

MARICULTURE IS AS IMPORTANT FOR INDIA AS AGRICULTURE

Relevant for: Indian Economy | Topic: Economics of Animal-Rearing incl. White, Blue & Pink Revolutions

Untapped resource: Seaweed farmers at mandapam camp in Ramnad district. | Photo Credit: [M.J. Prabu](#)

About 37% of the area of the entire world is agricultural land, a third of which (about 11%) is used for crops. And as the population of the world rises to 9.7 billion people in 30 years, the land available for crops will reduce. Thus, there is an immediate need to try and improve the efficiency of food production. Experts predict that agricultural yield must increase by 50% between now and 2050. How to do this is the question facing agricultural scientists across the world.

Plants use sunlight to produce energy for their metabolism and food production. This is referred to as photosynthesis (wherein sunlight is used to make energy-rich molecules needed for producing food molecules). However, the efficiency of photosynthesis is rather low, just about 5% in most land crops. The most efficient land crop with 8% average is sugarcane, which is not all that edible, except for the sugar in it. If only we can increase the efficiency of crops such as wheat, rice and other grains!

One such attempt is through the project RIPE (Realizing Increased Photosynthetic Efficiency), undertaken by a group of scientists at the University of Illinois at Urbana-Champaign in the US, supported by the Bill and Melinda Gates Foundation (for some details, access Katherine Bourzac, in MIT Technology Review, August 14, 2017 issue).

One way of achieving it has been shown in the model plant tobacco where the scientists could “engineer photosynthesis” by increasing the expression of three genes involved in processing light. This increases the tobacco yield by 20%. The team is trying to do the same genetic engineering method in other plants. One such plant is cassava (also called tapioca, sago or sabudana) whose roots are carbohydrate-rich, and eaten by over half a billion people in Latin America and parts of Africa; indeed it is eaten as staple food in parts of Andhra, Kerala and the hilly areas of Assam. Genetic engineering of this plant was done, just as in tobacco, and appears to work.

Another way that some other scientists are trying is to reduce what is called photorespiration in plants. Here the energy and oxygen produced in the ‘light reaction’ of photosynthesis is drained by the plant to make “wasteful” products in the ‘dark reaction’, and not just carbohydrates and other food material, particularly when the plant’s leaves close in order to reduce water loss by evaporation. If we can find ways to reduce this photorespiration, edible food yields can go up.

Many of these research attempts involve the introduction of external genes and gene products into food crops, and these are opposed by group of people who do not want genetic engineering and genetically modified plants. This is a curious situation where science finds ways to deal with genes so as to improve yields while sociology opposes it based on worries about safety, as well as monopolistic control of food material through exclusive patents and other factors. A via media solution needs to be found, failing which food production may not increase all to feed the ever growing population of the world.

It is in this context that we need to open our minds and expand our ideas about our food habits.

The most efficient use of photosynthesis is actually not by land plants but by micro and macro algae, such as seaweeds. These are the champions, contributing to about 50% of all photosynthesis in the world. And many of them, notably those with dark green, red and brown colour, are edible. They are low-calorie and nutrient-dense food items and eaten by people in most parts of South East Asia – Philippines, Malaysia, Vietnam, Indonesia, China, Korea and Japan, and also in some in coastal Atlantic region. A site called “The definitive guide to edible seaweed” (foodrepublic.com) gives the details about several of these food items.

About 844 seaweed species are reported from India, a country with a coast line of 7,500 km. Peninsular India from Gujarat all way to Odisha and West Bengal has a coast line of 5,200 km, and Andaman and Nicobar together have a coast line of 2,500 km. Thus, while we have 63% of our land area for crop agriculture, we should not forget this vast coastal area, much of which breeds seaweeds. Research in the area of edible seaweeds in India has been going on for over 40 years. The Central Salt and Marine Chemicals Research Institute (CSMCRI) at Bhavnagar, Gujarat has done pioneering work in the area. Dr Amitava Das, its Director, tells us that over 20 scientists there have been involved for decades in research and propagation of seaweeds as potential of foods for people, as well as for isolating important chemicals of technological importance and crop biostimulant purposes.

Professor CRK Reddy, who was at CSMCRI for decades and currently at the Institute for Chemical Technology, Mumbai, has been an active advocate of seaweeds as food. He points out that among the seaweeds found in plenty, Ulva, Pyropia, Porphyra and Kappaphycus are edible and that it will be good to cultivate them in large scale, as is done in countries like Japan. And Dr Arockiaraj Johnbosco points out (Times of India, 12-1-2016) that, of the 306 seaweeds in the Gulf of Mannar, 252 are edible. Thus India should embark on Mariculture as vigorously as Agriculture, given its 7,500 km-long coastal line. Further, it does not require pesticides, fertilizers and water for irrigation, which is an added advantage.

Seaweeds are rich sources of vitamins A and C, and minerals such as Ca, Mg, Zn, Se and Fe. They also have a high level of vegetable proteins and omega 3 and 6 fatty acids. Best of all, they are vegetarian, indeed vegan, and do not have any fishy smell, thus good and acceptable. For all for those who worry about this “new” introduction, let us recall that India took quickly to imports like potatoes, tea and most recently to soyabean.

Professor Reddy has suggested that we may “break in” through the use of seaweeds as pizza seasoning, in spice sachets, so that people get used to them. After all, if the entire Eastern Asian population eats them, why not we from South Asia?

dbala@lvpei.org

What is mutualism? How many carbon atoms does a Furan ring have? For answers, and more interesting questions, take this quiz.

END

Downloaded from **crackIAS.com**

© **Zuccess App** by crackIAS.com