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Times of Agriculture

An explode in Agriculture

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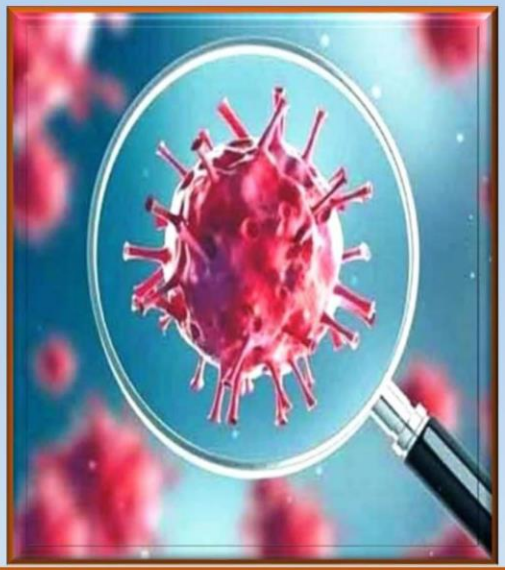

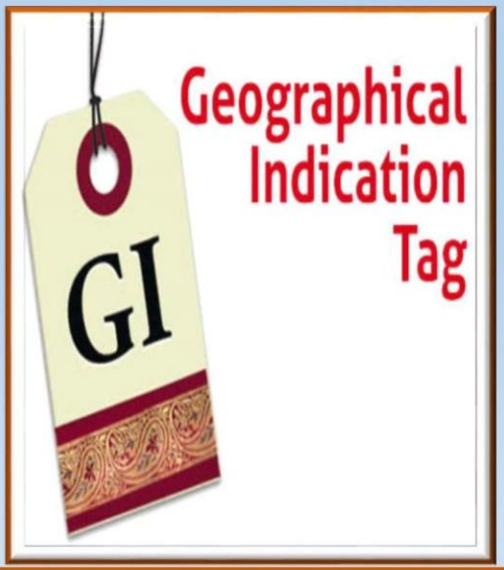

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Times of Agriculture
An Explode in Agriculture

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Few Words

Today, the whole world is in the grip of covid-19 epidemic which has baffled the economy path of both the nation and the world. In such a time as this, a country like India needs to be extremely vigilant. It is out in the open that the Indian economy is signaling the whole world. In moments like these, when climate change is having it's own different mood, a nation like India demands a skilled manager.

Our magazine "Times of Agriculture" includes published articles by experts of varied disciplines in the context of various contemporary situations as well as conditions pertaining to agriculture, the benefit of which will be received by everyone. Articles on diverse affairs allied to agriculture work of the country and the world will be published in this magazine to be utilized by agricultural students, agricultural scientists and farmer brothers. In the successful running of this magazine, the cooperation and assistance of senior agricultural scientists of the state and the country has been received and successful endeavors shall be taken unabated with the intention that their experiences and ideas may reach to you through publication in this magazine.

I believe that the magazine "Times of Agriculture" will bring a new revolution in the agriculture text of various latest and scientific activities of agriculture through it's active members. From time to time, success stories of various progressive farmers of the country will also be published in this magazine, so that we may continue to obtain different kinds of experiences.

(Devaraj Singh)
Editor-In-Chief

Contents

Agriculture updates

Mega food park launched in Mizoram

Food Processing Minister Harsimrat Kaur Badal launched a food park in Mizoram that will benefit 25,000 farmers and create 5,000 jobs. “The park will leverage an additional investment of about Rs 250 crore in about 30 food processing units in the park and would eventually lead to a turnover of about Rs 450-500 Crores annually.”

Govt approves setting up agri-infra fund of Rs 1 Trillion

The government approved setting up an agriculture infrastructure fund with a corpus of Rs 1 lakh crore to provide financial support to entrepreneurs, start-ups, agri-tech players, and farmer groups for infrastructure and logistics facilities. A decision in this regard was taken in the cabinet meeting, headed by Prime Minister Narendra Modi. The Agri-Infra Fund was part of the Rs 20 lakh crore stimulus package announced in response to the COVID-19 disaster. Briefing the media about the cabinet decisions, Agriculture Minister Narendra Singh Tomar said: "It is a historic decision. This will further the agriculture sector."He said that financial facilities of over Rs 1 lakh crore will be provided to primary agri credit societies, farmers groups, farmer producer organisations (FPOs), agri-entrepreneurs, start-ups and agri-tech players.

Alphonso Mango gets Geographical Indication tag

The Alphonso mango from Ratnagiri, Sindhudurg and other adjoining areas in Maharashtra have been accorded the Geographical Indication (GI) tag, the Ministry of Commerce announced A Geographical Indication or a GI is a sign used on products that have a specific geographical origin and possess qualities or a reputation that are due to that origin. The first product to get a GI tag in India was Darjeeling tea in 2004. There are a total of 325 products from India that carry this indication.

e-Kisaan Dhan launched by HDFC Bank

HDFC Bank launched of ‘e-Kisaan Dhan' app for farmers all over India. Through this app the farmers will be able to access a bouquet of services, both banking and agriculture, through their mobile phones. The app is a one stop solution for all the information needed on agriculture practices by the farmers. 'e-Kisaan Dhan’ will provide value-added services like mandi prices, latest farming news, weather forecast, information on seed varieties, SMS advisory, e-pashuhaat, Kisan TV, and more.

Agriculture ministry proposal to ban 27 pesticides faces resistance

An agriculture ministry proposal to ban a set of widely used pesticides has kicked up a storm, with the chemicals ministry opposing the ban, and advocacy groups supporting it, citing cases of pesticide poisoning. On 14 May, the agriculture ministry issued a draft order banning the manufacture and sale of the 27 pesticides “likely to involve risk to human beings and animals". One reason behind the ban was that manufacturers did not submit complete data on resurgence of pests, toxicity and bio-efficacy. The order followed an expert committee report of December 2015. On 2 June, the chemicals department wrote to the agriculture ministry that a “sudden ban" will not only render “investments (by the industry) wasteful, but also cause loss of export earnings for India".

Cabinate approves ordinance for 'One India, One Agriculture Market'

The Union Cabinet on Wednesday approved the Farming Produce Trade and Commerce (Promotion and Facilitation) Ordinance, 2020, which will pave the way for creating 'One India, One Agriculture Market'. Briefing the decisions taken in the Cabinet meeting headed by Prime Minister Narendra Modi, Union Minister of Agriculture and Farmers Welfare, Narendra Singh Tomar, said the

ordinance will create an ecosystem where farmers and traders will enjoy freedom of choice of sale and purchase of agri-produce.

Farmers can Avail 10% of loan for Household Needs under KCC

The Kisan Credit Card scheme does not only provide help to farmers financially but a part of it can also be used to meet their household needs. One can utilize the 10 percent of the short term limit under the KCC scheme for household consumption purposes. The Reserve Bank of India or RBI has put information on its website with regards to this under its Financial Education (for Farmers) section. The motive of Kisan Credit Card scheme is to enable farmers to meet their crop loan requirements. The RBI, advises farmers to not utilise large amounts for meeting your household expenses as this could limit a farmer's ability to generate income & repay the loan. Timely payments of KCC loans enable farmers to get more benefits on future loans.

Dr. Rattan lal: win world food prize

The Indian American soil scientist Dr. Rattan Lal has won the World Food Prize for mainstreaming and developing soil centric approach in order to increase to food production. The World Food Prize is equivalent to Nobel Prize in the field of Agriculture.

Enhanced import duty on bamboo stick

The Government of India had recently announced that the import duty on bamboo sticks is to be increased from 10% to 25%. This is to have great impact on Agarbatti industry creating at least 1 lakh new jobs according to KVIC (Khadi and Village Industries Commission).

MP's Claims for Basmati GI Tag

Recently, the All India Rice Exporters' Association (AIREA) has appealed to the government to preserve and protect the integrity of Basmati rice, following Madhya Pradesh (MP) government's pressure on the central government for seeking Geographical Indication (GI) tag for Basmati produced in 13 districts of MP.

Odisha Promotes Contract Farming

Recently, the Odisha government has promulgated an ordinance allowing investors and farmers to enter into an agreement for contract farming. The contract farming has been allowed in view of the continuing uncertainties due to the Covid-19 pandemic.

APEDA signs MoU with SFAC

Recently, the Agricultural and Processed Food Products Export Development Authority (APEDA) has signed a Memorandum of Understanding (MoU) with Small Farmers Agribusiness Consortium (SFAC) to bring in better synergy in the agricultural activities.

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REFORM FOR FARMERS IN THIRD TRANCHE OF GOVERNMENT AID

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"Financing facility of Rs. 1.63 lakh crore will be provided for funding agriculture infrastructure projects and aggregators like Farmers Producer Organization, agricultural entrepreneurs, primary agriculture cooperative societies etc.," said the Finance Minister.

India had beginning March 25, imposed a three-week-long nationwide lockdown, the most far-reaching measure undertaken by any government to curb the spread of the pandemic. Prime Minister Narendra Modi in 11 may 2020 announced a cumulative package of Rs. 20 lakh crore (nearly 10 per cent of GDP) to provide relief to various segments of the economy battered by coronavirus lockdown.

The Narendra Modi government on May 15 unveiled the third tranche of its COVID-19 economic package, with announcements worth Rs 1.63 lakh crore for agriculture and allied sectors aimed at strengthening infrastructure, logistics and capacity building. Finance Minister Nirmala Sitharaman announced the third tranche of the Rs 20 lakh crore economic stimulus package focusing on agriculture, dairy, animal husbandry and allied activities. The Centre will immediately create a Rs 1.63 lakh crore Agri-Infrastructure Fund for farm- gate infrastructure for small and medium farmers, most of whom are marginalized.

Here are the measures announced by the finance minister:

- Government has set up a Rs. 1 lakh crore agriculture fund for farm-gate infrastructure.
- This will be utilized for setting up cold chains and post-harvest management of crops.

- A Rs. 10,000 crore scheme has been launched for the formalization of micro-food enterprises (MFEs). A cluster-based approach will be taken for unorganized MEFs to get technical upgradation to attain FSSAI food standards.
- For promoting herbal cultivation, Rs 4,000 crore National Medicinal Plants Fund will be started to help 10 lakh hectares to be covered under herbal cultivation.
- For beekeepers, a Rs. 500 crore scheme was announced for infrastructure development and post-harvest facilities.
- Rs. 20,000 crore has been provided for fishermen through Pradhan Mantri Matsya Sampada Yojana (PMMSY) for the development of marine and inland fisheries.
- Operation Greens have been extended from tomato, onion and potato to all fruit and vegetables by providing 50 per cent subsidy on transportation and storage of these commodities.
- Rs. 15,000 crore Animal Husbandry Infrastructure Development Fund will be set up to support investment in dairy processing, value addition and cattle feed infrastructure.
- National Animal Disease Control Programme has been launched with total outlay of Rs. 13,343 crores for 100 per cent vaccination of cattle, buffalo, sheep, goat and pig population in India.
- Government will also implement a scheme worth Rs. 500 crore for infrastructure development related to beekeeping. This would lead to increase in income for 2 lakh beekeepers and quality honey for consumers.
- Apart from these, the finance minister also announced amendments to the six-and-a-half-decade old Essential Commodities Act to deregulate food items, including cereals, edible oil, oilseeds, pulses, onion and potato.

The amendment, besides deregulating production and sale of food products, will provide for no stock limit to be imposed on any produce. A stock limit will be imposed only under very exceptional circumstances like national calamities, famine with a surge in prices. She also announced agriculture marketing reforms to provide marketing choices to farmers.

Improve your diet to boost your immunity system

Pragati Shukla
RPCAU, Pusa, Bihar

"Fruit and vegetables in their whole form, rather than being juiced, are rich in fibre and help increase the good bacteria in the gut. Variety is also important so aim to eat a range of different coloured fruit and vegetables daily to boost your immune system."

As Covid-19 was declared global pandemic by the World Health Organization. And while the countries are grappling with imminent dangers that this virus poses to humanity, there are few key measures that individuals can take to fight this pandemic. When a foreign bug gets into your body, like the one that causes COVID-19, your body puts up its defence. That defence is your immune system and the army you have inside your body are your white blood cells. You may not be able to prevent all risks of exposure to bugs like COVID-19 and guidance is provided by the **Ministry of Health** on how to prevent getting the disease. However, a healthy lifestyle can help build up your immune system to make your defence as strong as possible.

According to health experts, people should take special care of their food and drinks intake. According to scientists, the coronavirus makes the vulnerable and elderly people their prey quickly and so to prevent this it becomes crucial for everyone to include high antiviral food items in your diet. This will help boost your immune system which

will protect you from viruses. Here is a list of measures you can undertake to improve your immunity.

What foods boost your immune system?

Your immune system begins in your gut, all the different bacteria that live there are called the gut-microbiome. When your gut is healthy, it's full of good bacteria which helps to strengthen your immune system.

Fruit and vegetables in their whole form, rather than being juiced, are rich in fibre and help increase the good bacteria in the gut. Variety is also important so aim to eat a range of different coloured fruit and vegetables dailky to boost your immune system.

Improve your Diet

The food you eat plays a key aspect in determining your overall health and immunity. Eat low carb diets, as this will help control high blood sugar and pressure. A **low carb diet** will help slow down diabetes and focus on h **protein-rich diet** to keep you in good shape. And regularly consume vegetables and fruits **rich in Beta carotene, Ascorbic acid** & other essential vitamins. Certain foods like mushrooms, tomato, bell pepper and green vegetables like broccoli, spinach are also good options to build resilience in the body against infections.

You can also eat supplements rich in **omega 3 & 6 fatty acids** for your daily dose, if stepping out to buy groceries is not an option during social distancing. Some natural immunity supplements include ginger, gooseberries (amla) and turmeric. Some of these superfoods are common ingredients in Indian dishes and snacks. There are several herbs that help in boosting immunity like garlic, Basel leaves and Black cumin. Certain seeds and nuts like sunflower seeds, Flax seed, pumpkin seeds and melon seeds are excellent sources of protein and vitamin E.

Probiotics like Yoghurt, Yakult and fermented food are also excellent sources to rejuvenate the composition of gut bacteria, which is important for nutrient absorption by the body. These are good options for the older generation too.

Some important Diets

1. **Low Carb Diet-** A low carb diet is low in carbohydrates, primarily found in sugary foods, pasta and bread. Instead you eat whole foods including natural proteins, fats and vegetables. In low carb diet you can eat meat, fish, eggs, vegetables growing above ground and natural fats (like butter). And you have to avoid sugar and starchy foods (like bread, pasta, rice, beans and potatoes)

2. **Protein rich Diet-** Protein is an essential nutrient to keep your body functioning well. Proteins are part of every cell in your body and are needed to build and repair muscle, tissue, skin, nails and hair. Protein also helps build hormones and enzymes.

What foods contain protein?

- **Mostly Protein:** Meat, poultry, fish, eggs, tofu.
- **Some Protein:** Legumes, nuts, nut butter, seeds, seed butter, milk, cheese, cottage cheese, soya beverages, yogurt.
- **Little Protein:** Whole grain breads, rice, pasta, quinoa, barley.

3. **Beta carotene Rich Diet-** Beta carotene is a red/ orange pigment found in many fresh fruits and vegetables. Human body converts beta carotene into vitamin A- beta carotene is a precursor of vitamin A. We need vitamin A for healthy skin and mucus membranes, our immune system and good eye health and vision. Foods rich in beta carotene are apricots, broccoli, carrots, grapefruit, Herbs and Spices- chilli powder, oregano, paprika, parsley, onion, peas, peppers, plums, pumpkin, spinach, squash, sweet potatoes.

4. **Ascorbic acid Rich Diet-** Vitamin C also called ascorbic acid, plays many important roles in the body. In particular, it is the key to the immune system, helping prevent infections and fight disease. The human body does not store vitamin C, so people need to get this nutrient from their diet every day. It dissolves in water, and any excess leaves the body in urine. Foods rich in vitamin C are orange, gooseberries, lemon and any citrus fruit.

5. **Omega 3 fatty acid Diet-** Omega- 3s are important components of the membranes that surround each cell in your body. Omega-3s also provide calories to give your body energy and have many functions in your heart, blood vessels, lungs, immune system, and endocrine system (the network of hormone producing glands).

What foods provide omega-3s?

- Fish and others seafood.
- Nuts and seeds (such as flaxseed, chia seeds and walnuts).
- Plant oils (such as flaxseed oil, soyabean oil, and canola oil)

- Fish are good source of protein but even more important –they are an excellent source of omega-3fatty acid. Regular consumption of fish with omega 3- fats can help to reduce the risk of heart disease. If you are choosing fish instead if other high fat foods, this will be good for your weight and your heart. Just remember to prepare your fish in a heart healthy way such as baking, broiling, grilling or poaching.

Don't Compromise on Sleep

Good snooze time for 7-8 hours is the best way to help your body build immunity; lesser sleep will leave you tired and impair your brain activity. The lack of sleep will prevent the body from resting and this will impair other bodily functions that will have a direct impact on your immunity. Lack of sleep adversely affects the action of the flu vaccine.

Stay Hydrated

Drink up to 8-10 glasses of water every day, to stay hydrated. Hydration will help flush out the toxins from the body and lower the chances of flu. Other alternatives include juices made of citrus fruits and coconut water, to beat the heat.

In summary

Good nutrition supports the body throughout the life course, from birth to old age. A balance diet, including all food groups, supports an effective immune system and may provide protection against infections, cancers and other diseases.

GI Tag: SPECIFICITY OF THE PRODUCTS

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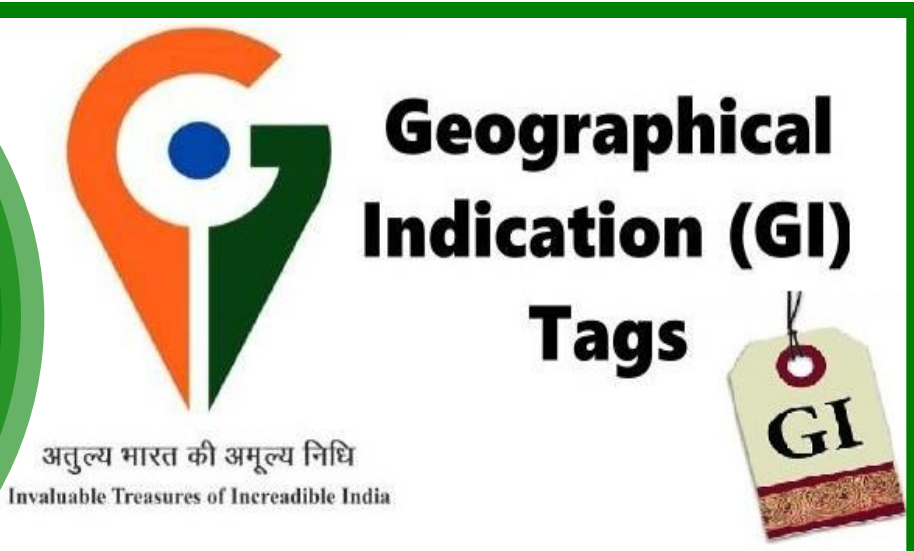


"Certain agricultural commodities depends entirely on the market success of their indigenous products and a GI tags provides recognition and economics protection to the farmers. It boots sales and export of the products. Kashmiri saffron from Kashmir and black rice from Manipur got GI tag recently."

Geographical Indication (GI) is a sign used on products that have a specific geographical origin and possess qualities or a reputation that are due to that origin. In order to function as a GI, a sign must identify a product as originating in a given place.

GI for agricultural products

Darjeeling tea was the first item to obtain a GI tag in the year 2004. As of now, more than three hundred agricultural items have been accorded with GI tags in India.

What is GI status?

GI status is an indication that identifies goods as produced from a particular area, which has special quality or reputation attributable to its geographical origin.

Importance of GI Tag

1. GI tag helps the producers to differentiate their products from competing products in the mark.
2. It enables the producers to build a reputation and goodwill around their products, which often fetch a premium price.

3. The products help in export earning, promotion of tourism, cultural heritage and national identity.
4. GIs have great potential to play a major role in trade between countries.
5. Legal protection to GIs protect livelihoods and encourage employment
6. Benefit to the rural economy by improving the incomes of farmers or nonfarmers.
7. GI allows genuine producers to capture the market and creates entry barriers for fakes.

Some Agricultural GI products

1. Darjeeling Green tea n white tea

The green tea and white tea of Darjeeling have been registered as a geographical indication (GI) products in the country. These two varieties of Darjeeling tea have been registered under Geographical Indications of Goods (Registration and Protection) Act 1999, with effect from October 2019.

Darjeeling white tea has a unique aroma. While the leaves used for making black tea undergo withering and oxidation, those used for making white tea do not face any withering and oxidation. In other words, white tea undergoes minimum processing and the terminal buds with rich pubescence of tea shoots are merely dried in natural sunlight. This allows the buds to retain the covering of velvety silver colour.

Darjeeling white tea brews have a pale yellow/light translucent colour and has a slightly sweet flavour with no 'grassy' undertones sometimes associated with green tea.

2. Khola chilli

The famous Khola Chilli or Kholchi Mirchi that's being grown on the hills of Khola village in Canacona taluka region of Goa has received the Geographical Indication tag from the Geographical Indications Registry.

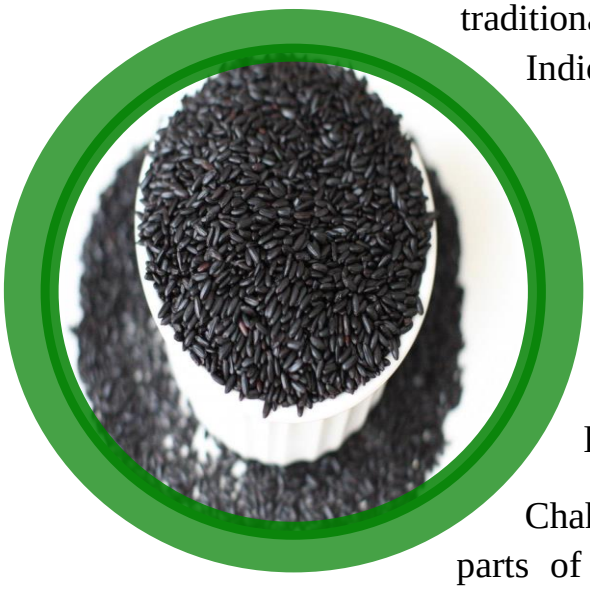
The prestigious GI certificate for this Chilli variety has come to give exclusive brand protection rights to the farmers of

Canacona who has been growing this horticultural spice crop for ages. This award has thrown up remarkable opportunities to the cultivators as well as authorities to take the Canacona Chilli to the worldwide market.

The unique Khola Chillies are grown on the hill slopes under rainfed conditions only. Local soil and climate play a crucial role in maintaining the quality of this Chilli variety, which is known for its brilliant red color and medium-pungent taste.

3. Chakhao/ Black rice of Manipur

Chakhao, the aromatic black rice of Manipur being cultivated for centuries with traditional practices, was recently awarded the Geographical Indication (GI) tag.



The Manipuri black rice has a lot of health benefits and is also completely gluten-free. There is also a special aroma that comes with consumption of the black rice. Apart from its high content of vitamins and minerals, the black rice is also rich in an antioxidant called Anthocyanin. It is also great for hair and skin, and is loaded with fibre and iron.

Chak-Hao is very popular not only in Manipur but also other parts of the Country. Nowadays, varieties of its products in different forms are marketed inside and outside Manipur by entrepreneurs.

4. Safrron

Kashmir saffron, cultivated in the karewa (highlands) of Pampore in south Kashmir, has been given the geographical indication tag by the Geographical Indications Registry after approving the application by the J&K Directorate of Agriculture in coordination with the Sher-e-Kashmir University of Agricultural Sciences and Technology, Kashmir, and the Saffron Research Station, Dussu.

The unique characteristics of Kashmir saffron are its longer and thicker stigmas, natural deep-red colour, high aroma, bitter flavour, chemical-free processing, and high quantity of crocin (colouring strength), safranal (flavour) and picrocrocin (bitterness).

Kashmir saffron, which is cultivated and harvested in the Karewa (highlands) of Jammu and Kashmir, have many health benefits. The health benefits of Kashmiri Saffron are manifold, from helping in the treatment of cold and fever to aiding the process of learning and memory retention. It is no surprise that the aromatic and flavourful spice is a must-have in the kitchen, especially when cooking biryani or being had with milk or yogurt.

Way Forward

1. The benefits of GI tag is realized only when these products are effectively marketed and protected against illegal copying.
2. Effective marketing and protection requires quality assurance, brand creation, post-sale consumer feedback and support, prosecuting unauthorized copiers, etc.
3. For internationally recognized products like Darjeeling tea, international protection is of crucial importance
4. Legal protection to GIs also extends to protection of traditional knowledge and traditional cultural expression contained in the products.
5. Hence Intellectual Property is a power tool for economic development and wealth creation particularly in the developing world.
6. GIs have the potential to be our growth engine. Policy-makers must pay a heed to this and give Indian GI products their true reward.

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PM-KISAN:
AN ADDITIONAL AND BRILLIANT SUPPORT TO THE INDIAN FARMERS

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"Under PM-KISAN Yojana, vulnerable landholding farmer families, having cultivable land upto 2 hectares, will be provided direct income support at the rate of Rs. 6,000 per year."

Government of India has decided to provide relief to farmers affected in lockdown due to COVID- 19 and said it will transfer in the first week of April the first installment of Rs. 2,000 to each of 8.89 crore beneficiaries under the PM-KISAN scheme. Announcing the relief measures of nationwide lockdown, government has said: "Farmers receive Rs. 6,000 annual from PM-KISAN. We will now be giving the first installment of that as a front-loaded matter, so that at the beginning of the year they will get Rs 2,000". Government has also provided additional support Rs. 2,000 per month for April, May and June months to the farmers. By this scheme, 8.89 crore farmers will be benefited immediately who feed 1.3 billion population of the country.

About the scheme

Pradhan Mantri Kisan Samman Nidhi is a central sector scheme under the government of India which provides income support to the farmers and their families. PM-KISAN scheme was first implemented as the Rythu Bandhu scheme by the Government of Telangana where a certain amount was handed directly to the eligible farmers. Later, on 1 February, 2019, during the 2019 Interim Union Budget of India, government announced the implementation of this scheme as a nationwide project. Hon'ble Prime Minister Shri Narendra Modi launched the PM-KISAN scheme on 24 February, 2019 in Gorakhpur, Uttar Pradesh. Under this programme, vulnerable landholding farmer families, having cultivable land upto 2 hectares, will be provided direct income support at the rate of Rs. 6,000 per year. This income support will be transferred directly into the bank accounts of beneficiary farmers, in three equal installments of Rs. 2,000 each.

The complete expenditure of Rs. 75000 crores for the scheme will borne by the Union Government in 2019-20.

Significance

Around 12 crore small and marginal farmer families are expected to benefit from this scheme. It would not only provide assured supplemental income to the most vulnerable farmer families, but would also meet their emergent needs especially before the harvest season. It would pave the way for the farmers to earn and live a respectable living.

Benefits of direct cash transfers

1. It has immediate impact on reducing hunger and rural poverty.
2. They can help households to overcome credit constraints and manage risk.
3. This can increase productive investment, increase access to markets and stimulate local economies.
4. Income support can be used to make a repayment or at least activate a bank account which can then receive a loan through Kisan Credit Card (KCC).
5. It can increase investment in agricultural inputs, including farm implements and livestock.
6. It can serve as an important complement to a broader rural development agenda, including a pro-poor growth strategy focusing on agriculture.

Eligibility Criteria

1. Land holding upto 2 hectares.
2. In the database, the land owner's name, gender.
3. Social Classification (Scheduled Tribes / Scheduled Tribes).
4. Aadhar number, bank account number and mobile number etc.
5. Land record details.
6. Jan Dhan Bank Account Number, Aadhaar and Mobile Number will help in identifying eligible beneficiaries and incompetent claimants.
7. The scheme is sponsored by the Central Government. Therefore, the farmers have to be citizens of the country.

Document required

1. Citizenship certificate
2. Landholding paper
3. Aadhaar card
4. Bank account details
5. Mobile number

Challenges with cash transfers criticisms

1. Landless labourers are not being covered under PM-KISAN.
2. Cash transfers are not greatly superior in terms of leakages compared to other schemes of in-kind transfer such as the public distribution system (PDS).
3. A targeted cash transfer scheme envisions the role of the state to only providing cash income to the poor. This kind of approach seeks to absolve the state of its responsibility in providing basic services such as health, education, nutrition and livelihood.
4. Cash transfer scheme such as PM-KISAN cannot be substituted for subsidies and other institutional support systems such as the National Food Security Act-powered public distribution system. In fact, such cash transfer schemes could be counterproductive and may lead to more distress.
5. Cash transfer is neither a substitute for the structural reforms needed in agriculture, nor does it adequately compensate the farmer for the risks and uncertainty of crop cultivation.
6. In the absence of proper tenancy records, it will also benefit the absentee landlords.
7. It is no substitute for the lack of investment in agriculture, which has declined at 2.3% per annum in real terms.

Present scenario

The efforts made by the Center to provide relief to the farmers during the nationwide lockdown have greatly helped the farmers. Small farmers have been able to buy their necessities such as seeds, fertilizers, agro-chemicals or other small appliances to a large extent. The PM-KISAN scheme has decided to provide additional Rs. 2000 per month for three months for small class farmers to reduce the losses during the lockdown, which is directly benefiting the farmers. Therefore, in this adverse situation the PM-KISAN scheme is proving to be a boon for small and medium farmers of the country.

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KRISHI UDAN AND KISAN RAIL: A NEW APPROACH OF TRANSPORTATION

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"To build a seamless national cold supply chain for perishables, inclusive of milk, meat and fish, the Indian Railways will set up a "Kisan Rail"- "Krishi Udan" will be launched by the Ministry of Civil Aviation on international and national routes. The scheme aims to improve the connectivity of undeserved and unserved destination in India."

Krishi Udan

A new scheme was proposed in the budget, which is to be implemented by the Aviation Ministry for transporting agricultural products of farmer. The scheme was named as 'Krishi Udan Scheme'. Generally "Krishi Udan" will be launched by the Ministry of Civil Aviation on international and national routes. UDAN (Ude Des Ka Aam Naagrik) is a regional connectivity scheme of the government which was launched in 2017 when Prime Minister Narendra Modi inaugurated a Delhi Shimla flight. The scheme aims to improve the connectivity of undeserved and unserved destination in India. A total of 43 airport have been operationalised since the scheme for operationalizing unserved airport was taken up, of which four were done in FY 2019- 20.

Hon'ble Finance Minister Nirmala Sitharaman as part of our budget speech said on February 1, 2020 that to boost agriculture export the Civil Aviation ministry will introduced a Krishi Udaan scheme to help to farmer export their produce internationally.

This will immensely help improve value realisation (on agricultural products) especially in the North-East and tribal district said Hon'ble finance minister during her budget speech. This was announced as part of the minister's 16 point plan targeted at doubling farmer's income by 2022.

The scheme will be started through Public Private Partnership (PPP). The focus is to link up Indian farmer with more global and local market through established and institutionalized supply-chain enabling them to get a higher price for their produce. This would be particularly effective in time of glut, when farmer struggle to deal with abundant supply as price collapse in the local market forcing them to dump product in Mandis.

Under the scheme financial incentives in term of concession from the centre, state government and airport operator are extended to selected airlines to encourage operation from unserved and undeserved airports, and air fares affordable as a list half of the seat in Udan flights are offered at subsidies fares and the participating careers are provided a certain amount of viability gap funding (VGF) an amount shared between the centre and the states concerned.

Kisan Rail

Hon'ble Finance Minister also said that the Indian Railway will setup a "Kisan rail" for the transport of perishable goods to assist agriculture export within India. In line with the goal of doubling farmers' incomes by 2022 Union Government in its Budget 2020-21 initiated the Kisan Rail scheme. The budget proposes that "To build a seamless national cold supply chain for perishables, inclusive of milk, meat and fish, the Indian Railways will set up a "Kisan Rail"- through PPP arrangements. Under this service, refrigerated coaches will be added in express and freight trains for the transportation of perishable goods from the producer to the market.

Initiatives that have already been taken by the Indian Railways

Towards fulfilment of the budget proposals, following are the major initiatives which have already been taken by Indian Railways regarding development of cold chain for transportation of perishable traffic.

- **Refrigerated Parcel Vans:** New design of Refrigerated Parcel Vans (VPR, carrying capacity of 17 tonnes) for transportation of highly perishable parcel traffic was developed, and procured through rail coach factory, Kapurthala. At present, the Indian Railway has a fleet of nine (09) Refrigerated Parcel Vans available.
- These Refrigerated Parcel Vans are booked on a round-trip basis and are charged at 1.5 times the freight of normal VP as per the category of the train.
- **Reefer (Ventilated Insulated) Rail Containers:** 98 Ventilated Insulated Containers (Carrying capacity 12 Tonnes per container, rake composition 80 containers) have been procured, through CONCOR, for movement of fruits and vegetables to different parts of the country.
- **Cold Storage Facilities for Perishables:** 'Temperature controlled perishable cargo centres' have been commissioned at Ghazipur Ghat (U.P), New Azadpur (Adarsh Nagar, Delhi) and Raja Ka Talab (U.P) as a pilot project under Kisan Vision Project by CONCOR under CSR initiative. Another project is under construction at Lasalgaon, Nasik (Maharashtra).
- Approval has been granted to Central Railside Warehousing Corporation (CRWC) to develop temperature controlled storages at Fatuha and Mancheswar.

Benefits of Kisan Rail

- The Kisan rail Yojna can reduce food wastage.
- It will build a seamless national supply chain for perishable goods like milk, meat, fish, vegetables and fruits.
- The Kisan Rail will bring down the handling of the produce from four times (in rail).
- This will also bring the cost of reaching the market.
- **As per agriculture ministry data:** West Bengal was the leading producer of vegetables 2018-19. So one of the key beneficiaries of this scheme is expected to be the vegetable and horticulture sector of Bengal.
- Right now, 18-25% of the vegetables, fruits and flowers is wasted during transportation in W.B.
- Andhra Pradesh was the leading fruits producer (horticulture) Banana, mango and sweet lime, tomato are exported from Andhra to other parts of the county.

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IMPACT OF CROP RESIDUES BURNING ON THE SOIL PROPERTIES AND ENVIRONMENT AND THEIR ALTERNATIVE USE

Pragati Kumar Maurya, Meenakshi, Diwakar Dubey, Saurabh Kumar Singh

"Cereal crops contribute 70%, while rice crop alone contributes 34% to the crop residues. The generation of crop residues is highest in Uttar Pradesh followed by Punjab and Maharashtra. Among different crops, cereals generate maximum residues followed by fibers, oilseeds, pulses and sugarcane."

India, the second largest agro-based economy with year-round crop cultivation, generates a large amount of agricultural waste, including crop residues. Harvesting of various crops generates large volume of residues both on and off farm. Ministry of New and Renewable Energy estimated that about 500 Mt of crop residues are generated annually. The generation of crop residues is highest in Uttar Pradesh (60 Mt), followed by Punjab (51 Mt) and Maharashtra (46 Mt). Among different crops, cereals generate maximum residues (352 Mt), followed by fibers (66 Mt), oilseeds (29 Mt), pulses (13 Mt) and sugarcane (12 Mt). Cereal crops (rice, wheat, maize, millets) contribute 70%, while rice crop alone contributes 34% to the crop residues. Paddy straw burning is practiced in Punjab, Haryana and Uttar Pradesh to clear the fields for *Rabi* crop sowing during October/November i.e. mainly wheat and potato, because the time window available between the harvesting of paddy crop and the sowing of next crop is very short (2-3 weeks).

Burning of paddy straw is most common in combine harvested fields because it leaves harvested paddy straw and standing stubbles (25-30 cm height) in the field. Use of paddy straw as fodder is limited due to high silica content. Crop residue burning practice has harmful effects on the soil biota, diminishes soil fertility, and causes additional emission of greenhouse gases while wasting the resource, which could be used for energy production. The crop residue produced at the farmer field can be used for various alternative uses if it is not burnt.

Adverse effect of crop residue burning on the field

1. Physical characteristics of soil

Burning of crop residues increase the sensitivity to erosion and loss of soil moisture at planting is a new product. Various researcher have reported that crop residue burning, bulk density and soil electrical conductivity will increase. Cereal straw burning reduces the aggregate stability.

According to the test of soil pores larger than 1.5 mm in the soil in the land of straw, 4.1 times greater than the residual land is burned in conventional tillage. Soil thermometer testing proved that soil temperature increases up to 33.8 to 42.2 ^{o}C (1- cm depth). Crop residue burning in the field increases infiltration rate due to increases pore size diameter and also slightly increase bulk density due to loss of organic matter. Availability of water content decreases due to decreasing micro pores because crops absorb water at field capacity which is present in micro pores.

2. Chemical characteristics of soil

Burning of crop residue increased soil pH. This is an increase of soluble salts from the soil. It is estimated that burning of one tone of rice straw accounts for loss of 5.5 kg Nitrogen, 2.3 kg. Phosphorus, 25 kg Potassium and 1.2 kg. Sulphur besides, organic carbon. Generally crop residues of different crops contain 80% of Nitrogen (N), 25% of Phosphorus (P), 50% of Sulphur (S) and 20% of Potassium(K). If the crop residue is incorporated or retained in the soil itself, it gets enriched, particularly with organic C and N.

3. Biological and biochemical properties

Incineration of crop residue on the open field reduces soil micro-organisms. In case of wheat straw burning 50% of the population of bacteria up to 2.5 cm. Incineration of crop residue amount and activity of enzymes involved in the cycle of mineral elements in the soil is reduced. Heat from burning of residues raises the soil temperature and causes depletion of the bacterial and fungal population. In some cases, the burning of crop residue on the effect of some chemicals break dormancy inhibiting seed germination of some seeds, or the loss of it, and such. In addition, the quantity of water and fat soluble compounds and humic acids show a decreasing trend.

4. Adverse impact on the environment

The main adverse effects of crop residue burning include the emission of greenhouse gases (GHGs) that contributes to the global warming, increased levels of particulate matter (PM) and smog that cause health hazards. Crop residue burning significantly increases the quantity of air pollutants such as CO_2, CO, NH_3, NO_X, SO_X, Non-methane hydrocarbon (NMHC), volatile organic compounds (VOCs), semi volatile organic compounds (SVOCs) and PM. Researcher reported that burning of 98.4 Mt of crop residue has resulted in emission of nearly 8.57 Mt of CO, 141.15 Mt of CO_2, 0.037

Mt of SO_x, 0.23 Mt of NO_x, 0.12 Mt of NH_3 and 1.46 Mt NMVOC, 0.65 Mt of NMHC, 1.21 Mt of PM during 2008–2009, where CO_2 is 91.6% of the total emissions. Remaining 8.43% consisted of 66% CO, 2.2% NO, 5% NMHC and 11% NMVOC.

The WHO standard for permissible levels of $PM_{2.5}$ in the air is 10 µg/m^3, and according to the India's National Ambient Air Quality Standard, the permissible level for $PM_{2.5}$ is set at 40 µg/m^3. However, the National Capital territory of Delhi recorded a mean value of 98 µg/m^3, which is at least twice more than the Indian standard and ten times higher than the WHO standard.

Sustainable management of crop residue

Various departments and institutions are promoting alternative uses of straw instead of burning. These include:

Fodders in deficit regions of India

The availability of crop residue in India is 253.26 million tones whereas the requirement is 415.83 million tones. Thus there is shortfall of almost 40 %. On the other hand, the availability of green fodder during the same time period is 142.82 million tones and requirement is 221.63 million tones with a short fall of almost 36 %. With Public-Private-Producers interventions, the pellets of residues after mixing other required ingredients could be transported from surplus areas to deficit regions.

Paper and Pulp Board Production

Using technology, we can convert any agro-residue or lingocellulosic mass into holocellulose fibers or pulp and lignin. This pulp can be converted into paper, tableware, bioethanol or fabric. Lignin can be used as binder in cement and ceramics industries.

Mushroom cultivation

A number of residues have been employed as feed stocks in solid state fermentation (SSF) processes using higher basidiomycetus fungi for the production of mushroom food, animal feed, enzymes and medicinal compounds. Wheat and rice straws are excellent substrates for the cultivation of *Agaricus bisporus* (white button mushroom) and *Volvariella volvacea* (straw mushroom), two of the four most commonly grown fungi.

Crop residue use as a straw mulching

The incorporation of the straw in the soil has a favorable effect on the soil's physical, chemical and biological properties such as pH, organic carbon, water holding

capacity and bulk density of the soil. Many international and national organizations are working in these regions (Punjab and Haryana) like as Borlog Institute for South Asia, CIMMYT, PAU, HAU, ICAR etc to promote Conservation Agriculture (CA) which advocates for residue retention and mulching.

In-Situ Management with Mechanical Intensification

In 2014, the Union government released the National Policy for Management of Crop Residue. Since then, crop residue management has helped make the soil more fertile, thereby resulting in savings of Rs 2,000/hectare from the farmer's manure cost.

Farmers can also manage crop residues effectively by employing agricultural machines like:

- Happy Seeder (used for sowing of crop in standing stubble)
- Rotavator (used for land preparation and incorporation of crop stubble in the soil)
- Zero till seed drill (used for land preparations directly sowing of seeds in the previous crop stubble)
- Baler (used for collection of straw and making bales of the paddy stubble)
- Paddy Straw Chopper (cutting of paddy stubble for easily mixing with the soil)
- Reaper Binder (used for harvesting paddy stubble and making into bundles)

Composting of crop residues

Composting is the natural process of rotting or decomposition of organic matter by micro-organisms under controlled conditions. As a rich source of organic matter, compost plays an important role in sustaining soil fertility and thereby helping to achieve sustainable agricultural productivity. Composting is mediated by different micro-organisms actuating in aerobic environment. Bacteria, fungi, acitnomycetes, algae, and protozoa are naturally present in organic biomass or added artificially in order to facilitate decomposition.

Production of Biochar

Biochar is a super charcoal made by heating any biomass- for example, corncob, husk or stalk, potato or soy hay, rice or wheat straw- without oxygen. All of the cellulose, lignin and other, non-carbon materials gasify and are burned away. What remains is pure. When amended to soil, highly porous nature of the biochar helps in improved water holding capacity and increased soil surface area. It mainly interacts with the soil matrix, soil microbes, and plant roots, helps in nutrient retention and sets off a wide range of biogeochemical processes.

Specifically, biochar is used in various application such as the water treatment, construction industry, food industry, cosmetic industry, metallurgy, treatment of waste water and many other chemical applications.

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ZERO BUDGET NATURAL FARMING (ZBNF): A BEST FARMING APPROACH

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"Addressing the United Nations conference on desertification (COP-14), Indian PM told the global community that India is focusing on Zero-Budget Natural Farming (ZBNF). ZBNF was also highlighted in budget 2019 in the bid to double farmer's income by 2022."

Zero Budget Natural Farming (ZBNF) is a farming practice that believes in natural growth of crops without adding any fertilizers and pesticides or any other foreign elements. The word Zero Budget refers to the zero net cost of production of all crops (inter crops, border crops, multi crops). The inputs used for seed treatments and other inoculations are locally available in the form of cow dung and cow urine. A ZBNF practicing farmer has lower cost of inputs and thus has better capacity to increase the incomes. At the same time, ZBNF crops helps in retaining soil fertilizing and is climate change resilientt. Addressing the United Nations conference on desertification (COP-14), Indian PM told the global community that India is focusing on Zero-Budget Natural Farming (ZBNF). ZBNF was also highlighted in budget 2019 in the bid to double farmer's income by 2022.

However, scientists from the National Academy of Agricultural Sciences suggested that there is no need for the government to promote ZBNF unless there is proper scientific validation. It is a holistic alternative to the present paradigm of high-cost chemical inputs-based agriculture. It is very effective in addressing the uncertainties of climate change. ZBNF principles are in harmony with the principles of Agroecology.

Its uniqueness is that it is based on the latest scientific discoveries in Agriculture and at the same time it is rooted in Indian tradition.

It was originally promoted by Maharashtrian agriculturist and Padma Shri recipient **Subhash Palekar** who developed it in the mid 1990 as an alternative to the green revolution method driven by chemical fertilizers pesticides and intensive irrigation. Hey argue that the rising cost of these external inputs was a leading cause of indebtedness and suicide among farmers while the impact of Chemicals on environment and on long-term fertility was devastating. Without the need to expand money on these inputs or take loan to buy them the cost of production could be reduced and farming made into a zero budget exercise breaking the debt cycle for many small farmers. The zero budget farming aims at pulling the farmers out of the debt trap that they found themselves in with the liberalisation of Indian economy. This is also an attempt to make small scale farming a viable vocation.

In many states, farmers are in huge debt due to rising agriculture cost on the account of privatised seeds, farm inputs and inaccessible markets. The high-interest rates for credit or loans that the farmers take from the easiest available lender made farming unviable.

Zero budget farming model promises to cut down farming expenditure drastically and ends dependence on loans. It also reduces dependence on purchased inputs as it encourages use of own seeds and locally available natural fertilizers. Farming is done in sync with the nature not through chemical fertilisers. Alternative low-input farming practices have emerged in India and across the world likely to reduce input costs and higher yields for farmers, chemical-free food for consumers and improved soil fertility. Zero Budget Natural Farming (ZBNF) is one such low-input, climate-resilient farming that inspires farmers to use low-cost and locally-sourced and available inputs, eliminating the use of artificial/chemical fertilisers and industrial pesticides.

Intercropping with leguminous crops is one of the components of Zero Budget Natural Farming (ZBNF) and it improves the crop productivity and soil fertility by way of fixing the atmospheric nitrogen. Further, the cow dung, urine based formulations and botanical extracts used in ZBNF help farmers in reducing the input cost.

Importance of zero budget natural farming

According to National Sample Survey Office (NSSO) data, almost 70% of agricultural households spend more than they earn and more than half of all farmers are in debt.

- In order to achieve the Central government's promise to double farmers' income by 2022, one aspect being considered is natural farming methods such as the ZBNF which reduce farmers' dependence on loans to purchase inputs they cannot afford.It reduces farming cost by reducing dependency on external inputs like seeds, fertilizer, pesticides, etc., which is a leading cause of indebtedness and suicide among farmers.
- The farmer can exercise the ZBNF without spending money on these inputs. So, the cost of production could be reduced and farming made into a "zero budget" exercise.
- ZBNF is helpful to fight against the impact of chemicals on the environment and on long-term fertility.
- ZBNF is for elimination of using chemical pesticides and promotion of good agronomic practices. It improves soil conservation, seed diversity and quality of produce.

Component of Zero budget natural farming

There are the four main component of the Zero budget natural farming which is beneficial for the improvement of the crop yield and also enhance the farmer's income.

1. Jeevamrutha: Adding soil inoculants

Soil nutrition is the most important factor for plant growth. The required soil health can be achieved by either using fertilizers (chemicals that affects the soil in the longer run), or organic manure (a natural ingredient requiring manure preparation which is time-consuming and labor-intensive). But Zero Budget Natural Farming states the best method is to increase the microbial activity in the soil in such a way that nutrients are easily available, which is achieved by adding an inoculant made from fermented cow dung, cow urine and jaggery.

Jeevamrutha, popularized by Shri Subhash Palekar, is considered to be a panacea for the prosperity of small farmers. It is important to provide a congenial environment to microorganisms that help in making available the essential nutrients for plant growth viz., nitrogen, phosphorus and potassium, to the plants. Jeevamrutha provides such an environment to beneficial microbes. Application of Jeevamrutha to soil improves the soil considerably. It also encourages microbial activity in the soil. This is an excellent culture for enabling the exponential increase of beneficial microbes. The microbes are added thru 2-3 handful of local soil. Though it can be used even after 6-7 days, its quite a challenge getting near the mixture due to overpowering stench, hence advisable to use this within 3-4 days of preparation.

2. Beejamrutha: The seed treatment

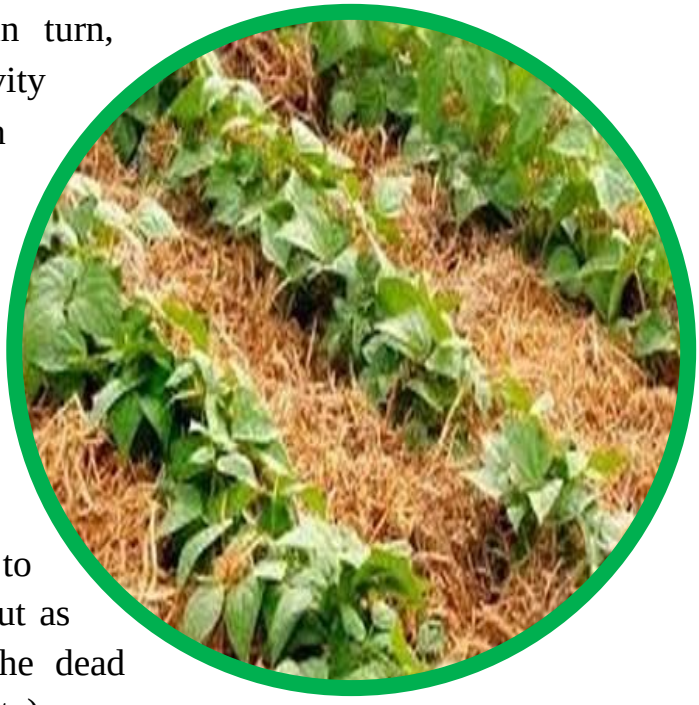
Beejamrutha s used for the treatment of the seedling or any planting material. It is effective in protecting young root from fungus along

with soil born and seed born illness that frequently effect crops after the mansoon period. Seed treatment is normally done to enhance the nutritional accessibility for seeds and to protect them from any stress so as to enhance their viability. The conventional way of doing that is to coat it with a chemical. But in ZBNF, the seed treatment is done using cow dung, cow urine and soil. This adds to the advantage of protecting the soil from seed-borne diseases.

Add beejmrutha to the seed of any crop as a seed treatment coat them and mix them by hand, dry well and use for sowing. For leguminous seed just deep them quickly and let dry.

3. Mulching: An outer cover for the soil

Crop residue is used to cover the soil from direct sunlight hence reducing the evaporation loss and soil erosion. This, in turn, conserves soil moisture. Both earthworm activity and microbial activity increases drastically in such dark and moist conditions



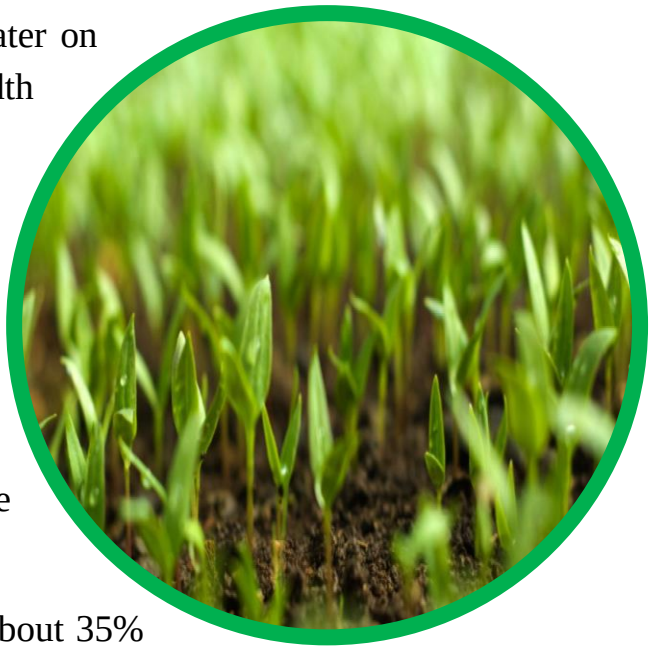
1. Soil Mulch: This protects topsoil during cultivation and does not destroy it by tilling. It promotes aeration and water retention in the soil. Palekar suggests avoiding deep ploughing.

➢ **Straw Mulch:** Straw material usually refers to the dried biomass waste of previous crops, but as Palekar suggests, it can be composed of the dead material of any living being (plants, animals, etc).

➢ **Live Mulch (symbiotic intercrops and mixed crops):**

According to Palekar, it is essential to develop multiple cropping patterns of monocotyledons (monocots; Monocotyledons seedlings have one seed leaf) and dicotyledons (dicots; Dicotyledons seedlings have two seed leaves) grown in the same field, to supply all essential elements to the soil and crops. For instance, legumes are of the dicot group and are nitrogen-fixing plants. Monocots such as rice and wheat supply other elements like potash, phosphate and sulphur.

4. Waaphasa: Maintenance of soil water balance



Waaphasa is carried out by spraying water on biodegradable materials. For more yield, stem width should be higher which means root coverage should be higher. When water is given outside the canopy of the crop, the root will automatically spread. This would increase the vegetation. If a trench is done, it must be so at least a foot away from the canopy so as the root can grow until there. Once it does so, the second trench is to be dug during the next season outside the first one as now, the canopy is more.

Typically, the atmosphere would contain about 35% humidity in summer, 65% humidity during the winter and 95% during the rainy season. It is this natural moisture absorbed from the atmosphere that is used in ZBNF. Further, a multi-tier cropping system is used instead of monocropping. This provides two advantages: one preventing hot air blows during summer to withstand minimum irrigation and also withstand against pest and insect attacks.

Benefits of Zero Budget Natural Farming

As both a social and environmental programme, it aims to ensure that farming particularly smallholder farming is economically viable by enhancing farm biodiversity and ecosystem services.

- It reduces farmers' costs through eliminating external inputs and using in-situ resources to rejuvenate soils, whilst simultaneously increasing incomes, and restoring ecosystem health through diverse, multi-layered cropping systems.
- Cow dung from local cows has proven to be a miraculous cure to revive the fertility and nutrient value of soil. One gram of cow dung is believed to have anywhere between 300 to 500 crore beneficial micro-organisms. These micro-organisms decompose the dried biomass on the soil and convert it into ready-to-use nutrients for plants.
- Zero budget natural farming requires only 10 per cent water and 10 per cent electricity than what is required under chemical and organic farming. ZBNF may improve the potential of crops to adapt to and be produced for evolving climatic conditions.
- With the rising cost of external inputs (fertilizers and pesticides), which is the leading cause of indebtedness and suicide among farmers. According to the National Sample

Survey Office (NSSO) data, almost 70% of agricultural households spend more than they earn and more than half of all farmers are in debt.

- Since in ZBNF there is the need to spend money or take loans for external inputs, the cost of production could be reduced and farming made into a "zero budget" exercise.
- This would break the debt cycle for many small farmers and help to envisage the doubling of farmer's income by 2022.
- At a time when chemical-intensive farming is resulting in soil and environmental degradation, a zero-cost environmentally-friendly farming method is definitely a timely initiative.
- The ZBNF method promotes soil aeration, minimal watering, intercropping, bunds and topsoil mulching and discourages intensive irrigation and deep ploughing.
- It suits all crops in all agro-climatic zones.

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LOCUST ATTACK AND ITS IMPACT ON CROPS

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"In recent days, the massive locust attack of December, 2019 has affected about 25,000 hectares of land in two of the worst-hit North Gujarat districts of Banaskantha and Patan. The State government has assessed the damages and announced relief assistance to about 11,000 farmers from 285 villages in the 15 talula across these two districts. About 24,750 hectares is affected in Banaskantha, while in Patan the affected area is about 750 hectares."

Why are locusts so destructive⁉

Locusts are large herbivorous insects that can be serious pests of agriculture due to their ability to form dense and highly destructive swarms. **Locust** belong to family Acrididae and order Orthoptera that are distributed worldwide. They are species of short-horned grasshoppers that periodically form large populations in dense migrating groups, where individuals differ in several characteristics from those living separately.

Locusts undergo incomplete or direct metamorphosis. Unlike in insects such butterflies or moths, there is no pupal stage and juveniles are similar in appearance to adults. There are three main stages of development - egg, nymph and adult. Green vegetation is necessary for nymph and adult survival, adult migration and egg development. How long it takes for a locust to reach maturity depends on the species, habitat conditions and

temperature. Nymphs and adults are able regulate their body temperature by basking in the sun or moving to shade.

A phase theory has been developed to account for the sporadic appearance and disappearance of locust swarms. According to the theory, a plague species has two phases: one solitary and the other gregarious. The phases can be distinguished by differences in coloration, form, physiology, and behaviour. A solitary-phase nymph, for example, adjusts its coloration to match that of its surroundings, does not collect in groups, has low metabolic and oxygen-intake rates, and is sluggish. A gregarious-phase nymph, on the other hand, has black and yellow or orange coloration in a fixed pattern, gathers in large groups, has high metabolic and oxygen intake rates, and is active and nervous. Adult locusts differ more in form than in colour. The solitary phase has shorter wings, longer legs, and a narrower pronotum, or dorsal sclerite (with higher crest and larger head), than the gregarious phase. The adult of the gregarious phase has a more saddle-shaped pronotum, broader shoulders, and longer wings. When a nymph of a solitary-phase locust matures in the presence of many other locusts, it undergoes a physiological change and produces offspring of the gregarious type. If crowding is sufficiently dense and of long enough duration, the majority of a local population will shift to the gregarious migratory phase. A gregarious-phase locust is restless and irritable, and it flies spontaneously on warm dry days, when its body temperature is high. The muscular activity of flight further raises its temperature. A swarm ceases flying only when environmental conditions change e.g., rain falls, temperature decreases, or darkness occurs. In 1869 desert locust swarms reached England, probably from West Africa, and a flight across the Red Sea in 1889 was estimated to be about 5,000 square km (2,000 square miles) in size. The long-distance dispersal of these swarms is usually associated with either frontal winds of storm systems or high-level jet-stream winds. The acridids typically fly almost straight up into these fast-moving winds and then are carried with the winds until they slow to the point where gravity overcomes wind speed, causing them to drop from the sky.

In recent days, the massive locust attack of December, 2019 has affected about 25,000 hectares of land in two of the worst-hit North Gujarat districts of Banaskantha and Patan. The State government has assessed the damages and announced relief assistance to about 11,000 farmers from 285 villages in the 15 talula across these two districts. About 24,750 hectares is affected in Banaskantha, while in Patan the affected area is about 750 hectares.

It is believed that the latest swarm has emerged following hatching of the eggs laid by the earlier one. The climate and the wind directions provide support to the locust movement and allow them to spread. The Locust Warning Organization (LWO) in Jodhpur had also predicted its trajectory - crossing the international border from Pakistan and entering India via Rajasthan. But the wind directions pushed the swarms into Gujarat from the northern districts. Their original flight path was towards Pakistan but due to suitable wind direction and moisture, they landed in Banaskantha and other parts of the state.

Besides Banaskantha and Patan, the districts of Mehsana, Kutch and Sabarkantha had also reported presence of locusts but were brought under control with preventive measures. There were total 18 operational Central teams, who had expertise in using the hazardous - highly toxic chemical - 96 per cent malathion, the State teams used Chlorpyrifos (CPS) 20 per cent and 50 per cent for sprayers.

The range of the migratory locust (*Locusta migratoria*) is wider than that of any other acridid. It is found in grasslands throughout Africa, most of Eurasia south of the taiga, the East Indies, tropical Australia, and New Zealand. The desert locust (*Schistocerca gregaria*) inhabits dry grasslands and deserts from Africa to the Punjab and can fly upward to about 1,500 metres (5,000 feet) in huge towers of individuals. The smaller Italian and Moroccan locusts (*Calliptamus italicus* and *Dociostaurus maroccanus*) cause

extensive plant damage in the Mediterranean area, with *D. maroccanus* found as far east as Turkestan.

Impact on Agriculture

- Locust swarms devastate crops and cause major agricultural damage and attendant human misery-famine and starvation. They occur in many parts of the world, but today locusts are most destructive in sustenance farming regions of Africa.
- The desert locust (*Schistocerca gregaria*) is notorious. Found in Africa, the Middle East, and Asia, they inhabit some 60 countries and can cover one-fifth of Earth's land surface. Desert locust plagues may threaten the economic livelihood of one-tenth of the world's humans.
- A desert locust swarm can be 460 square miles in size and pack between 40 and 80 million locusts into less than half a square mile.
- Each locust can eat its weight in plants each day, so a swarm of such size would eat 423 million pounds of plants every day.

Management

Once developed, a locust plague is almost impossible to stop or control. Control measures include destroying egg masses laid by invading swarms, digging trenches to trap nymphs, using hopper dozers (wheeled screens that cause locusts to fall into troughs containing water and kerosene), using insecticidal baits, and applying insecticides to both swarms and breeding grounds from aircraft.

Natural Enemies

- Egg parasites: Several species of small wasps (3-5 mm long) belonging to the genus *Scelio* parasitise the eggs of locusts and grasshoppers.
- Flies (Diptera): Various species of fly are parasites of locusts. They are usually seen in higher rainfall areas and can kill or reduce the fertility of locusts.
- *Blaesoxipha* spp. (sarcophid blowflies) female fly deposits minute maggot-like larvae directly on the locust which bore through the cuticle. It usually does not kill the adult, but parasitized females lay fewer eggs.
- *Ceracia fergusoni* (tachinid fly) female fly glues eggs directly onto the body of locusts. On hatching a small larva burrows through the base of the egg and enters the host.
- Mites: Tarsonemid mites (tracheal mites) are frequently overlooked as they live on the inside of locust tracheae (breathing organs).
- Fungi, bacteria and viruses: Locusts infected by fungi are rarely seen in the field and this may be due to the general aridity of the environment where outbreaks occur.
- Predators: Numerous birds, mammals and insects eat locusts but generally they are non-specific feeders and have not been shown to have a large impact on locust numbers during an outbreak.

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AN OVERVIEW OF FOOD SAFETY INFRASTRUCTURE

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"Safe and Nutritious food is the key to sound health. To ensure that the Food is safe to consume, food testing and analysis is an essential pillars of the food safety ecosystem. A meta study on food testing laboratories in India in 2018 estimates a total of around 600 laboratories in India which includes NABL accredited laboratories, FBO's, state/central government laboratories and FSSAI notified laboratories."

Food processing is one of the fastest growing industries in India. Safe food processing practices remains the topmost priority. Food safety issues and the enhancement of health security are of growing national and international concern. food safety has to be a culture, a habit. Hygienic and Food safety is used as a scientific discipline describing handling, preparation, and storage of food in ways that prevent food-borne illness. A food may be considered to be unsafe when it contains harmful microorganisms (*e.g.*, Listeria, Salmonella), toxic chemicals (*e.g.*, pesticides, herbicides) or extraneous matter (*e.g.*, glass, wood, metal, insect matter). Safe and Nutritious food is the key to sound health. To ensure that the Food is safe to consume, food testing and analysis is an essential pillars of the food safety ecosystem. Government regulations and recommendations are designed to maintain the general quality of the food supply, to ensure that the food industry provides consumers with foods that are wholesome and safe, to inform consumers about the nutritional composition of foods so that they can make knowledgeable choices about their diet, to enable fair competition amongst food companies, and to eliminate economic fraud. Despite the enforcement of food safety laws over a decade ago, many states in India lack the infrastructure to ensure food safety.

In India, National Accreditation Board for Testing and Calibration Laboratories (NABL), a constituent Board of Quality Council of India is the nodal agency for the accreditation of food testing laboratories. On the other hand, FSSAI is the nodal agency

governing the food safety scenario in India. Food safety and standards Act, 2006 No. 34 of 2006 is an act to ensure availability of safe and wholesome food for human consumption and for matters connected there with. A meta study on food testing laboratories in India in 2018 estimates a total of around 600 laboratories in India which includes NABL accredited laboratories, FBO's, state/central government laboratories and FSSAI notified laboratories. As an essential part of the food safety ecosystem, the FSSAI Authority has created a network of 265 laboratories to fulfill its mandate on food testing and analysis. The network comprises of 172 accredited primary food-testing laboratories from both government and private sphere, 88 state food testing laboratories and 19 referral laboratories of which two are under the direct control of FSSAI. Although there are several number of challenges which are faced by them to run these food testing laboratories which has been mentioned below.

Challenges

- Lack of adequate human resources as well as outdated infrastructure create hindrance in proper functioning of the food labs. There is an urgent need to upgrade these laboratories.
- In the present food regime, there is a lack of communication among the food suppliers, sellers and buyers, which is a major challenge.
- Market invisibility and lack of industrial connection makes a problematic scenario in getting samples for newly set up laboratories.
- Food testing laboratories, both public and private, seldom indulge in independent R&D to formulate or evolve latest techniques, training modules or protocols for food testing.
- Financial constraints are major problem. No incentive or promotion is available for the food laboratories to keep up with the global standards.
- Timely surveys for the identification of FBO's and its monitoring is an essential requirement to list out the FBO's involved in an illicit activities for taking proper actions against them.
- There are multiple accreditations and recognitions for food testing laboratories in India e.g. NABL, FSSAI, EIC, BIS etc. which create unwanted duplication of work. To avoid this duplication of work, it should be brought under a single platform.
- Multiple accreditations like FSSAI, NABL, BIS, EIC etc. Create unnecessary confusion and mandates high investment in terms of time, cost and human capital.
- Overall consumer awareness towards food safety is still negligible in India.
- Most of the state laboratories are not functional.

Conclusion

Food safety is growing public health issue. Food is essential to life, Hence food safety is a basic human right. There is a need to develop consumer awareness towards food safety. Testing of food is done to instill confidence amongst consumers that to eat safe food is important part of the food system ecosystem. Growing cases of food borne disease across the country is responsible for the growth of food test market. However, number and spread of food testing laboratories in the country is grossly inadequate. Government should draw an action plan for overcoming the shortage of food testing laboratories, for proper functioning of existing laboratories as well as for overcoming the shortage of manpower of food regulatory bodies. An outreach capability, sample inflow and visibility of a lab can be increased by means of high end testing equipment but at the same time such equipment, their procurement, their installation and maintenance are highly capital intensive. It is of utmost importance to have an understanding of the existing infrastructure available for food testing in the country. With the emergence of new safety challenges and issues, there is an urgent need to upgrade this sectors to reduce the risk factors.

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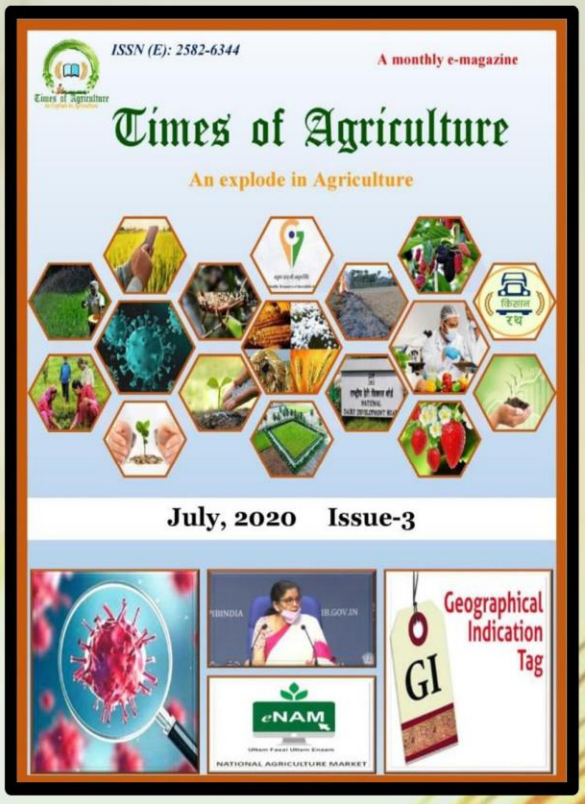

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