Catalysts have re-aligned ourselves to new market dynamics and are ready for coming season. We are launching new products, starting new verticals and opening new markets. We will continue to grow as always...

Best of luck to everyone...

Munish Madaan

Message from the Director

Dear Friends,

Bienvenidos i.e. Welcome all,

Almost half of the financial year has gone and the upcoming year is not just the sugar, molasses & brewery season but also the festival season. Happiness & celebrations from festivals will lift up our positive energies within and for sure that will reflect in the overall feel of India.

Though last 2 quarters have been challenging at Industrial & economic front but we are sure of positive outcomes of all the steps being taken by the Government over the next 2 quarters. We must be optimistic to look forward for positive results as our good feelings will generate positive thoughts which will help us draw the vision for a brighter future, this will liberate high energy within us to deliver promising results by challenging our limitations and surpassing our commitments. Thats the way of life and that's the life each one of us at Catalysts have.

India is now on the international podium where entire world is tracking India's growth. Our principals & associates are all geared to take on the market with new technologies & applications. Next 2 quarters we will have improved & advanced versions of some of our existing products, new products in existing verticals and the rise of our few new industry verticals.

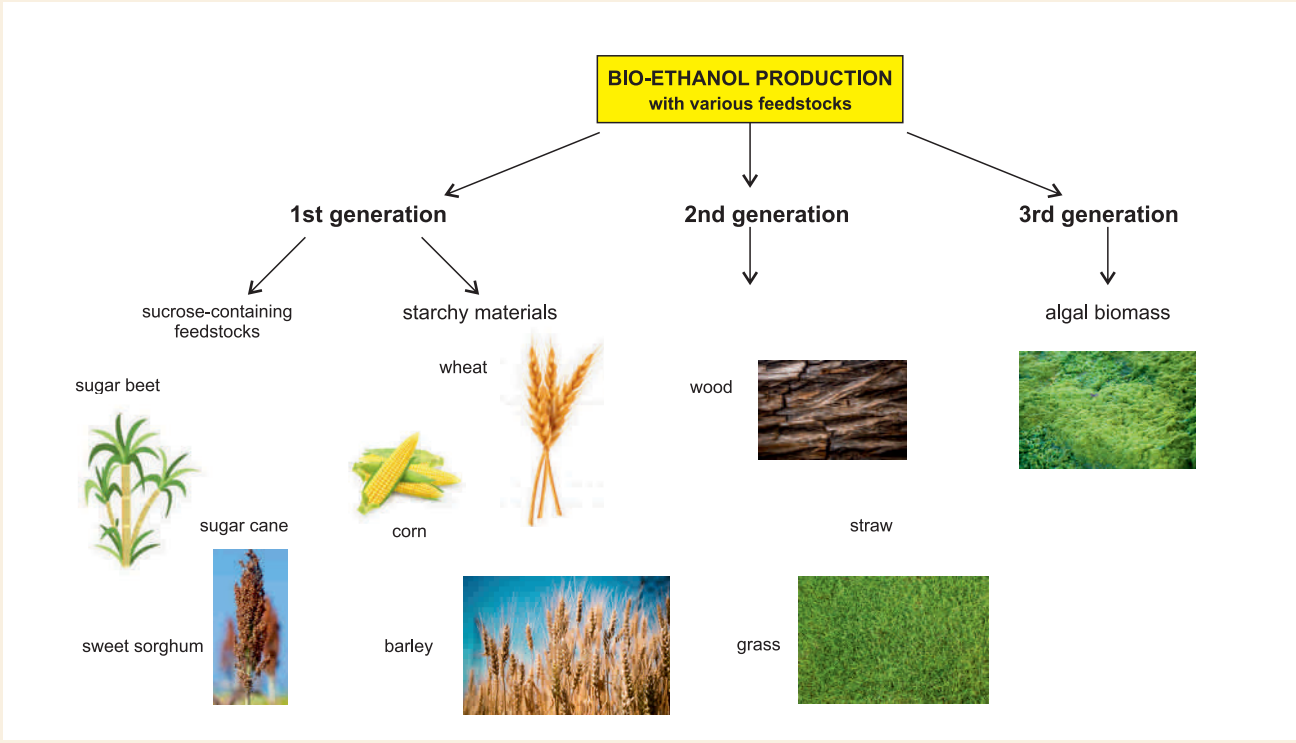
Our sales and technical service team backed by R&D are ready 24X7 to offer solutions & resolve troubleshooting. The roar of Catalysts team will be loud enough in the market to get noticed as we all here are committed for action and take the industry to next level.

We thank you for all the trust, support & co-operation always. Entire Catalysts family wishes you great celebrations for the festive season.

Aditya Malhotra

FUTURE ASPECTS FOR SECOND GENERATION ETHANOL

(Cellulosic Ethanol) - Shushil Kumar & Peeyoush Katiyar - Business Development



What is 2G Ethanol?

Second-generation biofuels, also known as advanced biofuels, are fuels that can be manufactured from various types of non-food biomass. Biomass in this context means plant materials and animal waste used especially as a source of fuel.

First-generation biofuels are made from the sugars and vegetable oils found in food crops using standard processing technologies. Second-generation biofuels are made from different feedstocks and therefore may require different technology to extract useful energy from them. Second generation feedstocks include lignocellulosic biomass or woody crops, agricultural residues or waste, as well as dedicated non-food energy crops grown on marginal land unsuitable for food production.

The term second-generation biofuels is used loosely to describe both the 'advanced' technology used to process feedstocks into biofuel, but also the use of non-food crops, biomass and wastes as feedstocks in 'standard' biofuels processing technologies if suitable. This causes some considerable confusion. Therefore it is important to distinguish between second-generation feedstocks and second-generation biofuel processing technologies.

Second generation (2G) ethanol draws on previously unused (ligno-) cellulosic plant parts, such as straw or corn cobs.

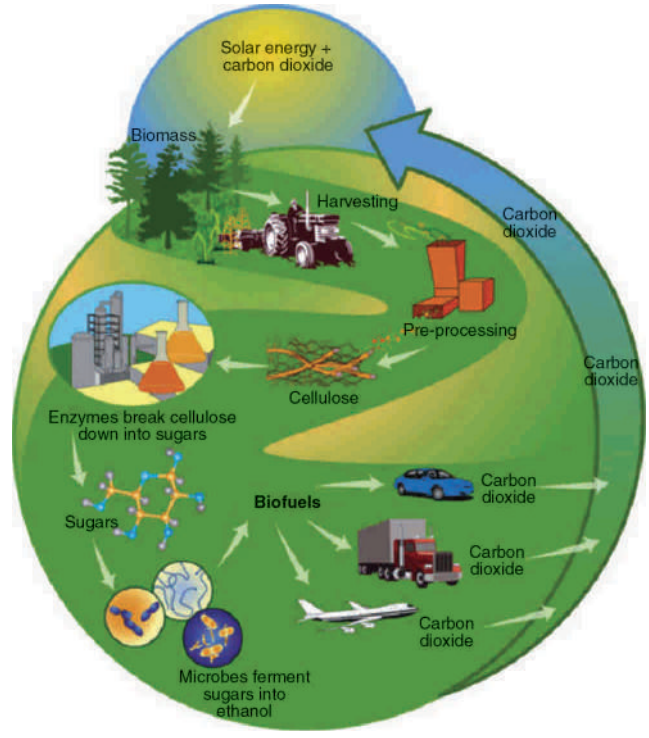
The core area of the new developments is the preparation of the raw material. The support structure of the plant, lignocellulose, must be broken down in order to then make the cellulose accessible to saccharification.

From the resulting hydrolysate bioethanol is produced by fermentation, distillation and dehydration, as in the classical process. For these steps modified first generation technology is used.

Why Cellulosic Ethanol?

The abundance of cellulosic materials, which boils down to about 60 to 90 percent of earth's biomass measured by weight, along with the fact that they are not used for food and feed (unlike corn and sugarcane), are significant reasons why cellulosic ethanol and other cellulose-b

Using biomass for transportation fuels raises questions concerning the logistics of feedstock production such as land use and land use change, fertilizer and pesticide use, water consumption, and energy used for production and cultivation. However, grasses and trees typically require minimal labor and generally have lower fertilizer and pesticide needs and resources as opposed to other row crops such as corn. Grasses such as switchgrass require a low level of attention and are perennial crops that do not need to be re-planted for about 20 years and provide as easily accessible feedstock to produce cellulosic ethanol.

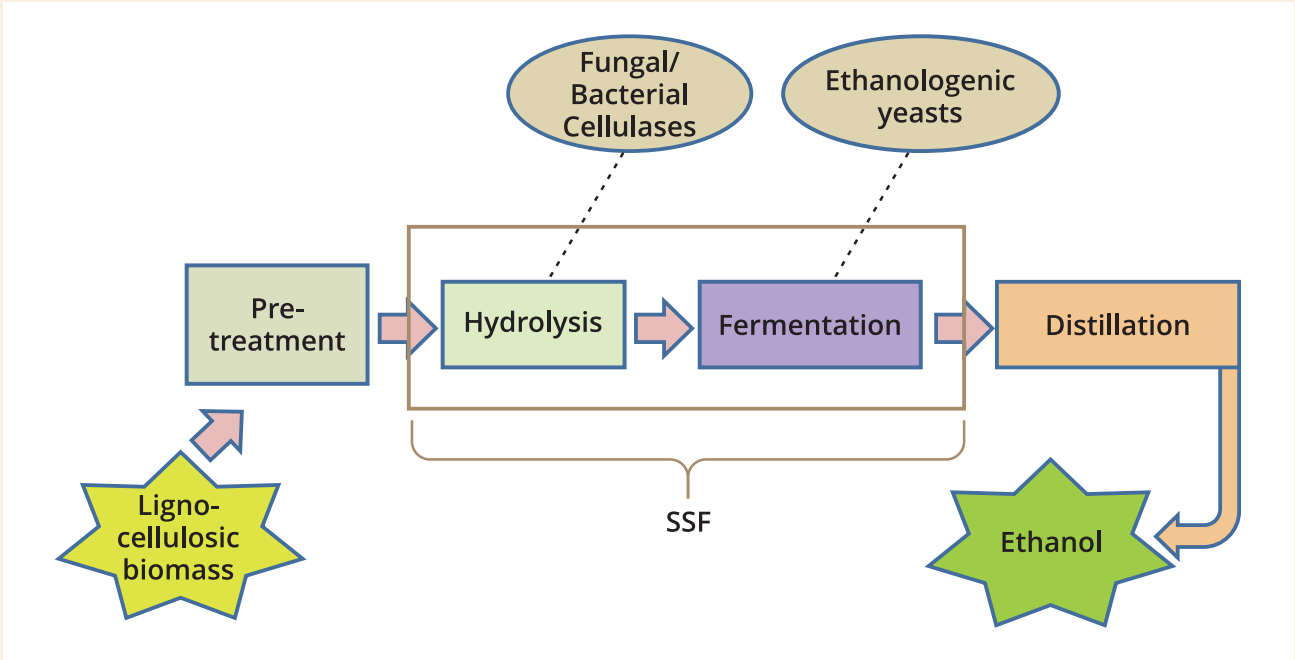


Cellulosic Production Process

The chemical make-up of ethanol is uniform across the board whether it is produced from corn, sugarcane, or cellulose; however, the differences lie in the production processes and the necessary technologies in different stages of development. While corn- and sugar-based ethanol production technologies have been produced at a commercial scale for decades, some of the technologies needed to manufacture cellulosic ethanol, an advanced biofuel, are relatively new. Today, there still no fully operational commercial-size cellulosic ethanol facilities in the United States.

The stages to produce ethanol using a biological approach are:

1. A "pretreatment" phase, to make the lignocellulosic material such as wood or straw amenable to hydrolysis
2. Cellulose hydrolysis (that is, cellulolysis) with cellulases, to break down the molecules into sugars
3. Separation of the sugar solution from the residual materials, notably lignin
4. Microbial fermentation of the sugar solution
5. Distillation to produce roughly 95% pure alcohol
6. Dehydration by molecular sieves to bring the ethanol concentration to over 99.5%



The process of producing ethanol from cellulosic materials is also far more complicated than the processes employed for starch- or sugar-based ethanol. Enzymes must break up the complex cellulose-hemicellulose-lignin structure in which cellulosic materials are found before the fermentation process can begin. The cellulosic ethanol conversion process consists of two basic steps: pretreatment and fermentation. This two-step process is what is responsible for the increase in time, expense, and complexity of converting the cellulosic biomass into ethanol, relative to the procedures used to convert corn or sugarcane into ethanol.

Pretreatment

Pretreatment is necessary to prepare cellulosic materials for hydrolysis, which converts the hemicellulose and cellulose into glucose. Standard pretreatment includes a chemical pretreatment step involving acid and a physical pretreatment step such as grinding. These steps make the cellulose more accessible to the cellulases, which are the enzymes that digest cellulose and turn it into glucose. These enzymes catalyze its conversion to sugars in the successive steps and begin the breakdown of hemicellulose into glucose. Following pretreatment, the conversion of cellulose to glucose is completed using a chemical reaction called hydrolysis, normally employing enzymes secreted by certain organisms (typically fungi or bacteria) to catalyze the reaction. The pretreatment and hydrolysis process usually results in one co-product, lignin, which can be burned to generate heat or electricity. Using lignin instead of a fossil-based energy source to power the conversion process reduces cellulosic ethanol's life-cycle greenhouse gas (GHG) emissions, compared to corn-based ethanol.

Once the sugars have been derived from the cellulosic materials, they are fermented using yeast or bacteria in processes similar to those used for the corn-based ethanol production. The liquid resulting from the fermentation process contains ethanol and water; the water is removed through distillation, again similar to the corn-based ethanol process. Finding the most effective and low-cost enzymes for the pretreatment process and organisms for the fermentation process has been one of the main areas of research in the development of cellulosic ethanol. The type of feedstock and method of pretreatment both influence the amount of ethanol produced. Currently, one dry short ton of cellulosic feedstock yields about 60 gallons of ethanol. Projected yields with anticipated technological advances are as high as 100 gallons of ethanol per dry short ton of feedstock.

Benifts Over first Generation ethanol

Ethanol produced from both cellulosic as well as 1G is essentially the same. But, cellulosic ethanol has many advantages. Firstly, it uses residual feedstocks, which are otherwise wasted or burnt. It has an attractive CO2 profile with often negative CO2 and no need for additional land use. Further, the creation of this new industry will also allow infrastructural development in rural areas, create new jobs and help India achieve its climate targets.
In India, the agricultural sector, which has long been the backbone of our economy, also presents a unique opportunity to develop cellulosic ethanol cellulosic ethanol industry because of the availability of vast agricultural residues. It is estimated that by 2020, between 125 million and 183 million tonnes of biomass residues will be available annually in India for conversion in cellulosic ethanol. Thus, without changing today's agricultural land-use patterns or cultivating new energy crops the available biomass residue could be converted into approximately 50 billion litres of cellulosic ethanol annually. Cellulosic ethanol industry will also lead to the following benefits:

- It will create a million aggregated jobs predominantly be in rural areas, enhancing India's agricultural sector and providing impetus to inclusive growth
- Catalyze rural development by generating up to $ 15 – $20 billion of annual revenues in India by 2020, leading to inclusive growth especially in the rural economy.
- Reduce road transport greenhouse gas emissions from fossil gasoline by 47-69%. CO2 and methane emissions would also decrease as biomass residues not be burned or decompose in the field.

The Government has already sponsored cellulosic ethanol pilot projects in the country and a few private companies have also announced their plans for initial demonstration plants. Although there is positive intent from the Government, stable & coherent policy framework is required to fast-track the deployment of second generation biofuels including:

- Blending
- Mandates Loan guarantees
- Private/public co-financing Biomass collection programs, and Infrastructure directed towards end consumers (e.g. pipelines and blending infrastructures).

Govt. promise of the second-generation (2G) bioconversion industry is that it will transform cellulose-based, nonedible biomass and agricultural waste into clean and affordable high-value fuels or chemicals. (The first-generation, or 1G, technology converts edible biomass.) In this way, 2G could offer an alternative source both of energy and of chemical-industry inputs, which other renewable technologies cannot provide.
That is 2G's potential, but the industry failed to deliver on this promise for almost a decade. However, there has been progress in recent years. Since the inauguration of the first commercial-scale 2G plant, in 2013, eight more have opened around the world, of which some, not surprisingly, are failing, while others are progressing

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What's next

The design, reliability, and processes of 2G equipment are all improving. Meanwhile, engineering is rightsizing specifications, increasing levels of process automation, and eliminating costly process aids. The race is on to become the first player to operate a stable, cost-competitive commercial-scale plant. For front-running facilities, the question is not whether their processes work but rather the strength of their operational performance—uptime, throughput, yield, and cost—and how quickly they will cut costs while improving their operations.

Refrences

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Advanced Biofuel Can Replace Diesel Fuel

Manav Prakash Sharma - QA & QC

Why enzymes and Biomass?

Biomass is the main source of biofuel production Converting domestic biomass into affordable fuels as biodiesel, bioethanol, biohydrogen,and biogas, are sustainable and renewable sourcesof energy, which are also considered CO2 neutral. In addition,burning biofuels results in reduced levels of particulates,carbon oxides and sulfur oxides, emissions compared to fissile fuels. To respond to the increased demand for biofuels, advanced biochemical processes using enzymes are being developed,which are gaining increased global attention. Research in this field aims at improving efficiency, and reducing negative environmental impacts, of production processes, in addition to enhancing the quality of the produced biofuels. Enzymes have been employed to overcome the drawbacks associated with the use of conventional chemical catalysts. For example, biodiesel production by enzymatic catalyzed processes is less energy intensive and more environmental friendly compared to its production by conventional alkaline catalyzed processes. In addition, the biocatalyst allows using unrefined feedstock, including waste oil, readily without the need to separate the free fatty acids that may be present in large amounts in the feedstock. Another example is the use of enzymes for the hydrolysis of cellulose to produce fermentable sugars for bioethanol production. The utility cost of enzymatic hydrolysis is much lower compared to the alternative methods of acidic hydrolysis because it is carried out at mild conditions and does not require subsequent treatment step.

Indeed, biomass is the only renewable energy source that can offer a substitute for petroleum-based, liquid transportation fuels for the near term. Developing domestic biomass as a clean, sustainable energy resource for transportation. Biofuels offers a range of significant benefits. (Source:- Enzyme research)

Why enzymes and Biomass?

Reduce Greenhouse Gases

Whether it's the melting of the frozen glaciers that shroud Kilimanjaro, Africa's highest mountain, or the overall rise in the level of the oceans, global warming is reshaping the planet. While some people see global warming as a natural event, most scientists agree that fossil fuels, such as oil and coal, drive the temperature increase. When burned, fossil fuels release greenhouse gases, including carbon dioxide, into the atmosphere. These greenhouse gases trap radiation from the sun close to the surface of the planet, causing the planet to warm. o stem the release of greenhouse gas, people around the world are using biofuels, such as ethanol or biodiesel, to power their homes, cars and factories. Some experts say that ethanol reduces greenhouse gas emissions up to 65 percent Scientists in Australia say biodiesel made from cooking oil reduces greenhouse gas emissions by 87 percent compared with petroleum diesel

High Quality Engine Performance

The neat thing about biodiesel is that it can run in existing diesel engines with little or no modification to the engine or its fuel system. Performance is the same. However, some biodiesel vehicles are sluggish in cold climates. Since most vegetable oil is high in saturated fat, ice crystals tend to form in the biodiesel causing a vehicle's engine to struggle. However, biodiesel made from certain types of vegetable oil, such as canola (a form of rapeseed), is lower in saturated fat, which makes it harder for ice to form in frigid temperatures . Biofuels help engines last longer, too. Oil has a high viscosity rate. Tests show that high biodiesel blends above B10 (10 percent biodiesel, 90 percent petroleum diesel) do not impact the vehicle's engine performance.

Positive Economic Impact

When gas prices in the United States topped $4 a gallon in the summer of 2008, motorists were aghast. Many drivers began thinking long and hard about buying alternative fuel-powered vehicles, including those that run on ethanol and biodiesel. For example, a flex-fuel car that runs on both ethanol and gasoline gets about 40 miles (64.37 kilometers) to the gallon, according to the National Highway Transportation and Safety Administration. While fuel economy is one way to measure the economic benefits of biofuels, there are others. For instance, biodiesel production has had a positive impact on the economy. Biodiesel production in the United States increased from 500,000 gallons (1.89 million liters) in 1999 to 545 million gallons (2.06 billion liters) in 2009, adding $4.28 billion to the gross domestic product. While biodiesel remains more expensive than regular diesel, consumers need to look beyond the cost per gallon to really gauge the economic benefits. Biodiesel vehicles get 30 percent better fuel economy than gasoline-powered vehicles. Biodiesel creates fewer emissions, including cancer-causing benzene, and it also produces less pollution by decreasing the amount of particulates suspended in the air less pollution means lower healthcare costs. In addition, as biodiesel becomes more fuel efficient, many businesses that use diesel engines, especially the trucking industry, could see more profits by gassing up with the green fuel.

Sustainability

One day the world will run out of fossil fuels, and with it, our main sources of energy will go up in smoke. But biofuels are different. They're made from plants that can grow and be replanted again and again. Perennial crops don't even have to be replanted. Still, not all biofuels are created equal. Some "energy crops" produce more energy than others. For example, rapeseed has a higher oil content than other vegetable plants, which means rapeseed can generate more energy when burned. Perennial plants, such as switchgrass, provide an abundant source of power, generating five times as much energy as they take to grow

Economic Development

In addition to reducing dependence on foreign oil, many countries expect the biofuel industry to fuel economic development in poor, rural areas. For example, experts at the International Food Policy Institute (IFPI) say in Tanzania, ethanol made from a shrub called cassava can help reduce poverty in that West African nation where 80 percent of the labor force is farmers. Tanzania is one of the poorest nations on the planet. IFPI experts say that government investment in the biofuel industry might lower Tanzania's poverty rate by 5 percent in the next 10 years. However, there is a downside. Shifting crop production from food to fuel could cause a decline in food supplies and a spike in prices . As a result, governments need to pay attention to how biofuel crops are grown to ensure an adequate supply of both food and biofuel crops.

Reduce Foreign Oil Dependence

In 1973, the oil-producing nations of the Middle East stopped exporting oil. Oil prices rose. Economies across the globe suffered. In the United States, people waited in line for hours to buy what little gasoline there was. The embargo was a cold slap in the face to the rest of the world. Governments scrambled to find new ways to deal with the energy crisis. Eventually the oil-producing countries lifted the embargo, but our thirst for oil continued. Today, humans consume 85 million barrels of oil a day .Americans use nearly 18.7 billion barrels a day . While growing sustainable energy crops at home will lessen the nation's reliance on foreign oil, most experts agree it will not solve our energy woes in one blow. Instead, biofuel use, coupled with long- and short-term solutions such as raising fuel economy standards for motor vehicles; enacting tax incentives for hybrids and fuel-cell vehicles; and increasing the use of all renewable fuels will help the United States -- and the world -- wean itself off oil.

Fuel Economy

Vehicles that run on biodiesel get 30 percent better fuel economy than gasoline-powered vehicles, which saves drivers money every time they visit the gas station.In 2006, the Toledo Area Regional Transit Authority (TARTA) in Ohio and The Intermodal Transportation Institute at the University of Toledo began a three-year fuel comparison study to determine the fuel economy of B20 and conventional diesel. Preliminary results showed that some of the biodiesel buses created less pollution, had lower maintenance costs, and had a 5 to 8 percent increase in miles-per-gallon.

Health Benefits

Each year in the United States, 10,000 people die from pollution created by gasoline engines [source: Reilly]. Among other irritants and pollutants, gasoline releases nitrogen oxide and acetaldehyde. Acetaldehyde molecules react with sunlight to form smog. These emissions make thousands of people sick every year with respiratory ailments and cancers .Biofuels discharge fewer toxins into the air than fossil fuels. When compared to conventional diesel, biodiesel reduces smog-forming particulate matter, which reduces cases of asthma and other respiratory illnesses. In addition, biodiesel doesn't emit any sulfur oxides and sulfates, which contribute to acid rain.

For its part, ethanol generally burns better and more robustly than gasoline, generating less pollution. When compared with gasoline, an E85 fuel blend (15 percent ethanol, 85 percent gasoline) burned in an efficient engine produces fewer toxins, including 40 percent less carbon dioxide; 20 percent less particulate matter; and 80 percent fewer sulfates However, scientists at Stanford University in California say ethanol releases many of the same pollutants as gasoline. In addition, a large amount of unburned ethanol escapes into the air, forming acetaldehyde molecules and ultimately smog. But, engines fueled by ethanol emit fewer cancer-causing substances than gasoline.

Biodiesel Is Becoming More Energy Efficient

In a car or truck, petroleum diesel is currently more energy efficient than biodiesel, but things are changing. According to the U.S. Department of Energy, the energy content of a gallon of diesel is 11 percent more than the energy content of a gallon of biodiesel. With all things being equal, a truck running on a mixture of 20 percent biodiesel and 80 percent diesel gets 2.2 miles fewer miles per gallon than a truck running on just diesel [source: U.S. Department of Energy]. Nevertheless, biodiesel is more energy efficient than gasoline.

In addition, producing biodiesel is becoming easier and more energy efficient. How so? Researchers at the University of Idaho and the U.S. Department of Agriculture say for every unit of fossil fuel energy needed to grow and refine soybeans into biodiesel, four-and-a-half units of energy are gained. In comparison, for every unit of fossil fuel needed to produce petroleum diesel, the return is less than one. Researchers say that farmers and refineries are using less fossil fuel and better production methods to turn soybeans into energy-efficient biodiesel

Classification of Biofuel...

First Generation (from sugars, grains, or seeds)

Biodiesel

From: Rapeseed, Soybeans, Sunflowers, Jatropha, Coconut, Palm, Recycled Cooking Oil

Ethanol

From grains or seeds: corn, wheat, potato

From sugar crops: sugar beets, sugarcane

Rapeseed Biodiesel

Sugarcane Bio-ethanol

Second Generation (from lignocellulose: crop residues, grasses, woody crops)

- Biological fuels :- Ethanol via enzymatic hydrolysis
- Thermochemical fuels (most made via “gasification”)

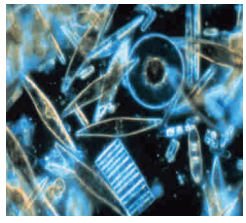
  Fischer-Tropsch liquids (FTL)
  Methanol, MTBE, gasoline
  Dimethyl ether (DME)
  Mixed alcohols
  Green diesel

VEGETABLE OIL → HYDRO PROCESSING → GREEN DIESEL

BIOMASS → GASIFICATION → FISCHER TROPSCH SYNTHESIS → BTL

Third Generation (from algae)

Growing biomass by means of micro-organisms (such as phytoplankton, micro-algae, bacteria) to produce lipids suitable for conversion into diesel fuel

CO_2 →  → BIOMASS COLLECTION → LIPID EXTRACTION → CONVERSION TO GREEN DIESEL

Open ponds, fotobioreactors or hybrid system

CO2 produced from power station and industrial plants can be used to feed the process (CO2 recycling and biofixation).

Top Ten Sources for Biofuel Production

1. Cellulose
2. Algal Oil
3. Corn
4. Soy
5. Sugarcane
6. Camelina and Jetropha
7. Rapeseed
8. Methane
9. Animal Fat
10. Paper Waste

Food as medicine or Medicine as food ?

Dr. KVTS Pavan Kumar - Research & Development

Food being medicine is intuitive and since good olden days people know that the good health depends on a healthy diet. The state of well being is perhaps determined by the food we take than anything else in our lives. The diet is playing a major role on health throughout the life and showing both positive and negative effects. The type of food we regularly eat will decide whether we will become ill or remain healthy into older age.

The idea of "diet as medicine" goes back to at least more than 2,000 years ago when father of modern medicine, Hippocrates said **"Let medicine be thy food and let food be thy medicine" (4th century BC).** The globalization fuelled with economic development over the past decade made lot of impact on the health and nutritional status of the developing countries.

Nutrient deficiencies and toxicity from a poor diet are linked to nearly all modern health conditions. The influence of food on expression of various genes in our body contributes to either good health and longevity or to disease and earlier death. Pharmaceutical and nutritional sciences emphasis on the use of food for their diversified health benefits and potential clinical applications. The vegetables, fruits, meat, oils or grains contain influential substances including antioxidants, phytonutrients, vitamins, minerals, fatty acids, fibre and health professionals now recognize that a synergism of drug therapy and nutrition might confer optimum outcomes in the fight against diseases. The reports from John Hopkins University reveals that 80 percent of cancer patients are believed to be malnourished, and that treatments used to battle cancer (like chemotherapy) only increase the body's need for nutrients and very high-quality foods even more.

HOW FOOD WORKS LIKE MEDICINE

Source: draex.com

The conventional food items we eat have specific healing properties. This includes the garlic or onions which are good for cold, shiitake mushrooms that increases resistance to infection by boosting immune system, lycopene from tomatoes being helpful in certain cases of cancer (particularly prostate cancer). Most of the culinary herbs and spices which enhance the taste of the food are also good for digestion. For example, turmeric is a strong antioxidant and helps in counteracting many chronic conditions. Given the current scenario one must take decision on whether they would like to have "food as medicine" or "medicine as food".

> "Let medicine be thy food and let food be thy medicine"
>
> - Hippocrates (Father of modern medicine)
> 4th Century BC

In this context the **Food as medicine or Medicine as food**- series would give a gist of potential opportunities of incorporating certain ingredients in food/ diet which offers prospective health benefits. During this knowledge sharing exercise, one ingredient per series will be discussed / explained for their beneficial effects in healthy nutrition.

(to be continued)

Food Fortification

Namrata Tyagi- Research & Development

Food fortification is the enrichment process of adding micronutrients (essential trace elements and vitamins) to food. It can be carried out by food manufacturers or by government as a public health policy which aims to reduce the number of people with dietary deficiencies within a population. The predominant diet within a region can lack particular nutrients due to the local soil or from inherent deficiencies within the staple foods; addition of micronutrients to staples and condiments can prevent large-scale deficiency diseases in these cases.

Food fortification has been identified as the second strategy of four by the WHO and FAO to begin decreasing the incidence of nutrient deficiencies at the global level. As outlined by the FAO, the most commonly fortified foods are cereals and cereal-based products; milk and dairy products; fats and oils; accessory food items; tea and other beverages; and infant formulas. Nutrient deficiency is estimated globally to cause the deaths of between 3 and 5 million people per year.

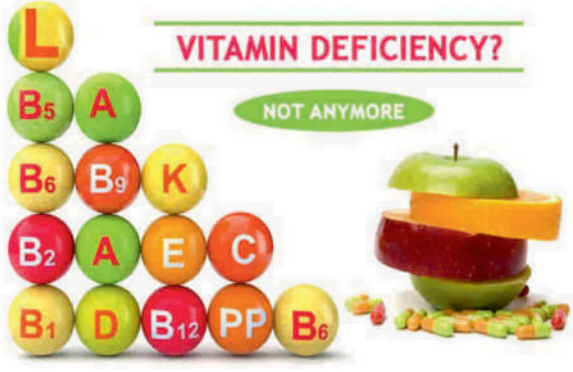
Food fortification overcomes the barriers to individuals accessing a range of nutrients which may be a lower concentration in normal meals, when the form of nutrient is not easily absorbed or when a certain public health issue needs to be addressed with food fortification.

Consuming fortified foods is an easy solution and supports a normalized approach to meeting increased nutrient needs and improving health. It fills in nutrient gaps that may be present in the individual's normal eating pattern, reducing the need to eat additional amounts of foods to obtain the same nutritional benefit.

Vitamins and Minerals Added to Grains

Each country sets standards to include the specific nutrients its population needs. The following vitamins and minerals are used in flour and rice fortification globally:

- Iron, riboflavin, folic acid, zinc, vitamin A, and vitamin B12 help prevent nutritional anemia which improves productivity, maternal health, and cognitive development.
- Folic acid (vitamin B9) reduces the risk of severe brain and spine birth defects. Fortifying with folic acid may also have a role in the child's mental health.
- Zinc helps children develop, strengthens immune systems, and lessens complications from diarrhea.
- Niacin (vitamin B3) prevents the skin disease known as pellagra.
- Riboflavin (vitamin B2) helps with metabolism of fats, carbohydrates, and proteins.
- Thiamin (vitamin B1) prevents the nervous system disease called beriberi.
- Vitamin B12 maintains functions of the brain and nervous system.
- Vitamin D helps bodies absorb calcium which improves bone health.
- Vitamin A helps individuals fight infections and helps prevent childhood blindness. It is often added to rice, cooking oils, margarine, or sugar instead of flour.
- Calcium builds strong bones, helps transmit nerve messages and assists with muscle function and blood clotting. A few countries add calcium to flour, but it is more commonly added to other foods.
- Selenium helps with reproduction and thyroid gland function.
- Vitamin B6 is needed for enzyme reactions involved in metabolism.
- Folic acid, vitamin B6 and vitamin B12 lower homocysteine levels.



Benefits of Fortification

- Since the nutrients are added to staple foods that are widely consumed, this is an excellent method to improve the health of a large section of the population, all at once.
- Fortification is a safe method of improving nutrition among people. The addition of micronutrients to food does not pose a health risk to people. The quantity added is so small and as well regulated as per prescribed standards that likelihood of an overdose of nutrients is unlikely.
- It does not require any changes in food habits and patterns of people. It is a socio-culturally acceptable way to deliver nutrients to people.
- It does not alter the characteristics of the food—the taste, the feel, the look.
- It can be implemented quickly as well as show results in improvement of health in a relatively short period of time.
- This method is cost-effective especially if advantage is taken of the existing technology and delivery platforms.
- The Copenhagen Consensus estimates that every 1 Rupee spent on fortification results in 9 Rupees in benefits to the economy. It requires an initial investment to purchase both the equipment and the vitamin and mineral premix, but overall costs of fortification are extremely low. Even when all program costs are passed on to consumers, the price increase is approximately 1-2%, less than normal price variation. Thus it has a high benefit-to-cost ratio.

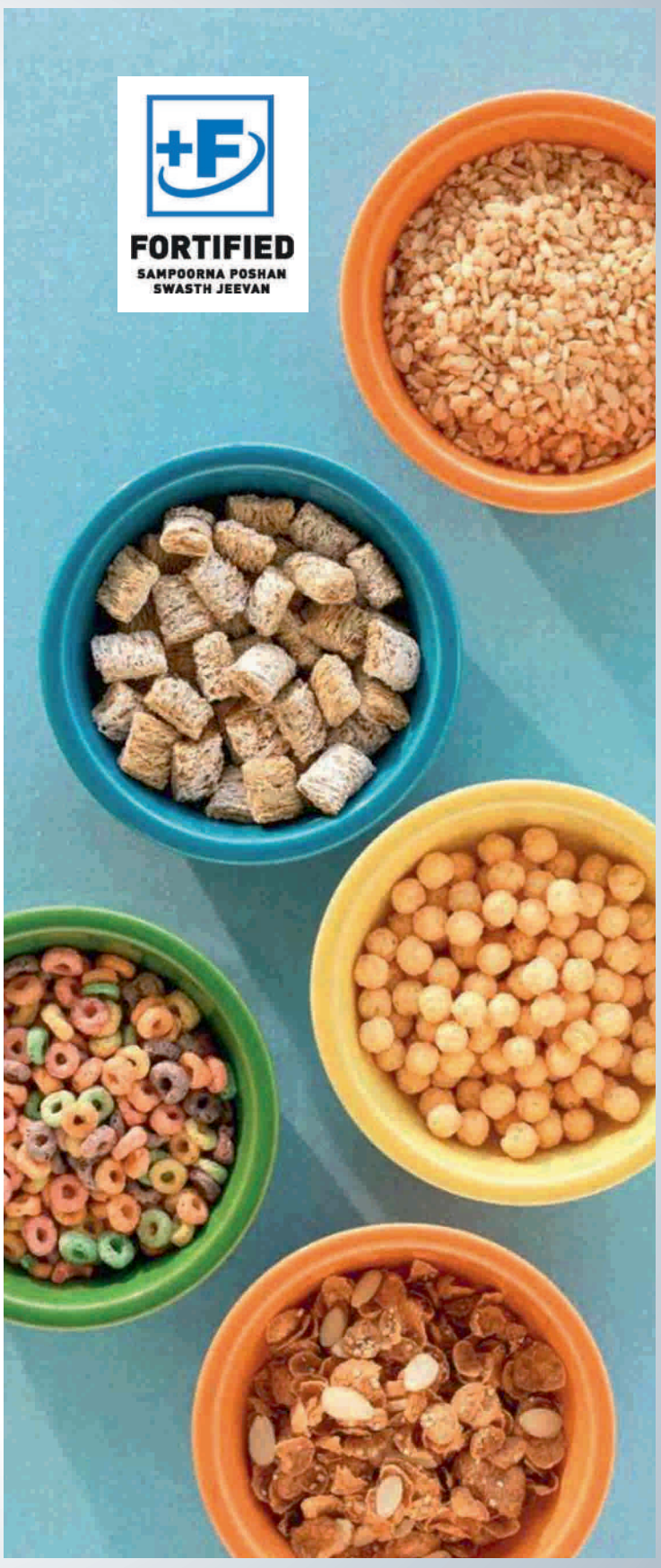
Bottom line

In some cases, fortified or enriched foods are helpful. They can fill in the gaps and increase a particular vitamin and mineral consumption that would otherwise be less than the recommended value.

But it's also easy to get too much. These foods can contribute to nutrient overdoses. Be aware of how much of each nutrient you are eating. Don't forget to include foods that don't come with a nutrition label, like dark leafy greens. Keep an eye on serving sizes to make sure you're not overdosing on added vitamins or minerals.

No matter what, you can't cover poor nutrition by adding extra vitamins. Desserts made with enriched flours and fortified breakfast cereals coated in sugar aren't healthy options. The typical diet is already full of nutrient-poor processed foods, added sugars, and refined grains. Avoid foods that contain added sugars, have trans fats, or are high in sodium.

While fortified and enriched foods can certainly add to a healthy diet, they aren't enough by themselves. You still need to eat a well-rounded, varied diet that is loaded with vegetables and other whole foods. You cannot rely on fortification or enrichment to get all of the nutrients you need.



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thepurefoodco.co.nz

Indian Agriculture Industry

Surendra Pal - Business Development

Indian agriculture has been a key contributor to India's growth story and continues to be one of biggest employers. India is the 2nd largest farm producer, 7th largest exporter and 6th largest importer as well. India is the world leader in the production of the Mango, Banana, Papaya, Lemon, Guava, Jackfruit, Pomegranate, Jute, Cotton, Millet, Pulses, Chili, Chickpea, Ginger and Safflower. India is also 2ns largest producer of Rice, Wheat, Cucurbit, Dry Beans, Onion, Cabbage, Cauliflower, Broccoli, Eggplant, potato, tomato, pumpkin & gourd, sesame, sugarcane, tea, peanut, tobacco and Silk.

The Gross Value Add (GVA) for agriculture sector was INR 48,720 Billion in 2018, over a production base of 285 Million tons. The food production target for 2019 is set for 291 Million tonnes. The market value is further expected to reach INR 89,380 Billion by 2023. The sector is likely to grow at an approximate rate of 2% on a year on year basis. The agriculture industry represents an important component of the Indian economy both in terms of its contribution to the GDP as well as a source of employment to the majority of the country's population. As the Indian economy has diversified and grown, agriculture's contribution to GDP has steadily declined from 32% in1951 to 16% in 2018.

While achieving food sufficiency in production, India still accounts for a quarter of the world's hungry people and home to over 190 million undernourished people. While agriculture in India has achieved grain self-sufficiency but the production is, resource intensive, cereal centric and regionally biased. The resource intensive ways of Indian agriculture has raised serious sustainability issues too. Increasing stress on water resources of the country would definitely need a realignment and rethinking of policies. Desertification and land degradation also pose major threats to agriculture in the country.

A UN study on global population trends predicts that India will surpass China to become the most populous nation in the world by 2022. With a present size of 1.35 billion, India currently supports nearly 17.84% of the world population, with 2.4% land resources and 4 % of water resources. It is also noted that about 15-25% potential crop production is lost due to pests, weeds and diseases. These indeed are challenging times. Keeping pace with these growing numbers, the country will not only have to raise its agricultural production but also the productivity to ensure food and nutrition security of the nation. Crop protection and crop enhancement solutions, based on best global practices and the latest technologies available are the answer. There are good emerging trends and solutions for sustainable crop protection which include crop protection chemicals, agronomy, fertigation, seed treatment, bio-technology development etc. The next generation agriculture in the country will have to encompass all such possible solutions using the best mode in a given scenario. Although yield per hectare has doubled in the past years, Indian agriculture is still grappling with challenges like high monsoon dependency, unpredictable weather patterns, reduction in arable land, low per hectare yield, increase in pest attacks, etc.

Being a key economic driver, the sector needs to adapt to the challenges that it is facing today.

Challenges

- High monsoon dependency: Indian agriculture is heavily dependent on monsoon. Poor rains could potentially hurt the agricultural output and lead to food inflation. In India, rainfall is the primary source of water, three-fifth of land under cultivation is watered only by rainfall; therefore the agriculture in India is often held hostage to the vagaries of rainfall.

- Unpredictable weather patterns: Across the globe, changing weather patterns are a major concern not only affecting crop productivity but also impacting lives of the farmers. Delayed monsoons, severe drought like conditions and excess rains resulting in heavy floods in several regions have often led to low agricultural output in those regions. On the other hand, unseasonal rains affect crop schedules or cause mass destruction and spoilage of crops. This has had a negative impact on crops like rice, wheat and also horticultural produce.

- Reduction in arable land: As per Indian agriculture census 2010-11, per capita arable land availability in India has consistently declined from ~0.34 ha in 1950s to ~0.15 ha in 2000s. With rising population it is further expected to reduce to ~ 0.07 ha by 2030.

- Decreasing farm sizes: As per Indian agriculture census 2010-11, the average size of operational holding in India has declined from 1.23 ha in 2005-06 to 1.16 ha in 2010-11. The 2011 Census of India indicates that 85% of farms are less than two hectares in size. While the average size of landholding is decreasing the number of operational holdings is increasing leading to poor harvest and low incomes for the farmers.

- Low per hectare yield: Per hectare yield in India is amongst the lowest in the world. Yields in India stand at 3 tons/ha compared to the global average of 4 tons/ha. Developed countries like USA (7), UK (7), France (7.5) and Germany (7) are able to achieve higher per hectare yields than India due to better farming practices.

- Increasing pest attacks: The total number of pests attacking major crops has increased significantly from 1940s. For instance, the number of pests which are harmful for crops such as rice has increased from 10 to 17 whereas for wheat have increased from 2 to 19 respectively.

Market Drivers

- India is the second largest populated country accounting for 18% of the total world population. With an increase in the population, the need for various agricultural products has increased significantly. This rise has prompted the farmers to adopt enhanced technologies and methods in dairy, fisheries and livestock in order to meet the diversified food needs of the people. Additionally, more than 58% of India's population is dependent on agricultural products which is further promoting the growth of the market.

- Over the past few years, India's GDP has been growing at a steady pace which has resulted in a rise in the disposable incomes of the consumers. This rise has driven the agriculture market both in terms of the producer and consumer. It has enabled farmers to invest more in advanced agricultural infrastructure such as irrigation facilities, quality seeds, equipment's, fertilizers, warehousing, cold storage, etc. It has also increased the consumers purchasing power creating a positive impact on the domestic demand of agriculture products.

- India represents one of the most bio-diverse countries in the world. The country encompasses various types of climatic conditions and soil types suitable for cultivating a large number of cereals, fruits, vegetables, flowers, cash crops, etc. The Indo-Gangetic plain, for instance, represents one of the most fertile lands across the globe. In addition, India also represents the second largest fish producing country in the world.

- Government support plays a vital role in the growth of the Indian agriculture sector as agriculture remains a primary means of livelihood for more than 58% of the India's total population and as such represents the most important vote bank for any government. The Indian government is providing subsidies to farmers on water, power, agricultural equipment, fertilizers, hybrid seeds, etc. The Government has also exempted agriculture income under the Indian income tax act, meaning income earned from agricultural operations is not taxed. Moreover, both state and central government often waive off loans given to farmers.

- The introduction of contract farming has also

created a positive impact on the agriculture industry. Contract farming reduces the load on the central and state level procurement system by increasing the private sector investments in agriculture. It also provides more exposure to the farmers to world class mechanized technology related to agriculture.

- The emergence of modern retail has also been an important catalyst for the agriculture industry. Modern retail helps in the elimination of middle men from the distribution chain, thereby providing better remuneration to the farmers. Organized retail enables the farmers to directly sell their produce to modern organized retail networks, thereby helping them to get a better price as compared to small-scale local vegetable markets. These retailers have also started signing supply agreements with various farmers which further assures them of a minimum income. Moreover, these agreements help farmers in reducing wastage, transportation costs and providing fresh supply of food items to the consumer.

- The establishment of rural banking and credit system has also played a pivotal role in the growth of the agriculture industry. The transformation of agriculture from subsistence to commercialisation requires investment on the farm along with the use of modern inputs. With the availability of credit, the constraint on certain inputs like seed, fertilizer, pesticides, hired labour, etc. has been reduced.

Top Trends

- Digital innovation in agriculture is the thing to look out for. We are likely to see streamlining of the policies, creation of necessary infrastructure to test and commercialise the innovation and creating incentives for adoption of these innovation, which can boost the infusion of digital solutions in the conventional businesses. The digital innovation in agriculture has applicability in infrastructure development, supply chain management and technology enablement of areas such as quality, traceability, logistics and distribution and other areas of value chain.

- Climate change is high on the priority list. There should be an effective climate risk mitigation strategy for effective water management, adapting to rising temperatures, facing drought situations. Solutions for early warning system can play a vital role in estimating and minimising the risk due to erratic climate change events. Water management and optimum utilisation of available water resources such as water user associations, water rationing etc will go a long way to benefit the agrarian society. This year, efforts to sensitise/incentivise adoption of climate change measures is a must to ensure long run benefits for the farming and trading community. Further, the regulators also need to consolidate the existing efforts in this field.

- The focus on developing the startup ecosystem and creation of digital agriculture is likely to continue in the FY 19. We expect to see more incubation happening for developmental and early stage startups while more funding is likely to continue in mid stage startups. Support infrastructure needs to be developed by each state. Further, we need to address key issues such as collateral requirement for loans, availability of growth capital, taxation on angel investment, applicability to mainstream government schemes etc.

- Leveraging the Farmer Producer Organisations (FPOs): There is a huge potential in monetising the number of farmers getting connected through FPOs. The FPO structure is currently in need of support services to enable them to secure business acumen and market linkages. Other key issues such as better insurance terms, quality assessment infrastructure, precision agriculture solutions for better crop management, access to finance, IT based applications etc. needs to be addressed for the success of the FPO's

- Water management initiatives like watershed management, drip irrigation and water user association can play an important role in the strengthening the agricultural sector. Considering the scarcity of water, end users need to be aware and work towards conserving water. Farmers should be incentivised and measures like loan waivers to farmers who use water judiciously could be used. Government agencies, too need to be empowered to monitor water usage in agriculture. Apart from these, we hope to see some bold steps to mitigate farmer's losses by expanding the insurance net, effective claim management, controlling distress sale and oversupply of agricultural commodities during the peak season. The Government bodies, private players and the growing agriculture start up community can together transform the sector's outlook. This aided by the digital drive in the sector can start the new agri and technology revolution in the sector.

Catalysts

making things happen...

ARTZENA CATGREEN

A Discovery of Nature

ADITI®

Certified and Approved as Organic Input
Recommended for Organic Agriculture as per the NPOP Standards
Accreditation No. : NPOP/NAB/0017

A Discovery of Nature

CATGREEN is the world's finest ARTZENA (SiO4) based bio-dynamic, multinutrient, balanced crop growth stimulant based on advanced Korean Technology. It has a unique combination of specially researched and designed zeolites, vermiculites containing more than 80 condensed high energy mineral elements including amino acids and vitamins. It is a world class plant nutrition product and a miraculous water of life.

Benefits

- ✓ Increases Yield
- ✓ Improves Quality of produce (color, size, keeping quality etc)
- ✓ Improves Soil texture and structure
- ✓ Neutralizes heavy metals and pesticide residues in soil
- ✓ Reduces Water usage
- ✓ Boosts Plant Immunity and metabolism
- ✓ Promotes Vigorous root growth
- ✓ Promotes Photosynthesis
- ✓ Increases Flowering and Fruit setting
- ✓ Increases Stress tolerance (both Biotic and Abiotic)
- ✓ Reduces Pests and Disease infestations
- ✓ Prevents Fruit drop & cracking
- ✓ Eco-friendly and Safe for use (Organic certified)

CATGREEN L1

(For All Field Crops)

Dosage : 200-250 ml per acre per spray
(To be applied 3-4 times at key growth stages - Vegetative, Flowering, Fruit setting and Fruit formation)

CATGREEN L2

(For Fruits, Vegetables & Ornamental Plants)

Dosage : 2-4 ml per litre of water per spray
(To be applied 3-4 times at key growth stages - Vegetative, Flowering, Fruit setting and Fruit formation)

CATGREEN P

(For all Crops-Field Crops, Fruits, Vegetables & Ornamental Plants)

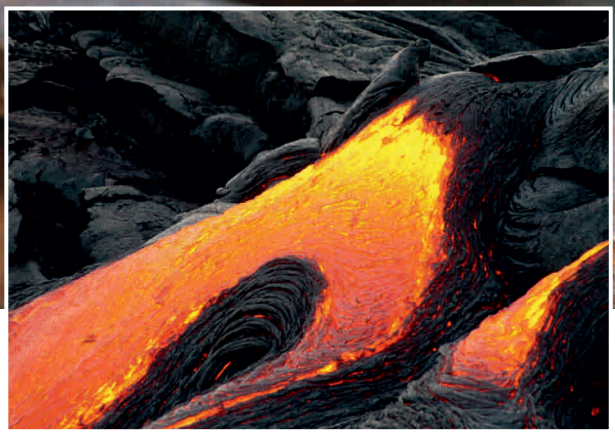
Dosage : 1-2 kg per acre
(To be applied in Soil at the time of land preparation before sowing)

For Queries, Please contact at: info@thecatalystsgroup.com

ARTZENA TECHNOLOGY

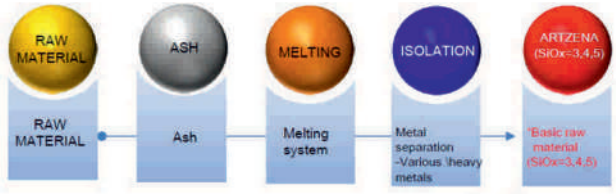
SiO4 ARTZENA refers to the number of life dynamo powders made of living high-energy artificial zeolite for human, animal and plant.

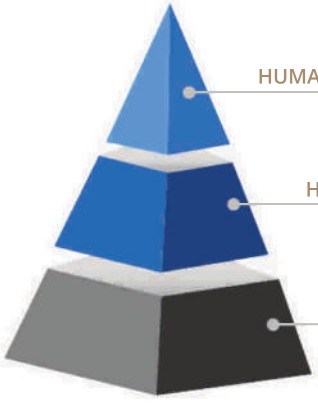
1. Retains physical attributes of natural mineral
2. Free of impurities
3. Ion exchange and binding properties
4. Heat exchange characteristics
5. Adorbs organic and chemical contaminants



IMMUNITY BOOSTER

EFFICIENCY BOOSTER





HUMAN A people-centered world that transcends race, state, and religion. A healthy society, a happy family is the future of the enterprise.

HEALTH The health of the body develops a healthy company with a calm mind and body.

ENVIRONMENT The basis of clean air, water, soil is the existence of the present and future value.

CATANBIO DRY

Functional food for a healthy gut

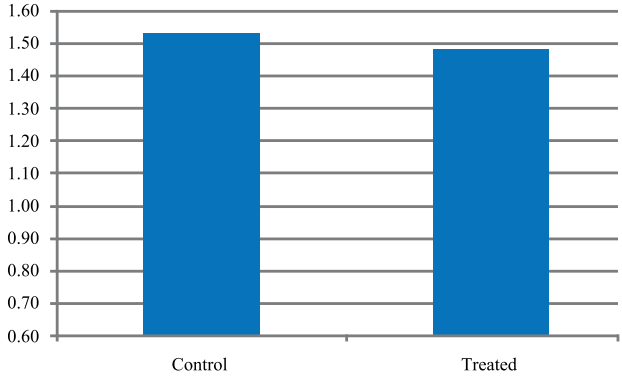
Features of CATANBIO DRY

- Reduces Mortality
- Improves Immune Status
- Improves Overall Health
- Boosts General Immunity

Trial Data for Catanbio Dry on Broilers

A statistically significant improvement in weight gain was observed.

4 point improvement in FCR observed in Catanbio Dry Treated Feed at a dosage 1 Kg/ MT



A Return of Investment (ROI) of 1 : 2, with over 90 gms body weight increase and reduction in mortality by over 30 % was observed in the trial

COMPONENTS

Artzena, Bacillus subtilis, Clostridium butyricum, along with carriers and stabilizers

Dosage: Metric Ton

Ten Things Successful People (Who Are Actually Happy) Do Differently

Monika Chaudhary - Human Resource

Achievement rarely produces the sense of lasting happiness that you think it will. Once you finally accomplish the goal you've been chasing, two new goals tend to pop up unexpectedly.

We long for new achievements because we quickly habituate to what we've already accomplished. This habituation to success is as inevitable as it is frustrating, and it's more powerful than you realize.

The key to beating habituation is to pursue, what researchers call, enduring accomplishments. Unlike run-of-the-mill accomplishments that produce fleeting happiness, the pleasure from enduring accomplishments lasts long after that initial buzz. Enduring accomplishments are so critical that they separate those who are successful and happy from those who are always left wanting more.

Researchers from the Harvard Business School studied this phenomenon by interviewing and assessing professionals who had attained great success. The aim was to break down what these exceptional professionals did differently to achieve both long-lasting and fulfilling success.

The researchers found that people who were both successful and happy over the long term intentionally structured their activities around four major needs:

Happiness:
They pursued activities that produced pleasure and satisfaction.

Achievement:
They pursued activities that got tangible results.

Significance:
They pursued activities that made a positive impact on the people who matter most.

Legacy:
They pursued activities through which they could pass their values and knowledge on to others.

Lasting fulfilment comes when you pursue activities that address all four of these needs. When any one of them is missing, you get a nagging sense that you should be doing more (or something different).

The behaviours that follow are the hallmarks of people who are successful and happy because they address these four needs. Try them out and see what they do for you.

They are passionate.
Jane Goodall left her home in England and moved to Tanzania at age 26 to begin studying chimpanzees. It became her life's work, and Goodall has devoted herself fully to her cause while inspiring many others to do the same. Successful, happy people don't just have interests; they have passions, and they devote themselves completely to them.

They swim against the current.
There's a reason that successful and happy people tend to be a little, well, different. To be truly successful and happy, you have to follow your passions and values no matter the costs. Just think what the world would have missed out on if Bill Gates or Richard Branson had played it safe and stayed in school or if Stephen King hadn't spent every free second he had as teacher writing novels. To swim against the current, you have to be willing to take risks.

"To be normal is the ideal aim of the unsuccessful" ~ Carl Jung

They finish what they start.
Coming up with a great idea means absolutely nothing if you don't execute that idea. The most successful and happy people bring their ideas to fruition, deriving just as much satisfaction from working through the complications and daily grind as they do from coming up with the initial idea. They know that a vision remains a meaningless thought until it is acted upon. Only then does it begin to grow.

They are resilient.
To be successful and happy in the long term, you have to learn to make mistakes, look like an idiot, and try again, all without flinching. In a recent study at the College of William and Mary, researchers interviewed over 800 entrepreneurs and found that the most successful among them tended to have two critical things in common: they were terrible at imagining failure, and they tended not to care what other people thought of them. In other words, the most successful entrepreneurs put no time or energy into stressing about their failures as they see failure as a small and necessary step in the process of reaching their goals.

They make their health a priority.
There are an absurd number of links between your health, happiness, and success. I've beaten them to death over the years, but the absolute essential health habits that successful and happy people practice consistently are good sleep hygiene (fights stress, improves focus, and is great for your mood), eating healthy food (helps you to focus), and exercise (great for energy levels and confidence).

They don't dwell on problems.
Where you focus your attention determines your emotional state. By fixating on your problems, you create and prolong negative emotions and stress, which hinder performance. However, by focusing on actions to better yourself and your circumstances, you can create a sense of personal efficacy that produces positive emotions and improves performance. Successful, happy people don't dwell on problems because they know that they're most effective when they focus on solutions.

They celebrate other people's successes.
Insecure people constantly doubt their relevance, and because of this, they try to steal the spotlight and criticize others in order to prove their worth. Confident people, on the other hand, aren't worried about their relevance because they draw their self-worth from within. Instead of insecurely

focusing inward, confident people focus outward, which allows them to see all the wonderful things that other people bring to the table. Praising people for their contributions is a natural result of this.

They live outside the box.
Successful and happy people haven't arrived at where they are by thinking in the same way as everyone else. While others stay in their comfort-zone prisons and invest all their energy in reinforcing their existing beliefs, successful people are out challenging the status quo and exposing themselves to new ideas.

They keep an open mind.
Exposing yourself to a variety of people is useless if you spend that time disagreeing with them and comforting yourself with your own opinions. Successful, happy people recognize that every perspective provides an opportunity for growth. You need to practice empathy by putting yourself in the other person's shoes so that you can understand how their perspective makes sense (at least, to them). A great way to keep an open mind is to try to glean at least one interesting or useful thing from every conversation you have.

They don't let anyone limit their joy.
When your sense of pleasure and satisfaction are derived from comparing yourself to others, you are no longer the master of your own happiness. When successful, happy people feel good about something that they've done, they don't let anyone's opinions or accomplishments take that away from them. While it's impossible to turn off your reactions to what others think of you, you don't have to compare yourself to others, and you can always take people's opinions with a grain of salt. That way, no matter what other people are thinking or doing, your self-worth comes from within. Regardless of what people think of you at any particular moment, one thing is certain—you're never as good or bad as they say you are.

By: Dr. Travis Bradberry

Bringing It all Together

People who are successful and happy focus on activities that address a variety of needs, not just immediate achievements.

New Joinees

Nilesh Omprakash Laddha
Department: Logistics
DOJ: 02/05/2019

Chandan Dixit
Department: Business Development
DOJ: 11/06/2019

Shubham Kumar
Department: Logistics
DOJ: 11/06/2019

Debasmita Dam
Department: R&D
DOJ: 01/07/2019

Swareena
Department: R&D
DOJ: 01/07/2019

Bhoopendra Bharadwaj
Department: R&D
DOJ: 22/07/2019

Nallabelly Praveen
Department: Business Development
DOJ: 5/08/2019

Ravi kant Dubey
Department: Business Development
DOJ: 12/08/2019

Manish Kumar
Department: QMS
DOJ: 12/08/2019

Yadvendra Nath Tripathi
Department: Business Development
DOJ: 12/08/2019

Dig Pratap Singh
Department: Business Development
DOJ: 19/08/2019

Independence Day Celebration

Offsite Tour- July'19

STAI-
July 2019
Kolkata

STAI-
July 2019
Kolkata

Philsutech
-August 2019,
Philippines

UPCOMING PROGRAMMES

TT Tournament:
14th September 2019

Inner Engineering Programme

by Isha Foundation: unique opportunity to be in the presence of Sadhguru

5th & 6th October, 2019 at India Expo Mart, Greater Noida

Airtel Delhi Half Marathon
20th October, 2019

Catalysts

making things happen...

PURSUIT OF EXCELLENCE

Catalysts values are based on belief of collective growth and respect in our internal and external relationships. This value system has facilitated our endeavour to enter into research and scientific collaborations with highly reputed institutes and organizations. We have a well-defined process for developing and launching innovative products based on the collaborative model.

Catalysts continuous striving for quality products and services developed with an innovative mindset has been recognized by various institutions. Our quality journey has been further detailed below:

Catalysts have been certified by ISO 9001:2015 ensuring compliance across multiple criteria including effective Quality Management System, efficient management of our processes and continuous improvement of the system.

Halal Certification Services (HCS) is a world-wide recognized certification providing assessment, auditing, and training services.

It has been established under the Food Safety and Standards Act, 2006 which consolidates various acts & orders that have hitherto handled food related issues. FSSAI has been created for laying down science-based standards for articles of food and to regulate their manufacture, storage, distribution, sale, and import to ensure availability of safe and wholesome food for human consumption.

Kosher certification is a standalone international quality standard which is increasingly prevalent in the food ingredients and retail sector. Catalysts Biotechnologies Pvt Ltd is certified from KLBD Kosher agency. As Europe's largest kosher agency KLBD is respected and accepted by all parties worldwide Kosher products require kosher certified ingredients. Ingredient buyers specify kosher knowing that their supplier's manufacturing process has been independently audited.

The FSSC 22000 Food Safety Management System provides a framework for effectively managing organization's food safety responsibilities. It is fully recognized by the Global Food Safety Initiative (GFSI) and is based on existing ISO Standards. It demonstrates that the company has a robust Food Safety Management System in place that meets the requirements of customers and consumers.

Research has been the backbone of Catalysts Biotechnologies Pvt. Ltd. since its inception. The research and development division located at 3/1/4, Site IV, Industrial Area, Sahibabad, Ghaziabad is recognized by Department of Scientific and Industrial Research (DSIR), Department of Science & Technology (DST), Ministry of Science & Technology, Govt of India. This recognition has created an enabling environment for development and utilization of new innovations benefit thereof for society and environment.

Catalysts

making things happen...

OUR VALUES

- Customer Centric
- Continuous Progression
- Persistence & Hard Work
- Integrity & Loyalty
- Humility
- Adaptability
- Learning Attitude

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Naturegen Technologies Pvt. ltd.

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naturegen
In sync with nature.

"We will endeavour to make 'Catalysts' a global brand in the Industrial Biotechnology space. Catalysts would be identified with a work culture of integrity, respect, team work, ownership, trust, learning and happiness for all

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ISO 9001:2015 Certified | FSSC 22000 Certified

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