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Editorial

A World Free of Hunger at a Lower Cost

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Pope Francis during his trip to Africa has mentioned that inequality amongst people and poverty will breed terrorism, violence and war. A little less than a billion people in the world are *undernourished* according to the Food and Agriculture Organization of the United Nations. 3.1 million Children do not make it to their 9th birthday because of *malnutrition*. 300 million children do not get *adequate food* per the UNICEF, United Nations International Children; s Emergency Fund. In 2008, the price of rice had tripled in some regions of the globe and has affected developing countries. The middle class as % of the population in this country, United States, has declined from 61% in 1971 to 51% 2011. Rich became richer and the *poor* remained poor. The unemployment rate was *10%* in late 2009 during the great recession. 14.6% of the U.S. population is on food stamps as of September 2014. During the great depression the unemployment rate was 25%.

The genetically modified crops offer the promise of adequate levels of food production that can drive their prices down and affordable for all citizens of the globe. Genetically modified crops can be used to make biodiesel that offer a viable alternate when and if the energy security of the world is at risk. Gene editing can lead to cows that can be used to in order to obtain more milk. Disease tolerance to cows can be increased using genome edition. A small piece of the genetic code that is functionally annotated can be swapped with genes that are found in animals without the undesirable attribute. Selective mating is used in the livestock industry. This takes a lot of time. Genome editing tools will get the job done sooner. Hornless cattle, edited female anoephellus mosquitoes can lead to eradication of malaria can come from gene editing. Genetic alteration is studied in domesticated pigs. Three genes in domesticated pigs that are found extra compared with those found in wild pigs are removed. Wild pigs are known for their resistance to diseases such as swine fever. Swine fever can be a plague to a herd of pigs. Recombinetics performs genome edition using tools such as Talens and Crispr. The tool Talens has been used by Recombinetics to generate more meat from fatter pigs, more muscles in beef cattle in Brazil. The metabolomics will be changed form an altered genome. Gene transcription and gene translation of the altered genome will lead to proteins that signal differently from the proteins from the unaltered genome. Longer hair grown cashmere goats that are meatier and faster dogs and novelty pets and bulky beagles are produced by Chinese researchers using genome edition techniques. Human organs can be grown in pigs using Crispr-cas9 gene editing tool.

The land used for cultivation of *genetically modified* crops has increased to 395 million acres in 2011 from 4.2 million acres in 1996. WHO, World Health Organization performs health-risk assessment in countries that produce genetically modified crops. Examples of these countries are United States, Canada, Ukraine, China, India, Spain, Mexico, Portugal, Indonesia, Australia and Germany. *Public confidence* in genetically modified crops is *jaundiced* by news reports of contaminated cataloupes in 2011 and listeria outbreak of caramel apples in 2014. The disasters killed 33 and 4 respectively. World leaders Mrs. Indira Gandhi and President L. B. Johnson took anti-poverty measures in the 1960s and 1970s. They smiled on genetically modified crops such as rapeseeds, corn, papaya, cotton, innate potatoes, soybeans, zucchini squash, more reddish tomatoes, sweet peppers and golden rice. The purpose of the genetic modifications have been largely to make the crop herbicide resistant, pest resistant, insect resistant, viral attack resistant, produce starch producing potato, soybean with less saturated fat, sugarcane with higher sucrose content and golden rice with β-carotene.

Gene silencing principles are used in the farm production of innate potatoes. RNA *interference* principles are used to disable the action of four genes responsible for creation of certain enzymes by methylation of oligonucleotide fragment. Two promoter sequences are *spliced* into the polynucleotide of *S Tuberosum*. The enzyme if formed is known to catalyze the formation of acrylamide during deep frying of potatoes. What it costs to obtain the microstructure amino acid sequence distribution of polypeptide that is encoded from DNA has declined from $2.5 million in 1974 to $150 this time and age. Sinplot's innate potatoes are expected to fare better than Monsanto's green leaf potatoes.

Genetically modified crops can be brought forward with greater efficiency and less time when microarray analysis are used. *Jatropha Curcas* shrub can be made more cultivable. The Jatropha seeds from the shrub can be crushed and oil generated. The Jatropha oil that is non-edible can be converted into biodiesel and glycerol by catalytic trans esterification. The cost of complete sequencing the genome of Jatropha Curcas in order to look for valuable mutations is down to $50 in 2014 from $250,000 to create master genome of *Jatropha curcas* 5 years ago. Gene expression of GUS reporter gene in Nicotiana Tabacum was driven by curcin gene found in *Jatropha Curcus*. RIP, risbosome inactivating protein was used to study the gene regulation. Silva-Junior (2011) found a set of SNPs for *Jatropha Curcus* using Illumina sequencing. Biodiesel may become an attractive renewable fuel when the oil price a barrel is $99. Shear flow was simulated on the desktop computer in order to obtain the energy needed and efficiency at which glycerol can be separated from FAME.

Products such as clothing, diapers, athletic shoes and automobile tires made from petrochemicals are going to be manufactured from raw materials that stems from botanical plants. Principles of enzyme catalysis are used in this endeavor. The PCR study of microorganism or host cell or polynucleotide that serves as catalyst can be performed using microarray analysis [1]. Cloning can be confirmed using sequencing studies. Mutagenesis and molecular cloning methods needed to achieve the desired outcome of higher yields can be designed using the information using microarray analysis. Engineered microbes and development of biocatalysts has led to the commercialization of bio based polymers. The environmentalists' concerns about air and water pollution can be allayed using manufacturing processes that are scaled-up from tube studies of bioprocess technologies. Plants can be used as source of raw materials for common polymers such as polyester, spandex, synthetic rubber and nylon. Energy sustainability is another benefit obtained using this route. A plant as a source for raw materials makes them renewable feedstocks.

Invista and Genomatics [2] have made the News for the investments in setting up manufacturing plants in order to prepare nylon intermediates from sugar. Acrylic acid for superabsorbent polymers is going to be manufactured using a bio based method by BASF, Cargill and Novozymes. A 100% bio based soda bottle is under development at Coca Cola and its partner Virent is going to supply the raw material. p-xylene is used as a precursor to terephthalic acid that is used in condensation polymerization with ethylene glycol in order to make PET, polyethylene terephthalate. Raw material supply and cost can be a critical factor in determination of the Present Worth of these manufacturing plants. Invista's Lycra brand spandex is 70% from dextrose that is derived from corn. The CO_2 emissions from these processes are low. These fibers are stretchy. Bioprocess based BDO was sourced from BASF. BASF had licensed this technology from Genomatica. Genomatica has demonstrated a bioprocess route to butadiene the monomer that is used to make polybutadiene that is used to make automobile tires. Engineered microbes have been developed in order to make caprolactum used in the preparation of nylon 6 and adipic acid and hexamethylenediamine used in nylon 6, 6. Virent has the technology that can be used to convert sugars catalytically into gasoline and diesel. Virent along with Shell has a vision to build bio refineries. A product from bio refineries is expected to become attractive by cost when the oil reserves become depleted. Acrylic acid production by biotechnology is a goal of a partnership of conglomerates such as BASF, Cargill and Novozymes, in the fields of agriculture, enzymes and chemicals. The group earlier this 2014 year reported 3-hyroxypropionic acid from sugar. 3-Hp was converted to glacial acrylic acid. This is used in order to make diapers that are superabsorbent. Commercial bio based products are likely in the next decade to make; (i) succinic acid, fumaric acid, malic acid from bacterial fermentation of glucose, chemical oxidation of 1,4-butanediol; (ii) 2-5-Furandicarboxylic acid from chemical dehydration of glucose, oxidation of 5-hydroxymethylfurfural; (iii) 3-hydroxypropionic acid from glycerol or glucose by bacterial fermentation; (iv) glycerol from vegetable oils by catalytic trans esterification; (v) sorbitol from glucose from corn syrup by hydrogenation of xylose; (vi) xylitol from xylose by bacterial fermentation. Downstream chemicals of these products include 1,4 butanediol, THF, tetrahydrofuran,

γ-butyrolactone, maleic anhydride, pyrrolidones, 1,3-propane diol, acrylic acid, methyl acrylate, acrylamide, propylene glycol, ethylene glycol, 1,3-propanediol, glyceric acid, lactic acid, acetol, acrolein, epichlorohydrin, isosorbide, propylene glycol, ethylene glycol, glycerol, lactic acid, alkanes, propylene glycol, ethylene glycol, glycerol, xylaric acid, furfural, 2,5-dihydroxymethylfuran.

Invista is setting up a $100 million manufacturing plant at Orange, TX in order to make AND, adiponitrile using next generation technology. They also have novel biotechnology process to make butadiene a raw material in the manufacture of automobile tires. Genomatica has posted on their websites 18 proprietary patents on bio based polymer technology. They prepare 6-ACA, 6-aminocaproic acid from 5-formylvaleric acid [3] using a biocatalyst. The 6-ACA is then converted into -caprolactum. They discuss a host cell or polynucleotide used to catalyze the reaction. Nylon 6 can be made from caprolactum. Nylon 6, 12 is a copolymer of caprolactum and laurolactum. Caprolactum has been made from compounds obtained from mineral oil in current industrial practice. Plasmids carrying the different genes were identified by genetic, biochemical and phenotypic means. PCR diagnostic analysis of transformed or purified plasmid DNA and DNA sequence analysis may be used. The genes that encode the biocatalyst were amplified from g DNA using PCR methods.PCR reactions were analyzed using agarose gel electrophoresis. PCR products were purified and cloned. The sequence of genes cloned by PCR was verified by DNA sequencing. *Escherichia Coli* was grown in 96 well plates with 940 µl media containing 0.02% L-arabinose. Protein expression was studied. Cells for small scale growth were obtained by centrifugation and supernatant was decanted. Centrifugation of 6000g was operated at 4°C for 20 minutes.

Whereas synthetic organisms and proliferation in a out of control manner can cause massive reductions in world population, there is nothing wrong with genetic modifications that cannot be corrected with what is right about gene modifications.

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