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Editorial

The vulnerabilities in supply chains and depleting workforces in the agriculture sector have been at the forefront line of discussion in the present context. Besides, the current Covid- 19 pandemic is an added challenge for this sector. The pandemic hit hard the availability of labour for different farm operations during peak harvest season. Although, the concern of farmer's income has been raised at several fora and is receiving top priority not only by the scientists and the farming community but all concerned, including the Governments of different Countries. Parallely, the present problem accentuated the need for agricultural market reforms and online platforms to connect farmers to markets. There is an urgent demand for new normal changes to the agriculture sector by relying on innovative digital solutions which can help to make supply chains function better and more efficiently. “FARMING” has been at the forefront of that response, mobilizing rapidly and always bringing new ideas in a single platform and projecting innovative thoughts of authors in a systematic way. It provides a forum for scholarly work and promotes technical competence for research in agricultural and allied subjects.

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SUMMER MOONG: ADOPT SOWING WITH HAPPY SEEDER OR ZERO-DRILL

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Conservation agriculture-based technologies like wheat sowing with happy seeder or zero-drill are becoming increasingly popular among the farmers owing to economic and ecological benefits. After the harvest of wheat and before the transplanting of rice, the land remains fallow at least for 60-65 days. A low input, short duration, high-value crop, mungbean fits very well into rice-wheat cropping systems and maybe grown during this period as a cash crop. The window period between the harvesting of wheat crop and sowing of summer moong is very short. The conventional method of mungbean sowing involves field preparation which is time-consuming and results in delayed sowing of summer moong. Timely sowing of summer mungbean is possible after manual or combined harvesting of wheat through zero-tillage technology. If there is no wheat straw lying in the field like in manual harvesting of wheat, summer moong can be sown without any tillage operations with the zero-till drill. In the combined harvested wheat field with the straw load, summer moong can be sown with a happy seeder without any delay.

Benefits of growing zero-tillage summer mungbean

- 1. Adding mungbean crop after wheat harvest will increase farm income and improve soil productivity (fix nitrogen into the soil) for sustainability of agriculture.*
- 2. Zero-tillage sowing saves money, energy and time required for field preparation.*
- 3. Happy seeder moong fields retains better moisture, organic matter promoting higher microbial activity.*
- 4. After picking of pods of summer moong, burying of its stover before transplanting of rice also helps to increase the paddy yield and in reducing the nitrogen requirement of rice by one-third.*
- 5. Growing summer moong also helps in reducing the loss of soil organic carbon due to higher temperature during the months of May and June.*

Improved varieties like SML 1827, SML 832, and SML 668 can be sown with zero-tillage technology by using 15 kg seed for SML 668 and 12 kg seed per acre for other varieties after the harvest of wheat. Inoculate the seed with a single packet of consortium biofertilizer at the time of sowing.



Sow the crop in rows 22.5 cm apart. Apply 5 kg of N (11 kg urea) along with 16 kg P₂O₅ (100 kg of superphosphate) per acre at the time of sowing. Generally, 3-4 irrigations are required by the crop depending upon the soil type, time, and intensity of rainfall. Apply first irrigation 25 days after sowing and do not irrigate the field later than 55 days after sowing for uniform maturity of the crop.



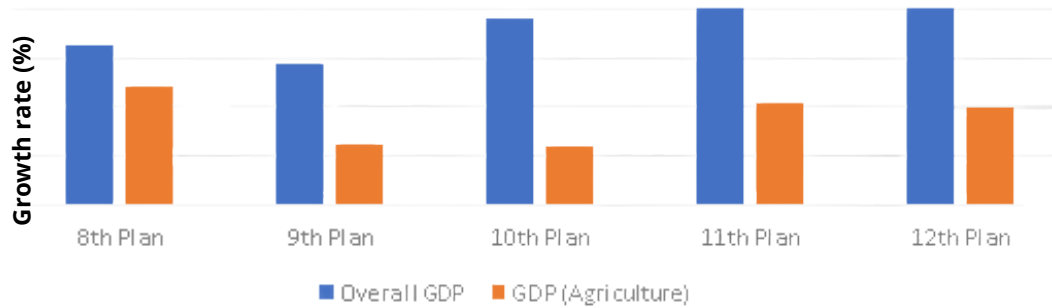
INDIAN AGRICULTURE: ISSUES AND PRIORITIES

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What is so distinctive about Indian agriculture? Most of the farmers in India are practicing subsistence agriculture. They own a tiny piece of land, grow their own crops, cultivate it with help of their family members and consume it with little surplus to sell in the near market. Indian agriculture is characterized by fragmented land holdings, high dependence on rainfall, labor-intensive cultivation, and dominance of food crops.

Growth in agricultural GDP has shown high instability since the introduction of economic reform in 1991. It fluctuated from 2.5 percent in the 9th plan to 4 percent in the 12th plan as shown in figure 1.1. Volatility is much higher in agriculture and allied sectors as compared to other sectors in the country. Small and marginal farmers are more susceptible to the vagaries of the monsoon and climate change. Also, agricultural commodity prices are unstable as the short-term production and consumption elasticities are low.

According to the Tendulkar Committee Report on Poverty Estimation, the percentage of the population below the poverty line is 25.4 in rural areas and 13.7 percent in urban areas



According to the Tendulkar Committee Report on Poverty Estimation, the percentage of the population below the poverty line is 25.4 in rural areas and 13.7 percent in urban areas. Nearly 75 percent of the Indian poor are from rural areas and their livelihood is directly or indirectly dependent on the performance of the agriculture sector. Thus, the economic growth of a country like India is highly dependent on the agriculture sector. It is the most effective means to reduce poverty, unemployment, and hunger.

Indian Agriculture is associated with the 'Green Revolution' that started in the mid-1960s. Pioneered by M.S. Swaminathan, it enabled the nation to become self-reliant. It transformed India into a food-surplus nation. India became an export-oriented country. It was possible due to the adoption of modern methods, infrastructure, and technology. For example, the use of high-yielding variety (HYV) seeds, tractors, irrigation facilities, pesticides, and fertilizers.

*According to
the 2011
Census,
every day
2,000
farmers are
quitting
farming as
their main
occupation*

Issues In Agriculture

Fragmented land holdings, dependence on erratic rainfall, lack of mechanization, poor quality seeds, lack of credit, and low prices. Though we should not forget the first-generation issues, we should prepare ourselves to meet the second-generation challenges too, especially related to sustainability, lower soil quality, massive use of synthetic fertilizers, the adoption of new agricultural technologies, excessive use of pesticides, urbanization on agricultural land, and fragmented supply chains.



An important issue is the migration of the next generation of farmers into other sectors. According to the 2011 Census, every day 2,000 farmers are quitting farming as their main occupation. The income of a farmer is as low as one-fifth of a non-farmer. Moreover, the farming population is aging without having a suitable occupational alternative.

Conventionally, the Indian agriculture system is characterized by caste-based rich peasants, the tenancy of absentee landlords, occupational land tenures, and parasitic landlords. These are the major historical obstacles in the path of advances and development in agriculture.

The total state-owned storage capacity of 37 MMT is held through three public sector agencies viz. Food Corporation of India (FCI), Central Warehousing Corporation (CWC) and State Warehousing Corporation (SWC)

The other issue that the agriculture sector should urgently address is the production and distribution of quality seeds for crops by government organizations. The majority of the farmers do not have access to the seed supply from the National Seed Corporation (NSC), State Farmers Corporation of India (SFCI), and State Seed Corporations (SSCs). Warehouses or storage facilities in the rustic regions are either missing or terribly lacking. Under such circumstances, the farmers are obligated to sell their produce immediately after the harvest at the prevailing market prices causing distress sales. Other issues include less area under leguminous and fodder crops, which ultimately affects the natural fertility of the soil. The soils are losing their resilience characteristics.



As far as the economic status of farmers is concerned, there is a lack of credit facilities and the farmers are not getting remunerative prices. In several parts of the country, most of the farmers remain in heavy debt. This has resulted in many farmers committing suicide.

*As per the
Central
Water
Commission,
85.3% of the
total water
consumed
was for
agriculture
in the year
2000*

Priorities in agriculture

Unfortunately, India ranks as low as 117 out of 193 countries (Sustainable Development Report 2020). As the climate crisis escalates, there is an urgency to maximize collective effort. There is a need to achieve sustainable development goals and transform the lives of farmers and consumers.



We need to educate our farmers to judiciously use the farm inputs for making the environment more sustainable. Better agricultural technology can improve productivity and reduce yield gaps. Irrigation facilities like drip or sprinkler irrigation and rainwater harvesting must be improvised at the farm level. Allied sectors like horticulture, and fisheries also need to be pushed forward. It will make the small farm holders economically sustainable, and they can diversify their source of income. Subsidies must be given to farmers following more environmentally friendly procedures. Linking small farmers with the urban retail supply chain will enhance the productivity and income of farmers. Globally, conservation agriculture has provided a common thread for the application of five sustainability principles—efficient use of water, reduced use of agrochemicals, improved soil health, adaptation to climate change, and doubling farmer income.

Just 14 per cent of farmers have registered on the National Agriculture Market (eNAM). Of those who have registered, 51 per cent have not benefited from the trading platform.

*The Hindu
(Business Line)
July 10, 2019*

Easy access for farmers to advance agriculture technology, and government-funded research with on-the-field trials will enable the country to progress further. Although the government has adopted measures in the form of schemes or programs such as PM Fasal Bima Yojana, PM KrishiSinchai Yojana, e-NAM, soil healthcare, etc, through rationalizing public expenditures, such schemes must be implemented with high economic returns. Lagging regions of central and eastern India such as Bihar, Jharkhand, Odisha, U.P. must be prioritized while implementing the agricultural schemes by the government.

Women are pivotal to the success of agriculture. The Sustainable Development Goal 5 (1), of the United Nations(UN), seeks to grant property rights and tenure security of agricultural land to women the world over. Along with farmers in general, the Indian government must take concrete steps to improve the economic status of women cultivators. Many have hailed the three bills pertaining to market reform in Indian agriculture as a watershed, but there is a need to resolve complex issues such as the large variation across states impeding the emergence of a single national market.



FORECASTING AND MANAGEMENT OF DISASTERS TRIGGERED BY CLIMATE CHANGE

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It is incontrovertible that human interferences have warmed the atmosphere, ocean, and land. The change in climate, extreme weather-related disasters, and sudden as well as the slow onset of disasters such as sea-level rise are threatening sustainable development and community resilience. This somehow is leading to cycles of poverty across the globe and loss of livelihoods. A load of climate change impacts is not uniformly distributed across the world due to different exposures, coping abilities, and vulnerabilities. People, ecosystems, livelihoods, environmental services, infrastructure, resources, etc including social, cultural, and economic assets are all adversely exposed to natural or manmade hazards. Extreme weather-related events have been found to increase with increased frequency and intensity worldwide as a direct consequence of rising temperatures. With the development of multi-hazard early warning systems, many lives are being saved but the fact is the number of people who are exposed to disaster risk is increasing as the population is increasing.

***Our Mission
to reduce
collective net
greenhouse
gas emissions
at least 50-
52% below
2005 levels by
2030.
(UN Foundation)***

The crisscrossing of the many man-made and natural disasters, particularly extreme weather-related events have complicated the risk assessment further. The overlap of some natural and manmade disasters with the Covid -19 pandemic has impacted people's life to a great extent which further demonstrates the need for a great investment in disaster risk reduction and to strengthen the preparedness for multiple disaster scenarios.



A thought can be given to disaster prevention to reduce the overall vulnerability of Social, physical, environmental, or economic factors or processes that actually affect the susceptibility of the community.

Taken as a whole, the range of published evidence indicates that the net damage costs of climate change are likely to be significant and to increase over time.

(Intergovernmental Panel on Climate Change, Published by NASA)

The preparedness and mitigation would involve early warning systems as well as Decision Support Systems (DSS) based on real-time data. Developing tools for DSS should be a primary effort for mitigating disaster risk assessment and management. Constant refining and improvement are one of the representative features of 'developing the tools'.



Once such a system of forecasting and decision support system framework is developed then the capacity building of individuals and institutions would be the next step. Boundary conditions, however, remain that these systems should be user-friendly and easy to use by the end-users or stakeholders. Climate change will continue to happen, hence early warning, decisions making at the local level, and mitigation strategies will be the best coping options.

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MEDICINAL PLANTS GROWING IN DIFFERENT PROVINCES OF CANADA

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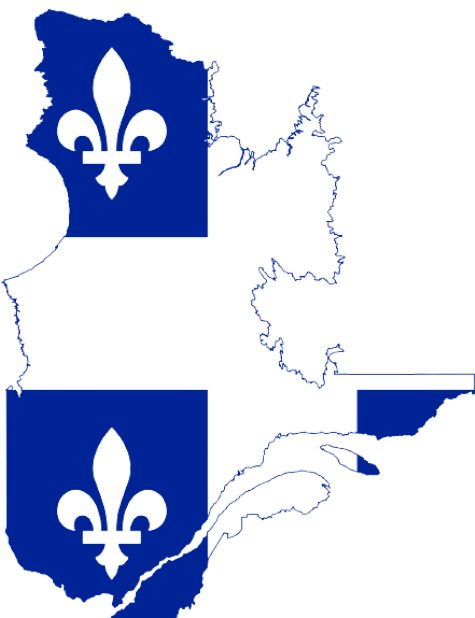
Canada is the second-largest country after Russia. More than 34 percent of Canada's land is under forests, which is 362 million hectares and 9 percent of the world's forests. Out of which 73,360 thousand hectares in Quebec, 57,910 thousand hectares in British Columbia, 53,578 thousand hectares in Ontario, 28,352 thousand hectares in Northwest Territories, 27,718 thousand hectares in Alberta, 20,043 thousand hectares in Saskatchewan, 18,968 thousand hectares in Manitoba, 10,730 thousand hectares in Newfoundland and Labrador, 7,884 thousand hectares in Yukon, 6,091 thousand hectares in New Brunswick, 4,240 thousand hectares in Nova Scotia, 815 thousand hectares in Nunavut and 265 thousand hectares in Prince Edward Island. Out of this area, some are reserved forests and some are non-reserved forests. Along with lumber, these forests are rich in different kinds of plants and flowers which are used for medicinal purposes and they are also adopted by households for their gardens as well as for commercial purposes.

Antibacterial Activity of Northern Ontario Medicinal Plants



Ontario

Antibacterial activity of northern Ontario medicinal plants extracts was tested in the lab and it was found by scientists that the leaf and/or flower crude extracts of *Anaphalis margaritacea* (L.) Benth & Hook.f., *Grindelia squarrosa* (Pursh) Dunal, *Apocynum androsaemifolium* L., *Arctostaphylos uva-ursi* (L.) Spreng, *Cornus canadensis* L., and *Xanthium strumarium* L. are highly effective against several types of microbial infections of *Escherichia coli*. The extracts of *Anap. margaritacea* and *G. Squarrosa* are efficient against the majority of germs tested in the lab by scientists. Cholecystitis, bacteremia, cholangitis, gastrointestinal infection, urinary tract infection (UTI), and traveller's diarrhea, as well as other clinical infections like neonatal meningitis, chronic cutaneous infection in HIV positive patients, mycobacterium avium complex (MAC) infections, diarrheal syndrome, and pneumonia, can all be treated with extracts from these plants.



Quebec



British Columbia

Medicinal Plants Growing in Quebec

The antioxidant activity of *Larix laricina* is strong, and the greatest quantities of phenolics are found in Pinaceae and Ericaceae extracts. Antioxidant activity gets impacted by factors such as the season and location of plant collection, as well as the plant portion from which the extract was produced. As a result, the antioxidant activity of these plants is employed to treat the symptoms of type 2 diabetes. These plants may be found in the Quebec towns of Whapmagoostui and Mistissini.



Medicinal Plants Growing in British Columbia

Methanolic extracts of plants in forests of BC, according to researchers, are effective against viral infections. *Rosa nutkana* and *Amelanchier alnifolia* extracts are highly effective against intestinal coronavirus. The respiratory syncytial virus can be totally suppressed by *Potentilla arguta* root extract and *Sambucus racemosa* branch tip extract. An extract of the *Ipomopsis aggregata* plant has a favourable reaction to the parainfluenza virus type 3.



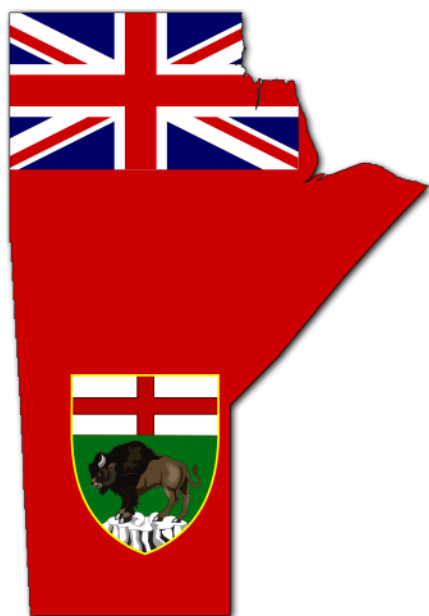
Alberta

Medicinal Plants of Alberta

The four herbs are Red Osier Dogwood, Fireweed, Buffaloberry, and Indian Pipe. These four herbs are used to cure a wide range of diseases in both traditional and modern medicine. Coughs, colds, fevers, sinus congestion, liver disorders, and postpartum hemorrhage have all been treated with Red Osier Dogwood bark tea. Buffaloberry fruits help relieve joint and muscular discomfort, as well as arthritis and other inflammatory symptoms such as swelling and blisters. Convulsions, fits, epilepsy, and drowsiness are all treated with Indian Pipe root tea.

Medicinal Plants of Manitoba

Some of the medicinal plants of Manitoba are Polygala senega, chamomile, and common nettle. Senega is used to treat a variety of ailments, including lung problems like asthma and emphysema. It is also used to increase saliva, expel mucus, and cleanse the intestines. Senega is sometimes gargled for sore throats. Chamomile preparations are often used to treat a wide range of human problems, including hay fever, inflammation, menstrual disorders, sleeplessness, ulcers, wounds, gastrointestinal disorders, rheumatic pain, and hemorrhoids. For hundreds of years, common nettle has been used to treat aching muscles and joints, arthritis, gout, and anemia. Many individuals take it to address urinary difficulties caused by an enlarged prostate in the early stages (called benign prostatic hyperplasia or BPH).



Manitoba



Saskatchewan



Nova Scotia



New Brunswick



Prince Edward Island

Medicinal Plants of Saskatchewan

This province's medicinal plants are regarded as significant. These are white willow salve and spruce salve. White willow can be utilized for medical purposes, although the inner bark has the most promise. The powdered form of the inner bark is used in aspirin as a pain reliever and in the treatment of ailments such as the flu. Spruce salve is used to treat eczema and arthritic discomfort.

Medicinal Plants of Nova Scotia and New Brunswick

Prunus serotina, or black cherry, is endemic to New Brunswick, and Nova Scotia. Coughs and lung disorders such as pneumonia and bronchitis can be relieved by making the bark into a tea or syrup. Black cherry can also aid with pain and diarrhea relief.



Medicinal Plants of Prince Edward Island

Lobelia inflata is indigenous to Prince Edward Island. It is primarily used to treat respiratory conditions such as asthma and bronchitis.



Newfoundland and
Labrador

Medicinal Plants of Newfoundland and Labrador

Three main medicinally important plants are Echinacea, Goldenseal and Ginseng found in Newfoundland and Labrador. Echinacea, often known as purple coneflower, is a herbal remedy that has been used for generations to treat common colds, coughs, bronchitis, upper respiratory infections, and various inflammatory diseases. Goldenseal (*Hydrastis canadensis*) is a plant in the buttercup family found in Canada's Newfoundland and Labrador. Berberine, a component of goldenseal, has antibacterial and antifungal effects. It also contains anti-hypertensive properties and can help with irregular heartbeats. Ginseng (*Panax quinquefolius*, L.) lowers blood sugar and cholesterol levels, promotes relaxation, treats diabetes, and manages sexual dysfunction in males.



CONTRIBUTIONS OF RICE PRODUCTION IN ARKANSAS TO THE U.S. EXPORT

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Arkansas is known as a rice state and is located in the south-central region of the United States of America (hereafter U.S.). Arkansas State shares its border with Missouri, Tennessee, Mississippi, Louisiana, Texas, and Oklahoma. It is the 29th largest state among 50 states of the U.S., with a total area of 53,182 square miles. There are two major rivers as Arkansas and the Mississippi River, which help recharge the groundwater, and the groundwater is further used for irrigation. The land is categorized into five sub-regions as shown in Figure 1 (a).



Figure 1 (a) Physiographic Regions of Arkansas

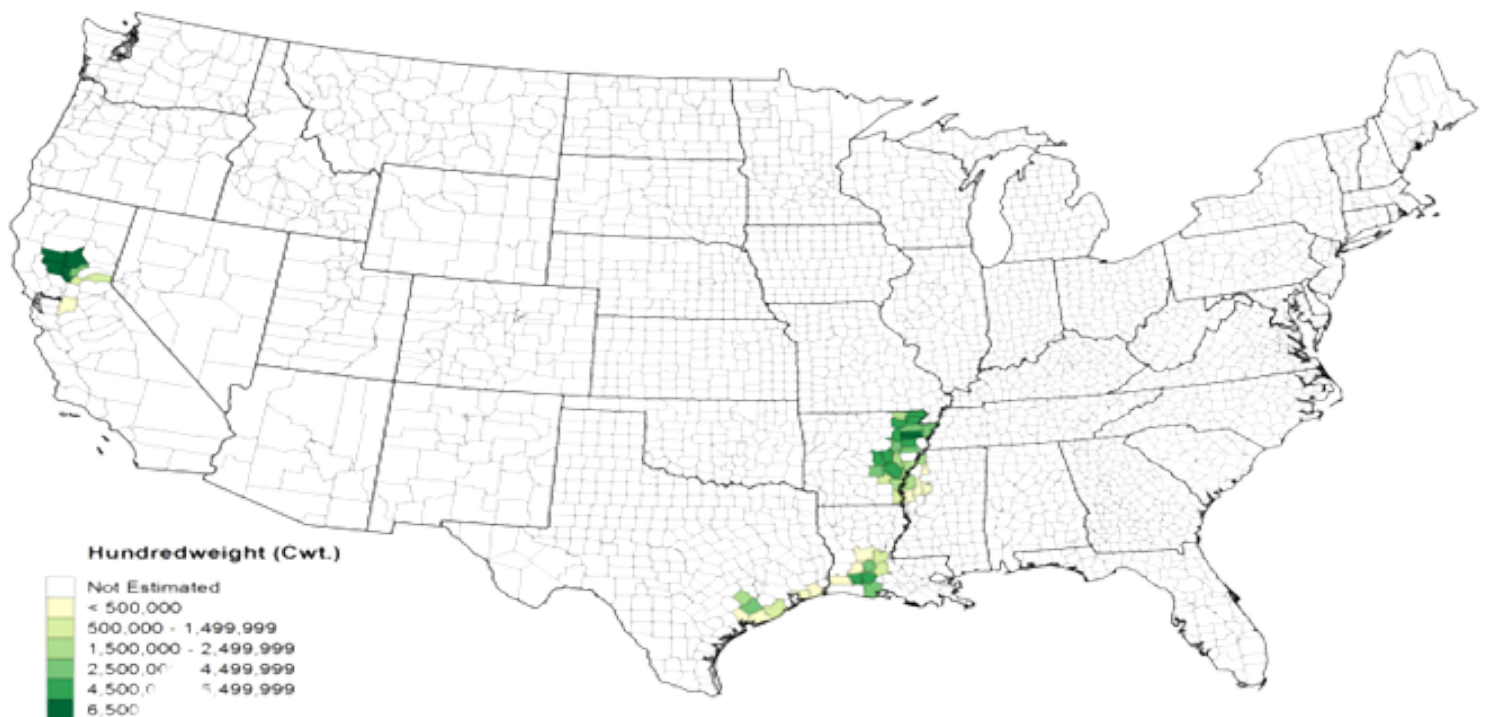
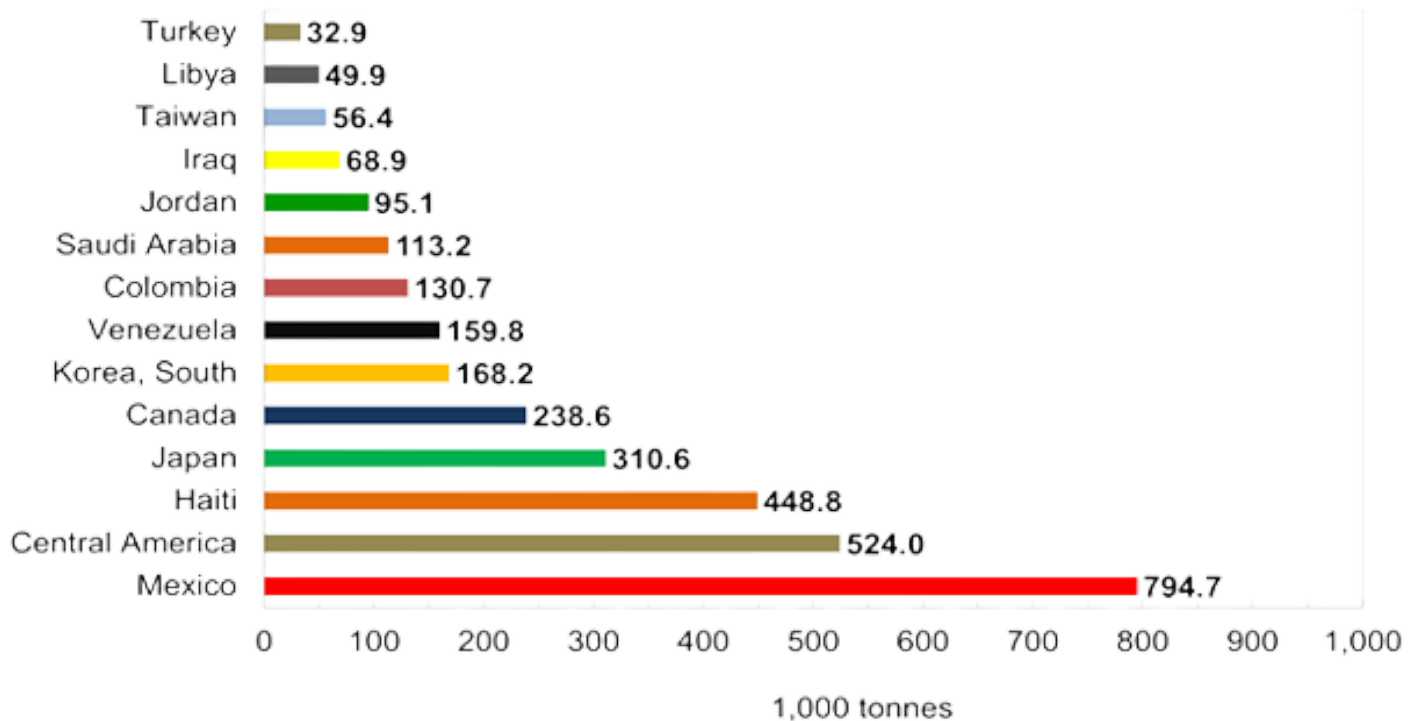


Figure 1 (b) Rice production by county in Arkansas, 2019

The overall average temperature ranges from 93.6 degrees high and 26.6 degrees low. This temperature is favourable for growing rice. That is why Arkansas is known as a rice state. Overall, 40 counties in Arkansas grow rice and contribute more than 40% of the total rice production in the U.S. Mainly, long and medium grain varieties are produced and exported; however, there are overall 9 varieties of rice in Arkansas.[1]

According to the United States Department of Agriculture (USDA) 2020, the land under the rice plantation was 1,461,000 acres, of which the total production was 108,107,000 CWT.[2] They also assumed that there might be an increase in rice production by 10% in the past decades. Arkansas rice farmers produce more than 9 billion pounds per year on average. The farmers contribute more than billions of dollars to the state economy and provide 25,000+ jobs. Overall, 56-58 percent of long-grain rice and a substantial amount of the small-grain rice are being grown. Arkansas rice plays a vital role in the total export of U.S. rice.



Notes: 1 metric tonne = 2204.62 pounds. All shipment averages are reported in actual shipment product-weight.

Source: USDA, Foreign Agricultural Service, Global Agricultural Trade System online database.

Figure 2. U.S rice exports by market from 2016 to 2020

Globally, the U.S. shares less than 2% of global rice production. This exported rice includes different grain types such as rough, parboiled rice, brown rice, and fully milled rice. Almost half of the rice produced in the U.S. is being exported every year. In figure 2, the data is from 2016 to 2020. The U.S exports almost 55% of its rice to Mexico, Central America, and Haiti. Out of which approximately 25% is exported to Mexico. Additionally, Turkey is the only with 1.03% which keeps it at the bottom for its contribution to U.S export.

Figure 3 shows different types of rice being exported from the U.S. White rice export has fluctuation over the past decades. It covers the high percentage of rice export. Whereas it remains around 1000 – 1500 tonnes in a year. Brown rice only has a rapid rise in the year 1980/81, but otherwise, it has maintained a stable growth since 1977.

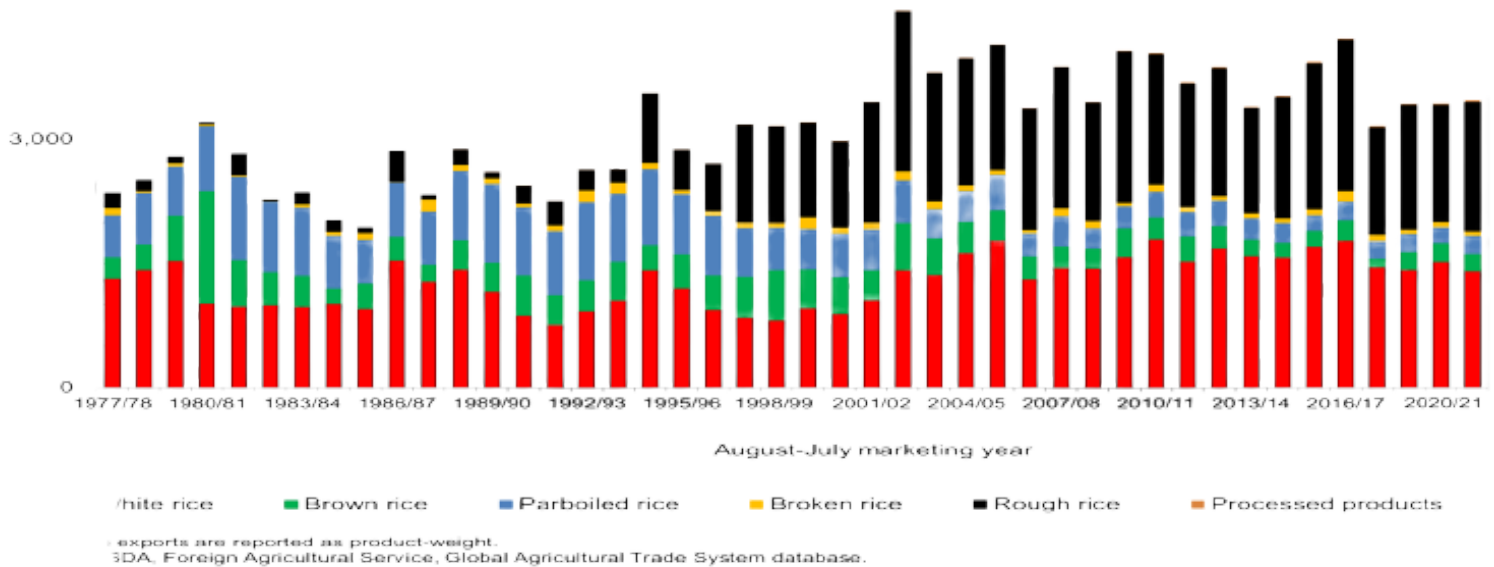


Figure 3. U.S rice exports by type from 1977 - 2020

Parboiled rice covers the second-highest percentage of the rice exported in the initial years. Whereas, it became the third-highest in rice export as the year passes. Broken rice is the one which is exported in very less quantity every year. Rough rice is highly likable in a rice export nowadays. But in the initial years, it was not that likable. It is also giving good competition to white rice in the rice export.

References:

1. Information on 9 varieties of rice can be found at <https://aaes.uada.edu/row-crops/foundation-seed-program/rice-seed/>
2. More detailed information can be found at <https://www.ers.usda.gov/topics/crops/rice/rice-sector-at-a-glance/>



ROLE OF HONEYBEES IN POLLINATION

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Imagining survival on planet earth seems impossible without flowers, vegetables and fruits. Artificial pollination is time-consuming. The natural pollination that takes place in the environment is done by pollinators. They make it easy for the flowers to cross-pollinate as they act as agents in the process of pollination. The setting of seeds by flowering species of plants is only possible if there is a pollination service provided by the pollinators. Roughly 80% of the wild plant species and 75% of plants worldwide from which humans get fruits and vegetables, also consumable, need pollinators in order to undergo the process of pollination.

The absolute number of bee species around the world depicted up until this point accounted for is to be 17,553. Honey bees are the major contributors to transferring the pollen from the anther of one flower to the stigma of another flower. They are known to be the best pollinators for commercial use. They are social insects and herbivores. They are esteemed for their honey and wax production. It has been observed that around 75% of the world's developed yields are pollinated by the honey bees.

*Pollination is
vital to the
approximately
250,000
species of
flowering
plants that
depend on the
transfer of
pollen from
flower anther
to stigma to
reproduce
(U.S. Food and Drug
Administration)*

Nearly, 30% of the crops all over the world depend on the pollination done by honey bees. The communication process that takes place between the honey bees is one of the major and important processes. This process helps the honey bees that have found food sources to let other bees in the hive know about the food source. Round, sickle and waggle are the types of dances that are performed by honey bees to provide information to other honey bees.



A few fruits and vegetables that are pollinated by honey bees are tomato, watermelon, onion, okra, lettuce, cole crop, kiwi, pear, apple, avocado, cucumber, soya bean, cotton pumpkin and squash. Honey bees work as the very major bioindicators in the environment as they respond to changes that happen in the environment due to their environmental stress delicacy. The worth of honey bee's pollination to overall horticulture has been assessed to be around 215 billion dollars. The vegetables that are major sources of pollen and nectar are muskmelon, okra, alfalfa, radish, pigeon pea and turnip. Fruits that contribute to providing a good amount of pollen and nectar to pollinators are apricot, pear, Jamun, passion fruit, alu-bhukara.

*The fuzzy,
hairy little
bodies of our
worker bees
collect pollen
accidentally.
Yes, while they
are busy
looking for
sweet nectar,
some of the
pollen particles
will adhere to
the tiny hairs
on their bodies
(Carolina
Honeybees)*

A few oilseed crops and seed species are also there that are good sources of pollen and nectar which are fennel, rapeseed, coriander, Sarson, taramira, sunflower and dill. Honeybee pollination in apples increases apple production, quality, yield (15-20%) and fruit drop decreases. Around 20-40% of pollination in guava is done by honey bees. Honey bee's pollination in guava increases the length of fruit, fruit set and width. The pollination by honey bees in guava also increases its yield to about 5-10%.



Honey bees play a major role in increasing the seed production of brassica vegetables. Maximum benefit has been seen in Brassica oleracea var. Italica with an increased seed yield by 29.2%. Avocado (Persea Americana) is a cross pollinated crop which address around 35% of the total agriculture production. Honeybee pollination inavocado increases its yield and production Also, in the rapeseed, pollination by honey bees helps in increasing the yield. Overall, pollination by the honey bees in various plant species help in increasing yield, fruit size, the weight of fruit and fruit set.



ROLE OF DIFFERENT POLLINATORS IN AGRICULTURE

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India

A pollinator is the biotic specialist, creature or vector that moves pollen from anthers to the stigma of a blossom. Insects and other animal pollinators are vital for the production of healthy crops for food, fibres, edible oils, medicines and other products. Pollinators assume a colossal part in the creation of many organic products, vegetables and field crops and various reports have esteemed insect pollination as an eco-framework administration for agrarian food creation at both and public level. Generally 78% of mild and over 90% of tropical plant species rely upon creature fertilization to some degree benefits that are given by blossom visiting, the most important pollinators are honey bees because of their large numbers and single gathering.

Different pollinators play different roles in agriculture such as ants digging developing water invasion, waste and soil area circulation. Ants complete food conservation, disease control and waste administration and with perseverance build new homes and modify them after harm. Bats are vital pollinators in tropical and desert environments.

A majority of plants, more than 70 percent of species, depend on insects, birds, bats, and other animals to transport the pollen

(Ecological Society of America)

They feed on the pests in the blossoms as well as nectar and bloom parts, for example, calabash, wiener tree, Areca palm, and Kapok tree. They also safeguard crops from pests by pursuing away insects with their echolocation calls. Beetles pollinate numerous industrially useful plants which include palms, sugar and custard apples and also provide pollination in ecological ecosystems. Beetles decrease weeds and insect pests in agricultural fields. Certain species of beetles are found to consume other helpful predators, consequently disturbing the natural control of pests by obstructing pest suppression. Birds are vital pollinators of wild flowers all through the world.



Around 2000 bird species feed on nectar, insects, and spiders related to nectar-bearing blossoms. Hummingbirds have excellent eyes and are very drawn to red. They play a double role in agriculture in which some of them help in pollinating the wild plants, improve the soil fertility, and assume a vital part in pest and rodent control.

*Pollinators
play a
significant role
in the
production of
over 150 food
crops in the
U.S.—among
them apples,
almonds,
blueberries,
cranberries,
kiwis, melons,
pears, plums,
and squash.
(Ecological Society
of America)*

Butterflies are also known as nectar thieves. The butterfly is a diverse insect, found in many tones and sizes. Around the world, there are about as than 28000 types of butterflies types with around 80% in tropical areas. The butterfly assumes a significant part in a biological system going about as a pollinator, as a food source and as a mark of biological system prosperity. They typically favour the flat clustered flowers that provide a landing pad and abundant rewards. Moths are successive plant guests, and there are various experiences between plant species and moths.



Moths fertilize around 40% of plant species in provincial scene conditions. The role of moths in farming conditions is regularly credited to their fertilization of non-crop plants, which adds to expanding the biodiversity in agro-biological systems, offering a broadly valued environmental capacity. Flies are one of the most diverse gatherings on the planet, they are found to be a pollination service provider. They are found to be important crop pollinators that have the potential to complement bee pollination.

*Most
pollinators
(about 200,000
species) are
beneficial
insects such as
flies, beetles,
wasps, ants,
butterflies,
moths, and
bees
(Pollinator
Partnership, USA)*

Flies are available in practically all living spaces and biomes and for some therapeutic food and ornamental plants, pollinating flies assurance improved seeds and organic product creation. They are significant in the natural landscape, in horticulture and in nurseries and also it has been found that they can also be utilized in the development of seeds for seed banks. Wasps play an important role in the ecosystem as pollinators, predators and parasitoids.



Parasitic wasps act as regular bio-control of insect pest populations in agricultural systems. Certain fig trees can only be pollinated by Blastophaga wasps, they lay their eggs on the fig trees. The little wasps crawl inside the developing fig and reproduce, and afterward at last become nourishment for the fig. Bees like any insect play a vital function in crop pollination. They make contributions to the worldwide meals deliver through pollinating a huge variety of crops including fruits and vegetables. They increase the yield and give rise to the lucrative honey industry. Bees are responsible for 35% of the agriculture production and other than their role as pollinators. Honey bees are the wellspring of honey and different honey hive items for example propolis, regal jam, toxin and bee wax.

*About 1,000 of
all pollinators
are vertebrates
such as birds,
bats, and small
mammals
(Pollinator
Partnership, USA)*



Overall, pollinators give food security, food variety, human nourishment and food costs all depend on animal pollinators. They are fundamental for plantation, and agricultural yield and very much beneficial for horticultural crops and help in crop enhancement. Pollinators support our environment and produce our natural resources by helping plants reproduce.