



LAND BANK JOURNAL

VOLUME 58 • DEC. 2018 • ISSUE III



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LAND BANK JOURNAL (QUARTERLY)

Managing Editor
K. K. RAVINDRAN

SUBSCRIPTION RATES

Annual

₹60/- (For Members)

₹200/- (For Others)

Price per copy

₹15/- (For Member)

₹50/- (For Others)

Published by

**National Co-operative Agriculture and
Rural Development Banks' Federation Ltd.**

701, BSEL TECH PARK, 7th Floor, A-Wing,
Opp. Railway Station, Vashi, Navi Mumbai-400 703

Phone No. (022) 27814114, 27814226, 27814426

E-mail : nafcard.org@gmail.com

Website : www.nafcard.org

Printed by:

ACHSA PRINTERS

Shop No. 39, Maruti Paradise, Sector - 15,
CBD Belapur, Navi Mumbai - 400 614.

Tel.: 27571209 / 27571210

*The opinions/views expressed in the Land Bank Journal are
not necessarily the official views of the National Cooperative
Agriculture & Rural Development Banks' Federation.*

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The model Recovery Policy for member banks finalized by the Board of the Federation recently, envisages significant changes in the loan and recovery systems. Banks need to view recovery as an essential part of credit cycle and not just as the final step, so that loan officers remain responsible for recovery of loans during the life of the loan. Timely detection of issues in the loan account can avoid default in repayment to a great extent. The system of quarterly/half yearly/annual due dates generally followed in agricultural term loan makes early detection difficult since by the time a loan account is identified as problematic when one or more instalments are defaulted, the amount of arrears surges beyond the capacity of the borrower to pay in the normal course.

Agriculture is prone to specific risks such as climate risk, price risk, risk of pests and diseases. In spite of reforms introduced in crop insurance through Pradhan Manthri Fasal Bima Yojana the coverage of Crop Insurance at peak level in the last two years was limited to 40-45% of farmers. Similarly, there is a growing feeling that huge amount of Central and State Government subsidy going into crop insurance scheme actually benefits only the Insurance Companies as annual compensation payouts under crop insurance scheme is only to the extent of 60-65% of gross premium collected, that too with huge delay in disbursements. The total payouts under PMFBY in the last two years were only ₹31613 crores against gross premium collection of ₹470408 crores. It is reported that crop insurance enrolment has come down by 15% this year, which is attributed to a great extent to issues in claim approvals and getting compensations. Apart from crop loss, farmers often suffer substantial losses due to destruction and damage of farm assets in extreme weather events, which have become frequent in recent times. At the same time, farmers generally are shy of insuring farm assets due to high costs. Like crop insurance scheme, there is need for a Farm Assets Insurance scheme with the financial support of Government to address this problem. In fact, a portion of the huge surplus generated under Crop Insurance scheme at present, can be used for implementing such a scheme. Presently farm assets by and large remain uninsured. The uncompensated losses of farmers on this account significantly increase the risks for banks which finance such assets. The model recovery policy suggests that the banks should endeavor to make clients aware of these risks and should take such risks into account in the loan design. It is necessary to make a provision for rescheduling instalments due under agriculture term loan in a bad crop year either partly or wholly depending on the extent of losses and the impact of such losses on overall repaying capacity of the clients. The Central Govt scheme of fixing MSP at 150% of crop production cost is a major initiative to address price risk in agriculture. However, farmers will get full benefit of the scheme only when there is adequate arrangements for market intervention or direct income support when prices go below MSP.

Lack of financial literacy among rural clients is another issue coming in the way of timely repayment. It is observed that clients who do not keep records of income and expenses, in spite of having capacity and will, fail to pay on time due to poor management of cash flow. ARDBs should also help such clients to accumulate their routine

savings by extending the facility of thrift and saving accounts. Promoting thrift and saving habit among members is one of the stated objectives of ARDBs like any other credit cooperative. In spite of their mandate to mobilise member savings through thrift and saving accounts, it is a matter of grave concern that NABARD's inspection teams, of late, have objected to acceptance of thrift deposits by ARDBs in some states. It appears that they are confused with the terms and conditions of the scheme sanctioned to SCARDBs in 1997 for mobilizing term deposits from public including any individual or institution. This confusion is totally unwarranted as deposits under the said scheme were to be collected only by SCARDBs. In the Federal structure SCARDBs do not have individual membership. Obviously, when Federal SCARDBs collect deposits from individuals, it should be from non-members or public, the conditions of which cannot be applied to schemes formulated by banks for mobilising deposits exclusively from their members. It is unfortunate that NABARD, which is expected to support ARDBs to augment their internal resources is playing a role contrary to that.

Adequate arrangements for financing working capital/production credit needs of clients who avail investment credit, sanctioning of loan and fixing loan period and due dates strictly based on repaying capacity, regular monitoring of activities undertaken by clients using the loan, introducing incentive scheme to clients for timely repayment, incentive/penalty systems for loan officers for their performance in recovery, cluster based group approach, especially in sanctioning small loans to facilitate regular and continuous follow up, avoiding wasteful expenditure on the part of the borrowers to complete loan procedure, intensive pre-due date follow up and following a prescribed standard procedure for carrying out post-due date recovery follow up are the other major highlights of the model recovery policy.

The model recovery policy views legal recovery more as a deterrent than as a means to achieve recovery targets. While rescheduling and restructuring with additional period with lower instalments and waiving a portion of charges are recommended for making overdue loan accounts regular when reasons for default are genuine, legal recovery is the only option in the case of clients who avoid repayment in spite of having ability to pay. It is seen that completing legal recovery process effectively in a few cases can drastically bring down the incidence of willful default. Giving state wide publicity to auction for sale of mortgage property, ensuring participation of prospective buyers from other districts in the auction, sanctioning loans to prospective buyers wherever required, outsourcing legal support for completing sale procedure in case of shortage of staff etc. are some of the suggestions to make legal recovery effective.

The Board expects member banks to formulate and implement their own recovery policy or to reformulate existing recovery policy on the lines of model policy for better results.

K K. Ravindran
Managing Editor



Agroforestry: An Income Generating Approach in Rural Areas of Red and lateritic region of India

Babloo Sharma¹, Sandeep Kumar Tripathi², Pratibha Kumari³, Reena Kumari⁴ and Adyant Kumar⁵

ABSTRACT

In India, the major part comes under rainfed or dry land agriculture system where farmers' are grown single crop in a year and crop failure risk is always. That's mean farmers are engaged only three to four months for income generating works whereas, rest time is not properly utilized. So, the farmers' family economic condition is very poor as well as social status. The multi-cropping system or different land use is require to improvement of farmers income sources. The agroforestry is the one of the most important land use system, for maximizing production and income generation for better societal development. Agroforestry systems have been historically significant as sources of food and fuel for forest-dependent and rural communities in Indian sub-continent. Agroforestry is the integrated development practises for farmers and their families. Empirical evidences on the determinants of agroforestry adoption categorized under five groups: economic incentives, biophysical, risk and uncertainty, resource endowments, and household choices. As former statement, Agroforestry increases efficient use of farmers' resource, i.e. it decreases cost of production and increases the produce. So, it increases the benefit per unit cost of production.

Keywords:- Agroforestry, Farmers' practices, Resource use efficiency, Income generation

Introduction

Agroforestry is the modern concept land use system but it has been ancient way of life and livelihood in India for centuries used in India. Agroforestry is a land use management system in which trees or shrubs are grown around or among crops or pasture land. Agroforestry is defined as a land use system which integrate trees and shrubs on same piece of lands and rural lands to enhance productivity, profitability, diversity and ecosystem sustainability. It is a dynamic, ecologically based, natural resource management system that, through integration of woody perennials on farms and in the agricultural landscape, diversifies and sustains production and builds social institutions. In the world, India has become the first nation to adopt an agroforestry policy. The National Agroforestry Policy was launched February 10, the first day of the World Congress on Agroforestry, held in Delhi which deals with the practice of integrating trees, crops and livestock on the same plot of land. The policy was approved by the Cabinet on

February 6, 2014, deals with problems agroforestry sector is facing at present, including adverse policies, weak markets and a dearth of institutional finance.

Basic objectives of national policy

- Encourage and expand tree plantation in complementarity and integrated manner with crops and livestock to improve productivity, employment, income and livelihoods of rural households, especially the small holder farmers.
- Protect and stabilize ecosystems, and promote resilient cropping and farming systems to minimize the risk during extreme climatic events.
- Meet the raw material requirements of wood based industries and reduce import of wood and wood products to save foreign exchange.
- Supplement the availability of agroforestry products (AFPs), such as the fuel-wood, fodder, non-timber forest produce and small timber of the rural and tribal populations, thereby reducing the pressure on existing forests.
- Complement achieving the target of increasing forest/tree cover to promote ecological stability, especially in the vulnerable regions.
- Develop capacity and strengthen research in agroforestry and create a massive people's movement for achieving these objectives and to minimize pressure on existing forests.

Red and laterite zone of India and its low productivity

These soil type rich in iron and aluminium, and is commonly considered to have formed in hot and wet tropical areas. Nearly Red and laterites are of rusty-red coloration, because of high iron oxide content. They develop by intensive and prolonged weathering of the underlying parent rock. Tropical weathering is a prolonged process of chemical weathering which produces a wide variety in the thickness, grade, chemistry and ore mineralogy of the resulting soils. Red and laterite soils along is the soil group of India. The main parent rocks are crystalline and metamorphic rocks like acid granites, gneisses and quartzites. They are acidic mainly due to the nature of the parent rocks. The alkali content is fair. They are poor in lime, magnesia, phosphates, nitrogen and humus. They are fairly rich in potash and potassium. When



limestone, granites, gneisses and quartzites are eroded the clay enclosed within the rocks remains intact with other forms of non-soluble materials. In oxidizing conditions, rust or iron oxide develops in the clay, when the soil is present above the water table giving the soil a characteristic red colour. These soils mostly occur in the regions of high temperature and heavy rainfall with alternate wet and dry periods. They occupy about 5.98 lakh sq km of the total area of the country. These soils are spread on almost the whole of Tamil Nadu, parts of Karnataka, south-east of Maharashtra, Telangana, Andhra Pradesh, Madhya Pradesh, Chhattisgarh, Odisha, Chota Nagpur plateau; parts of south Bihar, West Bengal, Uttar Pradesh; Aravalis and the eastern half of Rajasthan (Mewar or Marwar Plateau), parts of North-Eastern states. Red and Laterite soils lack fertility due to intensive leaching, the major crops are cotton, wheat, rice, pulses, millets, tobacco, oil seeds and potatoes whereas it is also suitable for growing plantation crops like tea, coffee, rubber, cinchona, coconut, arecanut, etc. and support grazing grounds and scrub forests.

The red and laterite soils in India are not fertile. Red soil might not be suitable fit for agriculture because it might not contain the suitable minerals which are necessary for the growth of the crop on which it is grown. They are coarse in texture and poor in nutrient availability especially major nutrient viz. nitrogen, phosphorous and potassium. Red soil has the least water holding capacity and has very much amount of iron and phosphorus which is very harmful for the crops. The low content of organic matter in red and laterite soil is directly affected nutrient availability as well as nutrient absorption in soil. The high content of Iron and aluminium is fixed available phosphorous to unavailable form. These soil formed under highly rainfall areas, so the soil erosion is also one of the major problem for the degradation of soil. Due to soils erosion, the topmost fertile soil is lost as well as the nutrient loss also and final result the soil is not suitable for crop cultivation.

Cropping system in red and laterite zone

In India, the cropping pattern follows three distinct seasons; Kharif season from July to October, Rabi season from October to March and Zaid season from April to June. The monocropping system is dominate in red and laterite zone of Indian subcontinent. The farmers grow single crop in a year mainly in rainy season and some area take two crops when

irrigation facility is available. The crops is short duration and drought tolerant. The water scarcity is the major constraint in red and laterite zone due low precipitation and high evapotranspiration which results in water deficit prevailing throughout the year. Water obtained during the sparse and irregular rainfall days are to be conserved in order to make it available during moisture stress period. The other major problem is acidity of soil due to leaching of base and accumulation of sesquioxide as well as low nutrient content in soil. The predominant crops in red and laterite zone is wheat, rice, cotton, sugarcane, pulses, coffee, rubber, cashew nut, tapioca and etc.

Benefit of agroforestry

- The agroforestry system increase the production from the field.
- It produces fodder for livestock production.
- It provides fuel for farmers' family.
- It controls soil erosion and improve soil quality.
- It increases biodiversity.
- It sequesters atmospheric carbon in different organic forms.
- They can maintain soil organic matter and biological activity at levels satisfactory for soil fertility.
- They can maintain more favourable soil physical properties than agriculture, through organic matter maintenance and the effects of tree roots.
- They utilize solar energy more efficiently than monocultural systems different height plants, leaf shapes and alignments all contribute.
- They can lead to reduced insect pests and associated diseases.
- In agroforestry system increase employment for the whole year as compared to mono cultivation.

Disadvantages of agroforestry

- The field crop production decreased as compared to mono-cropping.
- It's a time taking practices and at initial stage return is low.
- It requires proper knowledge for cultivation.
- The management is not easy because the multiple crop and tree combination in single piece of land.

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MAPPING PULSES ON EXPORT MAP

***Dr Yadnya Pitale**

Exports ensure valuable monetary premium over cash advantage. Though, India has to its credit various firsts in exports, its export basket in comparison to similarly developed countries, has a very narrow bandwidth with few commodities in its scope and agri-commodities and products being very miniscule in their comparison.

Pulses export has been a lucrative business for countries like Canada, Australia and USA where the purpose of farming pulses is purely for export. The cool climate and moisture laden soil due to the frost collected in winters makes these lands ideal for pulses farming. The pulses farming business has been taken seriously by the farmers who are efficiently guided in terms of effective farming techniques and forecasts not only in terms of weather but also for future demand from world markets. This has made farming a lucrative occupation.

India is branded as a country with large population. This large population versus small farm land holding makes export of agri products difficult. India's expanding population has restricted export of Agri-products mainly due to its large consumption capacities being the reasons for food security. Moreover, India's predominant vegetarian status makes pulses a prominent part of the population's diet being one of the many hurdles in export of this commodity. Although domestic demand restricts export is one reason, but the most deterrent factor for the downside skew in pulse production is attractive options in cereal production such as PDS, non-sensitive MSP, research and development in innovations in cereal production than pulses, lesser processed foods in pulses, restrictions in fumigation techniques and fewer innovations as pulses are less resistant to pest infections, no major fixed market, etc. being major ones.

Steady production of pulses will allow strong estimates for pulses export as well as import at the same time. Presently what is happening is due to no seriousness about this crop the estimation or forecast for production becomes unreliable even in prevalent healthy conditions for growing this crop. There has been a steady and confirmed domestic consumption and present production for the last 10 years on an average has been good enough thus, the marginal production above this estimate could be available for export. A growth in this marginal production is a need so that one

can ensure exports, this could also serve as a very good and strong indicator for rise and fall in production due to weather conditions and time imports at the same time. Improvement in scope for export production is reliable only on efficient farming management.

In spite of many reasons making export of agri commodities non cognizable there still exists a strong but small market for certain varieties of pulses and cereals and their processed products of Indian origin for outbound export. Also, rising global choices for international recipes is creating scope for export of such agri-products.

India being one of the largest producer and consumer of pulses there is no doubt there is quality and quantity pulses production. Indian Pulses have a large export potential however,

India's agricultural produce estimates are highly riddled in information asymmetry. This is mainly due to non coordination between farming concerns and too many permutations and combinations in sowing decision making. Thus production estimates are deficient in information which hampers export potential. Export preparation needs accurate production estimates to market the same in the international markets so as to meet the demand and price of that market. Export of pulses is thus a highly calculative game. Export in pulses is not as straight as to place the excess commodity during a unpredicted bumper production for sale in the export markets. Also, agricultural produce is highly susceptible to desiccation, vulnerable to pests and needs to be treated and packed at controlled temperature conditions. Efficient price discovery is also a prime requirement for export in world market coupled with low standard deviation in forex price fluctuations. At the same time, export process needs logistics arrangements to be made at the shipment level hence accurate forecasts become important to take export positions.

Since, the recent past India had been a net importer of pulses due to prevalent food security issues. Pulses is long being considered secondary as a crop for agriculture due to higher MSP on rice and wheat, pulses not being a product of the PDS system, non-regulation of pulses prices etc. hence, pulses farming was only done for home consumption by the farmers and moreover pulses price of the imported bulk were more economical than growing one on the domestic soil. This feature had continued for a long time dampening

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production of pulses and export being not even a feature of this sector.

India's pulse production is highly monsoon dependent and requires cooler weather conditions. Again, better forecasted monsoon weather condition prompts farmers to go for cereal crops rather than pulses crop. Most of the farmers are oblivious to modern techniques of polyvalent sowing decisions or use of crop rotation using pulses. Moreover land for cultivation versus demand for cereal and pulses cultivation is a still in competition and only 30% Indian farmers have embraced crop rotation techniques in areas sensitive to rainfall irregularities for commercial production. Pulses production is secondary as compared to other agricultural produce even after pulses crops being the best soil rejuvenators, thus crop rotation with pulses as a choice should be made mandatory farming practice. At the same time accurate weather forecasting is still future vision. India needs to go long way still to build better forecasting techniques albeit behaviorally and technologically. In such a situation imperative production forecasts becomes difficult. Moreover India's production is still under regulation and major reforms like application of MSP to bigger horizon of agricultural produce will boost the morale for pulses farming in addition to cereal farming. Again, pulses need to be included under the PDS Route so that a fixed estimate can be tracked for consumption and maintenance of prices as far as consumer is concerned. Pulses for compulsory PDS distribution needs to be made mandatory. There will be more seriousness among farmers to grow pulses.

Though in these conditions India export basket marginally consisted mainly in terms of garbanzos or chick peas, mung, urad and chana (black gram and its products). The rough compositions of these exports to destinations abroad are UAE 10.6%, Algeria 11.6%, Saudi Arabia 9.5%. Till the early 2017 India was one of the largest importer of pulses comprising 27% of the global share and pulses price dominated the Indian economy however manipulation in prices low farmer income for pulses production etc pushed the government initiatives to boost production domestically and restrict imports by imposing 40% import duty on most of the imported bulk, changing the earlier status dimensions of being the net importer of pulses. So one cannot thus, safely say that India is presently a net importer of pulses. Exports also have been on controversial side and highly regulated and this is in context to tur or pigeon pea or lentils sector. So India's status as a net importer or exporter is more like the tom and jerry case, try to catch up on exports and domestic production may decrease and run to catch the other that is imports vice versa, it's a vicious cycle. Things are not bad

after all as importer or exporter status is on stabilization route. A stable mix of imports and exports is desirable to balance the prevailing price as well as demand conditions.

Currently, India produced pulses at 25.23 MT for the 2017-18 crop year due to normal rainfall. However, 2018 monsoon is 10% lower overall average, if farmers are well informed and irrigation facilities are well maintained an estimate of 20-23 MT can still be estimated for 2018-19 crop year. Madhya Pradesh is India's largest pulse producing state, which accounts for 23% of total pulse production in the country. Madhya Pradesh followed by Uttar Pradesh (18%), Maharashtra (14%), Rajasthan (11%) and Andhra Pradesh/Telangana (9%). Estimated deficit of rainfall is in Uttar Pradesh on a higher side where as the remaining pulses producing states have normal average rainfalls thus estimated pulses production in India will hover just marginally below the last year recordings without any large deficits subject to all other factors apart from monsoon remaining in place.

The pulses are exported as a whole grain or as a processed product. UAE, Saudi, Singapore etc are the potential countries for export of loose pulses. Loose pulses fresh from farm need to be de husked and slatted and the produce to be assayed for quality purpose through the milling process. The milling process involves pre cleaning, storage, cleaning, grading, optical sorting, grinding to hulling, splitting etc. Pulses milling is the third largest food processing industry. An estimated 75% of pulses produced are processed for making dal in mills of different capacities. The final product is then branded as per quality for direct export or packaged and exported. As mentioned earlier agricultural produce as a whole is subject to desiccation and needs to be fumigated. Exports are mainly through sea route and the closest country of probable export being UAE. Hence, precautions need to be taken before the time of dispatch.

The range of food products are made from pulses for e.g. namkeen and farsan from chana or black gram, humus from chickpeas, protein diet supplements for health regimes, tur dal stock for tabled dal recipes, ready to eat packaged food, starch for noodles and pet food from yellow peas, etc. These products are either processed on Indian shores and exported or processed from basic imported pulses at the country of consumption. It has been observed to a larger extent that the hotel industry is undergoing a process of integration and the first stage ingredients are being outsourced such as cooked dal base and packed and exported abroad too.

Pulses have been exported to UAE in loose as well as



processed forms, India not being one of the major exporters though! The processed variants as explained earlier are mostly in chana for human consumption. New product variants are being developed for the pet populations also. But as far as Indian exports are concerned they are mostly for products dealing with human consumption. UAE or Saudi or Qatar or Bahrain the population is a global mix. Indian / Pakistani/ Middle East population in these countries is more dependent on pulses which are consumed even with animal proteins. Increasing health concerns especially connected with diabetes and obesity prescribe a protein rich diet.

Here when we are talking of imports and exports in terms of cleaned farm produce but the processed variety of pulses needs to be taken in account too. Especially, goods imported under the direct import of unprocessed or unfinished agricultural produce subscribe a lower import duty than the processed ones especially in case of Saudi and UAE , thus there is a tremendous rise in setting up of processing or milling centers in these countries which has promoted pulses trade in a big way. This has helped reduce time seeking imports as the agricultural produce is only subjected to basic milling, splitting, assaying etc. processes for determination of quality and can be directly shipped under low temperature conditions and exposure time to pests being lower in case of destination being India to UAE. Fumigation is a major issue with pulses export and with India to UAE export, this issue is at lower risk due to shorter travel time which promotes lesser intensity fumigants which are not climate interfering. Moreover processing techniques can be integrated for different product lines if plants are set up in UAE or Saudi importing agricultural produce encouraging

economies of scale. These factors put together makes processing more economies of scale in home country. However, lower labor charges and cost of land still makes it more efficient to have processing facilities in India.

The presence of large retail chains in UAE and in countries abroad give the consumer a good choice while shopping for quality as per individual pocket size. Pulses have a shorter value chain comprising of production, processing for quality, post which it is shipped or of loaded for consumption from wholesale to retail. At the juncture of wholesale, the produce is picked up for products processing post which it is processed and sold. It has become economical to process variants post imports especially in countries having majority of the Indian population. Some of the brands processing Indian produce are Eastern, RAG foodstuff, PRIYA, Aasha, Deira etc.

Most importantly, unreliable price discovery in the past leading to consumer grievance and un-coordinated export and import regimes in pulses production has led to depression in export confidence. An export in pulses from India is under strict jurisdiction and surveillance cut short to temporary export windows in export quantities. However, organic pulses consumption is totally free of export regulations in India due to its virtue that it does not serve food security issues hence more available for export with steady price discovery.

Methods like contract farming and export licenses residing with farming bodies will ensure systematic pulses production with a strong export potential.



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Azolla – “A super plant for Organic Agriculture”

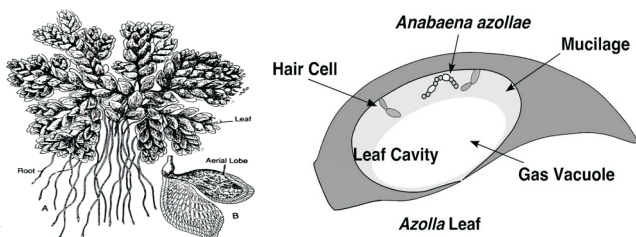
Nandish M.S., Suchitha Y.¹ and Shilpa H.C.²

Azolla (Mosquito fern, duckweed fern, fairy moss, water fern)

Azolla is a free floating water fern that floats in water and fixes atmospheric nitrogen in association with nitrogen fixing blue green alga *Anabaena Azollae*. Azolla fronds consist of saprophyte with a floating rhizome and small overlapping bilobed leaves and roots. The algal symbiont is associated with dorsal lobes from the onset of their development and is never in direct contact with external environment. *Anabaena Azollae* is the only species found in symbiotic association with Azolla.

Ecology and plant description of Azolla

Azolla is a highly productive plant. It doubles its biomass in 3–10 days, depending on conditions, and yield can reach 8–10 tonnes fresh matter/ha in rice fields under congenial conditions.



The plants are typically initial red and turn to green in later stages, and have very small water repellent leaves. Azolla floats on the surface of water by means of numerous, small, closely overlapping scale-like leaves, with their roots hanging in the water. They form a symbiotic relationship with the cyanobacterium *Anabaena azollae*, which fixes atmospheric nitrogen, giving the plant access to the essential nutrient. This has led to the plant being dubbed a "super-plant", as it can readily colonise areas of freshwater, and grow at great speed - doubling its biomass every two to three days.

Azolla cannot survive in prolonged freezing and dry conditions, so is often grown as an ornamental plant at high latitudes where it cannot establish itself firmly enough to become a weed. It is not tolerant of salinity; normal plants can't survive in greater than 1-1.6 ‰, and even conditioned organisms die in over 5.5‰ salinity.

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Species of Azolla

1. *Azolla pinnata* var. *imbricat*
2. *Azolla filiculoides*
3. *Azolla mexicana*
4. *Azolla caroliniana*
5. *Azolla microphylla*
6. *Azolla nilotica*
7. *Azolla pinnata* var. *pinnata* (Tropical variety grown in Indian condition)

The Elemental composition for Azolla on a dry weight basis.

| Particulars | % |
|-----------------|-----------|
| Nitrogen | 2.5-3.5 |
| Phosphorus | 0.15-1.00 |
| Potassium | 0.25-5.50 |
| Calcium | 0.45-1.25 |
| Magnesium | 0.25-0.50 |
| Sulphur | 0.20-0.75 |
| Silica | 0.15-3.50 |
| Sodium | 0.15-1.25 |
| Chlorine | 0.50-0.75 |
| Aluminium | 0.04-0.50 |
| Iron | 0.04-0.50 |
| Manganese(ppm) | 60-2500 |
| Copper(ppm) | 2-250 |
| Zinc(ppm) | 25-750 |

Advantages of Azolla

1. Azolla covering water surface reduce light penetration of soil surface, resulting in the depreciation in the germination of weeds (70% of the weed). Thus growth of azolla reduces aquatic weeds in flooded rice fields.
2. The integrated use of Azolla with rice and fish farming has been developed. The integrated approach can enhance a farmer's income while reduce the use of



pesticide and fertilizers and consequently environmental pollution.

3. It can fix 20 to 40 kg ha⁻¹ of atmospheric nitrogen per season in the paddy fields and carry out photosynthesis and uptake nutrients from its surrounding environment through its root system.
4. It has wide range of use including fodder for dairy cattle, pigs, chicken, ducks and fish. In some village communities it has even increased the overall milk yield.
5. Azolla can be used for all type of vegetables and plantation crops as a good source of organic matter which accelerates the mineralization and immobilization process in soils.
6. The application of Azolla as biofertilizer on agriculture crops, in order to provide a natural source of crucial nutrients nitrogen, can be very beneficial for the future.
7. Due to fact that rice paddy field form an ideal environment for Azolla.
8. Improve the nutritional status of the soil.
9. Reclamation of heavy metal and saline soil in polluted soils
10. Azolla has been used as green manure.
11. Improve yields by 15-20 per cent.
12. Azolla can be used as an animal feed, a human food, a medicine and water purifier.
13. It may also be used for the production of hydrogen fuel the production of biogas, the control of mosquitoes and the reduction of ammonia volatilization which accompanies the application of chemical nitrogen fertilizer.

Conditions for growth of Azolla

1. Water: Azolla is sensitive to desiccation. When water depth over soil is a few cm, it grows well. It can grow adhering on moist soil. Therefore, it should be kept in a small pond during dry season or non-irrigated period.

2. Wind: The wind pushes Azolla to one side of a field plot, accumulating a dense mass, leading often to its death. Strong wind makes Azolla fragmented, leading to poor growth or death.

3. Temperature: Azolla multiplies at the daily mean temperature of 15-30°C. Optimum temperature is about 25°C. *A. filiculoides*, *A. rubra* and *A. japonica* require lower temperature than *A. microphylla* and *A. pinnata* do. Above 30-33°C or below 10°C, the growth was sharply retarded. Azolla can tolerate survive up to 5°C.

4. Light: Under nutrient deficient and strong light conditions, Azolla becomes red. During hot summer or cold winter, it also turns red or brownish red. Under shaded conditions or nutrient-rich conditions, it remains green.

5. Mineral nutrition: Azolla absorbs nutrient from water, when it is floating on water. Because phosphorus diffusion from soil to water is slow, field population of floating Azolla is generally deficient in phosphorus. The application of phosphorus fertilizer is effective to enhance its growth. Phosphorus fertilizer should be water soluble, and be applied on top of Azolla mat.

6. pH: Azolla prefers slightly acidic media up to pH 4.

7. Insects: Lepidoptera, Pyralidae larva are most harmful insect pests to Azolla. In the tropics, Webworm -*Elophyla* and Case worm - *Epheosispsis* are major pests.

Mass production protocol Azolla

a) Under field condition

A simple Azolla nursery method for large scale multiplication of Azolla in the field has been evolved for easy adoption by the farmers.

MATERIALS REQUIRED

1. One cent (40 sq. m area plot)
2. Red earth (only in case of constructed cement tank)
3. Cow dung
4. Single super phosphate
5. Furadan granules
6. Azolla inoculum

Protocol of farmer level mass production

1. Select a wetland field and prepare thoroughly and level uniformly.
2. Mark the field into one cent plots (20X2m) by providing suitable bunds and irrigation channels.
3. Maintain water level to a height of 10 cm.
4. Mix 10 kg of cow dung in 20 litres of water and sprinkle in the field.
5. Apply 100g of single super phosphate as basal dose (Serve as phosphorus source).
6. Inoculate fresh Azolla biomass @ 8 kg to each plot.
7. Apply 100 g of single super phosphate as top dressing fertilizer on 4th and 8th day after inoculation.
8. Apply Furadan granules @ 100 g/plot on 7th day after inoculation (If the Azolla is grown for cattle



feed we need not to add the high concentration of Furadan).

9. Maintain the water level at a height of 10 cm till the thick mat of Azolla covers and float over the surface of the water.

METHOD OF APPLICATION OF AZOLLA TO RICE CROP

a) Azolla biomass incorporation as green manure for rice crop

This method of application is done before transplantation to main field (15 days before)

- Collect the fresh Azolla biomass from the Azolla nursery plot.
- Prepare the wetland well and maintain water for easy incorporation.
- Apply fresh Azolla biomass (15 – 20 tonnes ha⁻¹) to the main field and incorporate using implements or tractor.

b) Azolla inoculation as dual crop for rice

- Select the transplanted rice field.
- Collect fresh Azolla from nursery.

- Broadcast the fresh Azolla(500 – 750 kg/ha) to the transplanted rice field on 7th day after transplanting.
- Maintain water level at least about 3 to 5 cm.
- Note the growth of Azolla not co-insides with the weeding practice then it is incorporated using implements or during intercultivation.
- A second bloom of Azolla will develops at 8th weeks after transplanting which may be incorporated again.
- By the two incorporation, 20 – 25 tonnes of Azolla can be incorporated in one hectare rice field.

Conclusion

Though, the exploit of microbes as biofertilizers in different fields of sciences, ecological complexity of microbes and plant in the rhizosphere needs to be taken into consideration and optimization of rhizosphere systems need to be tailored and exploited for the beneficial of the mankind. Scale up studies are required to increase the nitrogen fixing potentiality of the Anabaena partner of Azolla for effective use the vital plant Azolla in the field of organic agriculture and also to maintain sustainable soil health.

From Page 12

In developing countries, the word 'rural credit' has been coined as banking for poor people. In rural areas a revolutionary step was taken by the government through introducing credit facilities. Earlier credit was provided by the informal agencies like landlords, moneylenders, merchants, relatives etc., but credit provided by them was very costly due to which the borrowers had to pay high interest on credit. After nationalization, the banks provided loans to the farmers but this did not prove effective. However; after introducing micro credit through the banks, this has led to tremendous change in the rural areas. This has created self-reliance and entrepreneurship amongst the rural poor. Hence, there is a need to strengthen rural credit system which will improve the socio-economic condition of weaker sections of the society.

Cooperative societies are welfare organizations where individuals join hands for augmenting their income through the activities based on the joint endeavour. The state governments extend financial assistance under various plans and scheme to assist the cooperative societies

In achieving their Objectives. One of the important schemes of the NCDC is Integrated Cooperative Development Project (ICDP) which was introduced in the year 1985-86 with three objectives—development of primary agricultural credit societies of multipurpose self-reliant entities, development of allied sector cooperatives; and development of viable functional linkages among cooperatives.

Several important schemes are being implemented by the state cooperation department to improve the cooperative sector. These are — risk fund for CCBs and PACS, assistance for universal membership, training for SHGs, supply of long-term credit, assistance for offsetting imbalance in PCARDBs, establishment of cold storage and godowns, rural infrastructure development fund (RIDF), ad-hoc grant to employees of cooperative societies, strengthening of various cooperative societies, and soon

Source : The COOPERATOR



GOOD GOVERNANCE FOR RURAL PROSPERITY

Every cooperative must have a board of directors, either elected or nominated. The future of a cooperative society good or bad depends on good governance. While the board has to carry out its duties properly according to the law, the employees of the society have also an important role in the functioning of a society. There are so many cooperatives which have been closed due to lack of good governance.

In rural areas, the financial condition of the members of societies mainly depends on the functioning of the agricultural cooperatives, marketing cooperatives etc. where the cooperatives look after the financial requirements of the members. If the societies do not function properly, then the needs of the members will not be fulfilled. So, the rural cooperatives play a vital role in the development of the societies and their members.

The first thing which is required for a cooperative is a board which can govern the society in the best possible manner. The cooperative societies in rural areas may help their members in various ways like providing inputs, fertilizers etc. and also collecting the produce based on fair price. The board of the societies plays an important role in decision-making, and is well aware of the acts and rules of the societies.

A board based on good governance is able to take good decisions, and is well aware of the activities of the societies. It is very much concerned with the prosperity of the members.

There have been instances of the societies which had been incurring net and accumulated losses every year due to lack of good governance, but after changing the board and having a new board, the accumulated losses of the societies have been wiped out, thanks to good governance. So, the development of the societies and the prosperity of its members depend on good governance.

The main pillars of good governance are transparency, accountability risk management and control. Co-operative governance regulates the relationship between members and the board. Good cooperative governance will ensure that board of directors pursues objectives that are in the interest of the cooperatives and its members, lead to effective monitoring of activities of the societies, ensure efficient and effective use of available resources, reduce conflicts, and increase accountability and transparency in cooperatives.

As per cooperative legislation, a board of directors shall manage the affairs of a cooperative society. It shall exercise all the powers of the cooperative societies subject to any limitation in the content of the law and constituting instruments, the board shall abide by some codes of good governance such as leadership and management, transparency and accountability, compliance, control and supervision etc.

Cooperative societies play a vital role in ensuring that a nation's economic progress conforms to the requirements of democratic planning. The institution of a cooperative society provides support and sustainability to rural economic activities. Small and marginal farmers need support in the form of inputs, harvesting, storage facilities, distribution of channels and a network of market information system. Technical guidance is required to help agriculturists in processing their produce and reap benefits through value addition.

The village artisans faced with competition from the organized sector find it difficult to maintain their traditional employment. Through pooling of experience, knowledge and by helping one another, cooperative societies help members to find solutions to their problems. These are local institutions which address the local needs by using local talent.

The importance of cooperative societies in the rural area is mainly due to the fact that they provide sustainable support to the agriculturists. This is done through developing necessary infrastructure and support facilities. Farming cooperatives help farmers to pool their small and fragmented land holdings. While this facilitates improvements in the land at one end, on the other, it paves the way for intensive cultivation by using modern technology. Agriculture processing cooperatives provide support towards paddy milling, oil seeds crushing, processing fruits, vegetables and so on. The farmers gain through value addition of their produce. Agricultural marketing societies enable farmers to benefit from increased bargaining strength. By removing intermediaries they help farmers to have a direct interaction with the consumers. The National Agriculture Cooperative Marketing Federation of India (NAFED) is a good example of this.

The financial support to the rural sector is provided through National Bank for Agriculture and Rural Development



(NABARD). NABARD provides funds to the state cooperative banks (SCBs) which in turn indirectly finances the rural sector. The bulk of the credit goes to the agricultural sector through the district cooperative banks and primary agricultural credit societies. All the above indicates that cooperative societies have a significant impact on rural prosperity.

Krishak Bharati Cooperative Ltd. (KRIBHCO) and the Kaira District Cooperative Milk Producers Union Ltd. which market its product under the brand name Amul are a few examples of cooperatives that provide support to farmers in improving their livelihood. In India the cooperative sector had a spiritual content based on ethical values as it was led by towering leaders like Vinoba Bhave, Vaikunthbhai Mehta and Dhananjayrao Gadgil.

India is a developing country facing a variety of problems viz population explosion, low productivity, inequalities, low living standards etc. Agriculture sector provides livelihood to two-thirds of India's population and gives employment to about 57% of the work force. It is also a major source of raw material for a large number of industries. Cooperatives have been playing a significant role in disbursing agricultural credit and inputs so that farmers have an access to the market for their produce.

The Indian cooperative movement is the biggest movement in the world and has made tremendous progress in several sectors of the Indian economy. In the early period, the cooperative movement was limited to providing rural credit. Cooperatives now have covered 100% villages and 75% of rural households through a network of over 8 lakh cooperatives with membership of well over 25 crores. In fertilizer production and distribution, the fertilizer cooperatives command a major share of the market. The cooperatives now have contributed significantly to the growth of institutional infrastructure in the rural areas and played an important role in capital formation in the agricultural sector.

There are many environmental problems caused by the agricultural sector, however, organic farming can help to reduce the adverse impact on the environment. So, reduction in the use of pesticides can contribute to the improvement of biodiversity and soil health, which can promote sustainable agriculture growth. Over the years, organic products have become more popular, and many farms have started to produce organic food. The principle of

organic farming that refers to environmental sustainability is more suitable for small farms where control is greater. For these farms there is the problem of limited available resources, however, one way to solve this is through the creation of cooperatives, where all members can help each other, getting fair price while reducing costs in some respects. Cooperatives will have an internal quality and purity team, which will make sure that the processes, practices and products are completely natural, pure and local with no use of chemicals, pesticides, fertilizers, GM seeds etc.

Some of the important principles and practices of natural farming are increase in carbon and organic content of soil, no synthetic manure and fertilizers, and no pesticides and chemicals. Zero budget natural farming, as the name implies, is a method of farming where the cost of growing and harvesting plants is zero. This means that farmers need not purchase fertilizer and pesticides in order to ensure the healthy growth of crops.

Women cooperative societies are the unique cooperative societies which are established for specific goals. Nearly 2% of the people in India live in rural areas and the cooperatives are concentrated in these areas. As it is a male dominated society, the women in rural areas are exposed to several disadvantages. They have all the potential but they lack the support of the movement. Women cooperative societies are playing an important role to empower women in all spheres of life. There is a greater need to include women in the functioning of cooperatives. Today there are many women cooperatives formed to deal with women's needs. These societies not only deal in accepting and depositing money from the members, but also focus on self employment, while creating awareness for dowry, family planning etc. These societies are always encouraging women to save money regularly and form SHGs so as to include them as members.

A cooperative form of enterprises tides young people a means to create their own employment. At a time when young people are unemployed, cooperatives can create world opportunities with better working conditions for them. They can help young people both to find work and gain work experience as well as offer opportunities for professional and vocational training. At present, most of the youth are engaged with engineering cooperatives, labour contract cooperatives, producer cooperatives, and consumer cooperatives and so on.

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PRECISION FARMING: AN INNOVATIVE APPROACH TO MAXIMIZE THE OUTPUTS IN HORTICULTURE

¹Bhavya N and ²Raghupathi B*

Horticulture has become one of the major sectors for economic development in many states and it contributes nearly 30.4% of GDP to agriculture. To achieve higher growth rate, farmers have to look forward towards precision farming, which include Hi-tech horticulture, micro propagation, micro-irrigation, water management techniques, application of plant growth regulators, use of plastic and high density orchard systems etc., in order to maximize the use of available resources and to enhance the returns of farmers.

Precision farming is a comprehensive information based farm management system to identify, analyse and manage variability with fields for optimum profitability, sustainability and protection of the land resources, which basically means adding the right amount of treatment at the right time and at the right location within a field. It is one of the scientific and modern way to apply technology and principles of spatial and temporal variability associated with crop production to improve crop performance and environmental quality, which sometimes referred to as satellite farming or site specific crop management, where spatial variability refer to identification and measuring the variables, such as land features or general topography, moisture levels present in the soil, soil nutrient status and more and temporal variability refers to aspect of time, by which the information gathered under spatial variability can be plotted to distinguish rate of nutrient depletion, soil moisture etc.

Need of Precision Farming

1. To increase the total productivity, 2. Diminishing and degrading natural resources and to make best use of the available resources, 3. To enhance the declining farm incomes, 4. Lack of eco-regional approach, 5. Fragmented and declining land holdings, 6. Variation of climate at global level and 7. Limited employment opportunity in non farm sector.

Precision farming lays emphasis into popular uses of GPS (Global Positioning satellite), GNSS (Global Navigation Satellite system) and Remote sensing which allowed farm operator to create precision maps of their fields that provide detailed information on their exact location.

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Steps Involved in Precision Farming

Assessing Variability : Inputs are needed to be applied according with existing variability, hence the spatial variability is first step in precision farming.

Managing Variability : After assessing variability, managing variability by applying and making farm inputs available only in a require quantities at particular time and specific location.

Evaluation : Transfer of technology to farmers, check the economic variability and environment maintenance.

Technological Requirement in Precision Farming

Remote Sensing : It is the science of obtaining information about a place or an object without coming in direct contact with object. The electromagnetic radiation is normally used as an information carrier in remote sensing. The output of remote sensing is usually an image representing the scene being observed. Remote sensing encompasses the set of sensors, platforms and the data processing techniques that used to derive information from the physical, chemical and biological properties of earth surface.

There are three essential components of remote sensing:

1. **Signal** (the information that we get from object)
2. **Sensor** (the plat from that receive the input signal, detect and process and gives out information)
3. **Sensing** (user acquire knowledge about the phenomenon after analysis of the signals received by the sensor)

The first remote sensing based project was used for identification of coconut root-wilt disease in Kerala carried out using infrared aerial photography, similarly aerial photography were used in estimation of acreage increase in horticultural crops and Orange orchards of Meghalaya were examined using enhanced colour composite image and reported that the orchards in slope areas are suffering from moisture stress and soil loss leading to nutrition imbalance prone to "citrus decline". These mapping was useful in detecting potential citrus decline areas with similar climatic conditions.

GIS (Geographic Information System): This helps us to manage, analyse and present spatial related information, based on which the farmer make a decision of precise site



specific and effective weed control, pest control and fertilizer application. It integrates different information and visualizes scenarios, present ideas and provides solution for complicated problems. It performs six tasks which include data input, data manipulation, data management, query, analysis and visualization. General advantages of GIS are ability to observe different perspectives of an object at oblique angles and access additional information about site. It develops maps associated to climate change effects on increase in pest and diseases (spatial plant disease and pest distribution maps)

GPS (Global Positioning System): It is used to find out the exact location to assess the variability of soil and plant parameters. It provides continuous position data in 2 or 3 dimensional in real world co-ordinates.

Variable Rate Technology (VRT): Variable rate technology and Variable rate application refers to development of automated variable rate sprayers for application of chemicals at a specific site. This technology requires correct positioning in the field for operation. The machines are precisely programmed to spray right amount of chemicals by analysing variability of field condition.

Yield Monitoring: This yield monitor utilizes sensors in the combine to continuously log grain flow rate during harvesting and the combine's speed. This data combined with the GPS location for each data point allows the creation of a yield map. This yield map can be used for comparing with soil test data, chemical application maps and other information resulting in a recommendation for the next year's site specific management plan. Yield maps are report card of field which quantifies variability within field.

Horticulture Tools in Precision Farming

1. Precision Nutrient Management : Site specific nutrient management by using leaf colour chart, and chlorophyll meter. It's an inexpensive diagnostic tool for monitoring the nitrogen status.

2. Water Management : Drip irrigation and micro sprinklers are the best to optimize water usage by plant, this technique saves water by 30 to 50 per cent and reduces weed growth.

3. Mulching : Covering soil ground with plastic film or any organic material to conserve moisture, prevent weed growth and modify soil temperature.

4. Plant Protection : Pest and disease monitoring by site specific application and techniques like herbigation (applying herbicides through water).

5. Hi-Tech Horticulture: Protected cultivation of exotic

vegetables, flowers and fruits which require modified atmospheric conditions for cultivation.

Strategies for Success of Precision Farming in Horticulture:

1. Government policy support is needed as this technology requires co-ordination of higher scientific advancement in the diverse field of science. Region wise farming action plan are needed to be developed.
2. **National land use planning:** The average land holding is reducing day by day in India. Individual farmer is free to grow crop of their choice. The region wise crop planning according to climate, edaphic and marketing conditions is essential for success of this technology. Farmers are needed to be motivated to grow crops according to land use planning in order to get maximum economic returns.
3. Further research and development in precision farming for successful usage and execution of research in farmer field especially in field of horticulture.
4. **Adoption of technology and mechanization:** Farmers are needed to be educated and motivated for the adoption of technology and mechanization in farming. Since the technology is costly the investment costs are needed to be shared among farmer group. Further, government subsidy support and low interest rate loan also help adoption of precision farming.
5. **Market linkage:** Huge investment in precision farming should fetch remunerative prices which is a best kind of motivation for farmers to adopt technology. To make precision farming a successful venture proper marketing linkage is must.

Conclusion

Precision farming is a comprehensive system designed to optimize production and it gives ability to use crop inputs more effectively such as fertilizers, pesticides, tillage and irrigation etc. Using the key elements of precision farming such as information, technology, and management etc can be used to increase efficiency of crop production, quality of product can be improved, efficiency of crop chemical can be improved, energy can be conserved and environment can be protected. Much of this technology is still in its immaturity. Extensive research is necessary to allow the systems to reach maturity. While technically feasible, further research is also needed to clarify the economic and environmental benefits of many elements of precision farming in horticulture.



SUSTAINABLE AND SMART WASTE MANAGEMENT

The total municipal solid waste (MSW) generated in urban India stands at 62 million tons per year or 160,000 TPD. This is predicted to increase by a factor of 2.7 by the year 2030 and 7 by 2050. Only 60 per cent of total waste is collected, of which 30 per cent is treated and rest goes to dump sites, rivers, roads, parks and nallas (drains) causing serious problems of health and environment.

The Solid Waste includes plastics, food waste, bottles, paper and other wastes such as industrial waste, construction and demolition waste, bio medical waste, electronic waste, and nuclear/radioactive waste.

Plastic Waste: Plastic waste roughly comprises 10% of total garbage. In India 5.6 million tonnes of plastic waste is produced each year, of which only 20% is recycled. Plastic Waste in Delhi is estimated at 690 mt, Mumbai 408 mt and Bengaluru 314 mt/day. Katie Danger field informs "The world's oceans will have more plastic than fish by 2050". 8 million tons of plastic waste ends up in the oceans each year. Accumulation of Bio- toxins such as DDT and PCBs, which are hydrophobic, can cause adverse health effects.

Plastic waste adversely affects wildlife, water bodies, habitat and humans. Plastic pollutants are categorized into micro (between 2mm-5mm), meso (5 mm to 20 mm) and macro (more than 20 mm). Micro-plastic contaminates water and air. Municipal Waste Management has no system of segregation of plastics, except by rag pickers and it often ends up in drains, rivers, open spaces and mountains.

Degradation of plastics takes much longer. It is estimated that a foam plastic cup takes 50 years, a plastic beverage holder 400 years, a disposable nappy 450 years and fishing line 600 to 1000 years to degrade. Breakdown of biodegradable plastics releases methane, a very powerful greenhouse gas that contributes to global warming. Toxic chemicals such as bisphenol A and polystyrene leach into waters from some plastics.

Industrial Waste is produced by the factories, mills and mines. The industrial waste can be non-hazardous, non-toxic, such as waste fibre produced by agriculture, or it could be toxic, chemical and hazardous. It pollutes the water, air and land.

Construction and Demolition Waste (C&D Waste): The progressive pace of construction and demolition in civil works have enhanced the debris to a large extent. It could be as high as one-third of urban waste in areas having extensive construction activity, while 15% in a normal situation. It needs to be treated separately, which can be recycled to a large extent.

As per the Construction and Demolition Waste Rules, large waste generators (above 500 MT) are to recycle and reuse construction and demolition waste at the site (minimum 20%) for reconstruction purposes meeting structural requirements. Recent initiatives of the Government of India (MoUD) at the Redevelopment of Residential Complex of East Kidwai Nagar (New Delhi) have shown that it is possible to provide for 100% recycling and reuse of C&D Waste at the construction/demolition site itself. Such models obviate the need for transporting the C&D waste to a centralised unit and transporting the reused materials such as bricks, to the construction sites. This is cost effective and environment friendly.

Electronic Waste may be defined as all secondary computers, entertainment devices, mobile phones and other items, such as television sets and refrigerators and other used electronics gadgets.

Bio-Medical Waste comes from biological sources, diagnosis and treatment of diseases. Common producers of bio-medical waste include hospitals, health clinics, nursing homes, medical research laboratories, dispensaries of physicians, dentists and veterinarians, healthcare and funeral homes.

Nuclear or Radioactive Waste: Nuclear or radioactive waste means any waste material containing radio nuclides in quantities or concentrations. The disposal of such waste includes the release of radioactive material to the environment in a manner leading to loss of control over the future disposition of the radio nuclides contained there in and includes emplacement of waste materials in a repository beings or animals or in research activities in these fields or in the production or testing of biological waste. Such wastes must be managed through Atomic Energy (Safe Disposal of Radio active Wastes) Rules, 1987.



THE SWACHH BHARAT ABHIYAN (2014-19)

The Government of India launched Swachh Bharat Abhiyan (Clean India Campaign) on 2nd October 2014, which covers 4041 cities/towns. The primary goal of the campaign is to achieve the vision of a 'Clean India' by October 2019 which will mark the 150th birth anniversary of Mahatma Gandhi. The Urban Development Ministry has earmarked ₹6,20,090 million and the Ministry of Drinking Water and Sanitation will spend ₹13,40,000 million for the Rural Programme.

The Government of India has also initiated the following in the field of SWM:

- Bio-medical Waste Handling Rules, 1998
- Municipal Solid Waste Management Rules, 2000
- Reforms Agenda (fiscal, institutional, legal)
- Plastic Waste Handling Rules, 2016
- Technical Manual on Municipal Solid Waste Management
- Technology Advisory Group on Municipal Solid Waste Management
- Income-tax relief granted to waste management agencies
- Public-private partnership in SWM
- Capacity building and skilling

The "Municipal Solid Waste (Management & Handling) Rules, 2000", require the following compliances:

- Development and Improvement of properly engineered and constructed sanitary landfill (SLF) from which pollutants do not escape and have an impervious bottom layer for leachate collection and treatment.
- Identification of land fill sites for future use and making site(s) ready for operation.
- Setting up of waste processing and disposal facilities.
- Monitoring the performance of waste processing and disposal facilities.
- Segregation of solid waste at points of generation, which includes organic and recyclable wastes (plastic, glass, metal, paper, etc.).
- Specialized handling of construction and demolition waste, bio-medical waste, industrial/hazardous/toxic waste, e-waste (electrical and electronic waste) and nuclear/radioactive waste.

The common approach (or disposal) of municipal waste is its dumping in landfill sites. However, there is a strong opposition to location of new landfills, which are seen as an environmental disaster, causing health risk from flies and rodent, air pollution and water pollution through leaching.

A study conducted by the World Health Organisation titled

"Management of Solid Wastes in Developing Countries" concluded that to achieve the lowest cost, a policy of encouraging multiple small composting plants should be followed. Recycling wastes is by far the cheapest alternative to landfills; and plants that convert garbage into other products are cheaper than those that burn garbage. As such, it may be more practical to build several small, decentralised waste facilities rather than a large one.

THE ROLE OF THE RAG PICKERS

The informal sector is characterized by small scale labour intensive, largely unregulated and unregistered low technology recycling of waste materials and services. A large quantity of waste is dealt by the rag pickers (kabari*) who are the backbone of waste management. They not only help in cleaning the neighborhood, but also collect, reuse, recover and recycle an estimated one-third of municipal solid waste per day. As such, the strategy of solid waste management should begin with the 4 Rs. i.e. Refuse, Reuse, Reduce and Recycle.

STRATEGY OF FOUR'S FOR SOLID WASTE MANAGEMENT

REFUSE: Whenever and wherever possible, choose items that are not packaged in plastic and carry your own bag, container and utensil. Heavy tax and penalty on plastic carry bags, styrofoam, single use plastics, bottles and straws can diminish their use. Plastics can be replaced by more sustainable options like reusable steel, glass bottles and non-disposable utensils. Disposable sanitary napkins can be replaced by menstrual cups and cloth pads.

REUSE: Choose glass, paper, stainless steel, wood, ceramic and bamboo over plastic, non-toxic straws, utensils, to-go containers, bottles, bags, etc. which can be reused.

REDUCE waste by half in next five to ten years. Cut down the consumption of goods that contain excessive plastic packaging. The Ministry of Drinking Water and Sanitation, Government of India has requested various Government Departments to avoid the use of plastic bottles for drinking water during meetings.

The States of Maharashtra, Uttar Pradesh, Bihar and Sikkim have banned the plastic carry bags and have restricted the usage of plastic water bottles in government functions and meetings.

The 2015 National Games of India (Thiruvananthapuram) aimed at "zero-waste" venues to make the event "disposable-free" and banned the usage of disposable water bottles, plastic tableware and tumblers.

RECYCLE: Waste can be recycled keeping in view the entire life cycle of items, from source to manufacturing, distribution



and disposal. Waste plastic (HDPE) can be recycled into plastic timber, pallets, tiles, waste containers, liners, railway sleepers, fence posts, park benches, street furniture, lumber, tables, roadside curbs, benches, truck/ cargo liners, stationery, etc. Recycled plastic can be used for road surfacing with aggregate and bitumen (asphalt) at a temperature of 220°C (428° F). Biodegradable and degradable plastics help to reduce plastic pollution. It is necessary to adopt ecosystem-based adaptive management for solid wastes.

WASTE TO ENERGY (W2E)

By adopting scientific methods, energy can be recovered from waste. As the organic matter decays it produces biogas, known as landfill gas (LFG), landfills have to be managed so that the LFG does not pose a threat to the surroundings. Rather than discharging it to the atmosphere, LFG can be recovered for providing a useful energy. Indian municipal waste has a potential to generate 150-250 cum of biogas/LFG per ton depending upon the quality of wastes. By employing a set of generator and transformer, bio-gas can be converted in electrical energy.

The Task Force of the Planning Commission headed by Shri K. Kasturi rangan proposed a target of setting up 215 Waste to Energy Plants by 2031 that will generate 1,075MW of power and setting these through public private partnerships (PPPs) with viability gap funding of up to 40%. The report stresses for an integrated approach towards municipal solid waste management, and the need for segregation of waste at source with private sector help. Since the urban local bodies (ULBs) lack the financial and institutional capacity necessary for integrated management of municipal solid waste, which requires investments, especially for 'Waste to Energy' projects, the report suggests to transfer the commercial risks to the private sector in order to ensure an efficient system for collection, transportation and processing of waste for generation of electricity. 'Waste to Energy' projects can be set up in cities with population above two million, generating more than 300 tonnes per day or more of combustible waste.

The Indian Renewable Energy Development Agency (IREDA) suggests that the country has so far realised only about 2% of its waste-to-energy potential. A market analysis by Frost and Sullivan predicts that the municipal solid waste-to-energy market could be growing at a compound annual growth rate (CAGR) of 0.7% in the near future.

SOLID WASTE ENERGY AND RECYCLING FACILITY (SWERF)

A sustainable and feasible solution for the management of

municipal solid waste is setting up a Solid Waste Energy and Recycling Facility (SWERF). SWERF reduces the need for future acquisition of land for landfills by 90%. Odours and health risks are reduced as the SWERF is totally enclosed. There is sterilized handling of recyclables and rejects as the municipal solid waste is first processed in an autoclave. Greenhouse gases are reduced by efficient conversion technology.

In Waste to Energy System, prior to the collection of solid waste, recyclables are sorted out and retrieved for processing. The solid waste that remains is then collected and sent to the various waste-to-energy plants for incineration. Incineration reduces the volume of solid waste by about 90% and produces steam that runs turbine generators to generate electricity. The incinerated ash and other non-incinerable wastes are then transported to the Transfer Station plants. To prevent odours from escaping into the environment, the air in the refuse bunker is kept below atmospheric pressure. High-capacity rotary crushers reduce the size of bulky solid waste to improve its burning efficiency. The solid waste is then fed into the incinerator by a grab crane. As the incinerator is heated to temperatures between 800°C and 1,000°C, a lining of silicon carbide tiles protects the incinerator walls from the extreme heat and corrosion. Each load of solid waste is reduced to about 10% of its original volume in about five hours. Catalytic fabric filter systems and two-zone electrostatic precipitators remove pollutants from the fuel gas before it is released from the plant while ash is collected, and the ferrous material is removed for recycling.

Energy can be also recovered from biodegradable and non-biodegradable waste through thermal, thermo- chemical, bio-chemical and electrochemical methods.

Thermal Conversion : The process involves thermal degradation of waste under high temperature and it is then that complete oxidation of the waste occurs. The major technological option under this category is incineration. But incineration has been losing attention because of its emission characteristics.

Thermo-chemical conversion : This process entails high temperature-driven decomposition of organic matter to produce either heat energy or fuel oil or gas. These are useful for wastes containing high percentage of organic non-biodegradable matter and low moisture content. The main technological options under this category include Pyrolysis and Gasification. The products of these processes (producer gas, exhaust gases, etc.) can be used a sheat energy or further processed chemically to produce a range of end products.



INCINERATION TECHNOLOGY

Incineration is a process of controlled combustion of solid wastes and residue. During combustion moisture is vaporised whereas the combustible portion produces heat, carbon dioxide, water vapour, ash and non-combustibles are the end products. The heat generated during incineration is recovered and utilised for the production of steam, heating water, and generating electricity. Incineration technology is economical for the treatment of large quantities of solid wastes by thermal process. This type of refuse includes not only metals and laminates but also untreated domestic wastes.

PYROLYSIS/GASIFICATION TECHNOLOGY

In this process segregated combustible matter is allowed for drying and thereafter it is shredded in a hammer mill. The combustion/pyrolysis of shredded matter takes place in a fluidised bed reactor without any fuel support. The end product includes combustible "producer" gas, which can be utilised for production of power. The heat produced in the process can also be employed for production of steam and ultimately generating power. Although not fully competitive with conventional electricity at today's energy prices, extracting energy from wastes offers environmental benefits, helping to reduce fossil fuel consumption and, amongst other things, the problem of methane emissions from landfill sites.

LAND FILL GAS EXTRACTION (LFG)

The waste deposited in a landfill gets subjected, over a period of time, to anaerobic conditions. This leads to landfill gas production containing about 45-55% methane. This methane can be recovered through a network of pipes and utilised as a source of energy. Landfill gas extraction system adds to efforts to reduce Climate Change initiatives as it helps reduce Green House Gas emissions through avoidance of landfill gas (mainly comprising of methane) into the atmosphere.

While planning for LFG, pH and Nutrient content of the waste should be considered. The generation of methane in landfills is greatest when neutral pH conditions exist. Numerous toxic materials, such as heavy metals, can retard bacterial growth in portions of a site and consequently slow gas generation. Another parameter that influences the LFG generation rate is the particle size and density, which may affect the transport of nutrients and moisture throughout the landfill.

Bio-chemical conversion: This process is based on enzymatic decomposition of organic matter by microbial action to produce methane gas, and alcohol, etc. This

process is preferred for wastes having high percentage of organic, bio-degradable (putrescible) matter and high level of moisture/water content, which aids microbial activity. The major technological options under this category are anaerobic digestion (bio-methanation) and fermentation. Of the two, anaerobic digestion is the most frequently used method for waste to energy generation, while fermentation is still emerging.

Electrochemical conversion: Electrochemical conversion in the context of waste to energy refers typically to microbial fuel cells (MEC). These systems are developed to trap energy from wastes, where the reduction-oxidation machinery of immobilised microbial cells is catalytically exploited for the accelerated transfer of electrons from organic wastes to generate electricity and bio-hydrogen gas. However, this methodology needs extensive evaluation studies on bulk scale waste treatments and stands at a nascent level in India as well as worldwide.

In this process, organic matter of solid waste is segregated and thereafter it is fed directly into a bioreactor, where in presence of methanogenic bacteria, and under an anaerobic condition, the fermentation takes place and biogas is produced. In addition, a high quality organic manure is also produced. Energy can be recovered by digesting certain organic wastes and recovering the methane rich bio-gas which provides heat and electricity.

FUEL PELLETS

Municipal Solid Waste (MSW) comprises various materials such as paper, plastics, glass, metals, vegetable matter, rags, rubber, etc. It is essential to segregate the organic materials from MSW in such a way that it is free of sand, moisture and other ferrous and non-ferrous materials. The segregated organic matter can be dried, ground and pelletised. This ground organic matter can be added by biomass to enrich calorific value of fuel pellets.

A pilot project of the Department of Science and Technology had been set up at Mumbai for producing about 80 tons per day of refuse derived fuel pellets as a coal substitute. The pelletisation technology has been developed as an indigenous technology with pellets having a calorific value of 3500 Kcal/Kg, as a substitute of coal.

COMPOSTING OPTION

Incineration is an effective solution, but it is air-polluting and expensive for wastes having a high proportion of vegetable and putrescible matter. Economic constraints favour composting, as the city wastes contain a significant amount of nitrogen, phosphate and potash, as well as organic soil



supplements.

For biodegradable matter composting is one of the most popular options of garbage disposal. Apart from saving land, valuable products like compost, biogas, heat, electrical power, recycled paper, plastics, glass, metals, etc. are obtained. Composting can be done in different ways:

- Aerobic windrow composting
- Anaerobic trench composting
- Vermicomposting
- In vessel aerobic composting

VERMI-COMPOSTING

Composting of biodegradable waste by earthworms, including human excreta, is gaining popularity. Organic waste is allowed to be decomposed by micro-organisms already present in the waste. The process can be accomplished either in presence or in absence of oxygen known as aerobic or decomposition respectively. During aerobic decomposition, organic compound gets oxidized to oxides of carbon and nitrogen and temperature of the mass rises to 70°C.

The destruction of common pathogens and parasites takes place during this period. Absence of oxygen during the process generates methane in addition to other gases. The mixture of methane and carbon dioxide is known as biogas which is a useful source of energy. This process requires controlled environment and closed reactor to reduce odour problem, eliminate flies and for effective collection of gas.

In vermi-composting earthworm species are used for the conversion of organic waste into compost. Selection of appropriate species of earthworms for vermin-composting in India is limited to a few. The best choice for vermi-composting is two worm species, i.e. *Eudriluseugeniae* and *Eisenia fetida*. *Eudriluseugeniae*, popularly known as African Night Crawler is found to be the best for vermi-composting. It has excellent growth and high conversion ratio. Worms use about 5 to 10 per cent of the organic material for their growth and excrete the rest in the form of granular cast which is known as vermin-compost. The granular loose vermin-cast provides oxygen rich, nutrient rich media for aerobic microbes which further accelerated decomposition process. About 2,000 worms are required for a volume of 1x1x0.5 m. On an average, 5 kg of waste is partially digested by 1,000 worms in a day.

PNEUMATIC WASTE COLLECTION

Garbage transportation is one of the largest overheads of local bodies. The current system which uses waste-hauling

trucks is very costly compared to the operating cost of mechanized system. Disadvantages of current system include unsightly, unhygienic landfill sites, bins, transportation, truck maintenance cost, labour cost and the noise and pollution. To obviate these problems, pneumatic waste collection can be adopted. It consists of an integrated collection station, piping system and discharge valves that are situated below vertical chutes outside the residential, commercial and other areas. Waste of one type is collected into the garbage chute, where it is stored above a garbage valve between the emptying cycles. There is a main pipe network under the valve that connects all valves and transports the waste to the collection station. These systems work best in a radius of about a kilometer. The new colonies and urban extension can be pre-planned with pneumatic waste ducts, gravity chutes and underground waste storage facilities.

Pneumatic waste collection offers a cleaner solution that can alleviate traffic congestion and encourage recycling. It also would improve the overall city hygiene, aesthetic, and landfill sites required, besides cost reduction in waste collection. The processing of garbage is mostly underground at local collection stations. Fewer garbage trucks lead to a reduction in CO² emission, traffic noise pollution and reduced haulage costs.

Pneumatic Solid Waste Management has been implemented at several places, including Mecca and Holy City's Grand Mosque. Vacuum conveying technology specialist Mari-Matichas supplied a waste collection system to deal with the 900 MT of waste per day. Waste bags are fed into gravity chute intakes linked to a network of 30 km of pipelines running beneath the grand mosque complex. Transporting waste through airtight pipelines instead of using trucks minimizes problems of noise, smell and dust.

BIO-REACTOR LANDFILL

The bio-reactor landfill disposal comprises a bio reactor chamber in which the waste degradation process is accelerated by re-injection of the leachates. This helps to control humidity, a critical parameter in degradation, and create optimal conditions for the development of bacteria.

The main advantages expected from bio-reactor processing include:

- The reduction of long-term environmental risks by more rapid stabilization of waste, since the performance of sealing systems can deteriorate over time;
- Reduced biogas leakage, thanks to a surface geomembrane which ensures that disposal cells are leak



tight. This results in a reduction in foul odors and greenhouse gas emissions;

- An increase in the number of sites capable of making use of energy conversion, as bio-reactors increase the volume of captured gases.

Ecological sustainability is ensured by geological and hydro-geological studies prior to the project, the distancing of the site from populated areas, very strict technical specifications such as, increased leak tightness of disposal cells using geomembranes on the bottom and sides of the disposal cells to capture and processing of leachates and biogases.

INSTITUTIONAL AND MANAGEMENT REFORMS

The solid waste management has the following stages.

(a) Waste generation and storage, b) waste collection, (c) waste transfer/transportation, (d) treatment, recycle and recovery, and (e) disposal. Promoting alternative approaches in solid waste management need municipal reforms, change in attitude (particularly towards rag pickers), capacity development and a partnership approach involving the private and community sectors. Suitable mechanisms need to be evolved to overcome the barriers in promotion, development and dissemination of new approaches to waste management. This requires proper coordination and dovetailing of the resources of the government/local bodies, development authorities, NGOs, RWAs, industry, cooperatives and private sector. In UK, the British Local Authority Act in 1980 introduced the concept of 'Compulsory and Competitive Tendering', the monopoly of local bodies in the solid waste management has been disbanded and they have to compete with the private sector. Indian cities can learn from such success stories and incorporate suitable legal, managerial and financing reforms that will bring

investments, together with new, smart technology and operational efficiencies.



The institutional framework may be centred on the concept of Producer Responsibility Organization (PRO) by providing forward and backward linkages with all other actors involved in the process. Such PROs can be formed to manage and collect the end-of-life products in lieu of each producer establishing its own separate system.

The Ministry of Urban Development in its Atal Mission for Rejuvenation and Urban Transformation (AIVJRUT, 2015) have also recommended establishment of dedicated Special Purpose Vehicle within the urban local body for integrated, efficient and professional management of urban waste. The model requires integration of activities between the informal and formal sectors, thereby bringing them into the mainstream of waste management activity.

Technology can play an important role by providing intelligent, smart, performance based and efficient systems for digital planning for waste management, sensor based collection, transportation, pollution monitoring, energy simulation, resource optimization, asset management maintenance, air quality measurements, etc. Technology can also help involving citizens in waste management and monitoring by using mobile and web channels.

The endeavour to make the Indian cities and villages cleaner, hygienic and environmentally sustainable requires smart IT and sensor-based processes of solid waste management. It is necessary to adopt the alternatives to landfill and the strategies of refuse, reuse, reduce and recycle for sustainable waste management.

Source: NCHF Bulletin

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Key Financial Indicators

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| S. No | Particulars | As on 31.03.2018 |
|-------|---|------------------|
| 1 | Share Capital | 144.10 |
| 2 | Reserves | 466.00 |
| 3 | Owned funds | 610.10 |
| 4 | Deposits | 3851.25 |
| 5 | Borrowings | 3388.92 |
| 6 | Working Capital | 7850.27 |
| 7 | Loans & Advances | 5195.75 |
| 8 | Call money & short term deposits with other Banks | 1198.25 |
| 9 | Investments | 1328.66 |
| 10 | Gross Profit | 66.97 |
| 11 | Gross NPAs | 0.24% |



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हमारी कृषि प्रधान अर्थव्यवस्था महिलाओं की भूमिका

हरियाणा, पंजाब, हिमाचल प्रदेश, मध्यप्रदेश, पश्चिम बंगाल या कोई अन्य राज्य गाँवों देहातों में कहीं भी चले जाइए, दिन भर खेतों में मेहनत मशक्कत करती महिलाएं आपको नज़र आ जाएंगी. अल्लसुबह मुंह अंधेरे उठकर घर—गृहस्थी के सारे काम निपटाकर खेतों में पहुँच जाती हैं ये जुझारु भारतीय नारियाँ. हर दिन १४ से १६ घंटे घरों और खेतों में जुझती इन महिलाओं को न तो खेती का प्रशिक्षण मिलता है, न मेहनताना और न ही अच्छी फसल होने पर शाबाशी. संयुक्त राष्ट्र के खाद्य और कृषि संगठन के सर्वे में महिलाएं कृषि मामले में पुरुषों से हर क्षेत्र में आगे हैं, बस अधिकारों और सुविधाओं को छोड़कर. जिन विकसित देशों में महिलाएं आर्थिक रूप से अपना योगदान दे रही हैं उनमें ७९% महिलाएं कृषि क्षेत्र से हैं, जबकि पूरी दुनिया में यह आंकड़ा ४८% तक है. विकासशील देशों में औसतन कृषि श्रमिक बल में ४३% महिलाएं शामिल हैं जो विश्व में अनुमानित ६० करोड़ गरीबों में से है, यानी दो तिहाई हिस्सेदारी है. ये आंकड़े चिंतित करने वाले हैं. वहीं आबादी के हिसाब से देश के आर्थिक विकास में कृषि के माध्यम से योगदान देने वाली महिलाओं की बात करें तो लैटिन अमेरिका और कैरेबियन में इनकी संख्या १९८० की अपेक्षा २०१० तक २०% नॉर्थ ईस्ट और नॉर्थ ईस्ट अफ्रीका में ४१% साउथ एशिया में ३२% पूर्व दक्षिण एशिया में ४५% और उप सहारा अफ्रीका में सबसे ज्यादा ४८% के आसपास हैं.

अगर भारत की बात करें तो २०११ की जनगणना के सर्वेक्षण के मुताबिक हमारे देश में छह करोड़ से ज्यादा महिलाएं खेती के व्यवसाय से जुड़ी हैं. खेतों में काम करने से पहले और बाद में घर का भी सारा काम करती हैं जबकि पुरुष अपना समय मनोरंजन में खपाते हैं. एक बार ऑफिस ड्यूटी पर हरियाणा के झज्जर जिले में जाने का मौका मिला तो दबंग मानी जाने वाली हरियाणवी महिलाओं से रुबरु होने पर उनकी पीड़ा, बेचारगी का जो अहसास हुआ, आज तक मेरे ज़हन से नहीं मिट पाया. सुबह—शाम खेती—किसानी, दिन भर घर और बच्चे और रात को मेहनत की कमाई शराब में उड़ाने के लिए पतियों को न देने पर आज भी यहां के तथाकथित मर्द घरेलु हिंसा, अचानक घर की महिलाओं को घर की चौखट से निकाल देने जैसे दुःसाहसी और अमानवीय कदम उठाने से बाज़ नहीं आते. उस पर ढिठाई इतनी कि

समूह बनाकर ताश खेलते नज़र आते हैं.

अमर साहित्यकार शेक्सपीयर की निम्नलिखित पंक्तियाँ नारी अस्मिता की विडम्बना का वर्णन करती हैं:

"It is a star to every wondering bark; whose worth is unknown, although his height be taken"

इस मूक मार्गदर्शक को चमकते तारे बनने का अवसर जब भी मिला है, उसने चमकते सूर्य को भी परास्त किया है. 'कौन कहता है आसमां में सुराख नहीं हो सकता?' ज़रूर हो सकता है—फर्क बस इतना आ गया है कि किसी खास को आवाज़ उठानी पड़ती है और आज के मुश्किल दौर में बकौल शायर, दुश्यन्त कुमार सिर्फ एक पत्थर उछालने से नहीं हो सकता बल्कि लगातार पूरी ताकत से ढेर सारे पत्थर उछालने पड़ते हैं. मुंबई की पूर्व शेरिफ, रजनी बकुल पटेल ने कुछ अरसा पहले पी.एन.हक्सर मेमोरियल लेक्चर देते हुए अपने विचार इस प्रकार व्यक्त किए, 'महिलाओं को सशक्त बनाने से हमारे समाज को दो अति महत्वपूर्ण लाभ हो सकते हैं. पहला—देश की जनसंख्या के आधे भाग यानी महिलाओं को आर्थिक और सामाजिक दृष्टि से सशक्त बनाकर उन्हें समाज का उत्पादक अंग बनाया जा सकता है, दूसरा—महिलाएं सामाजिक परिवर्तन लाने की दिशा में स्वभावतः पुरुषों से बेहतर होती हैं'.

महिला किसानों की दुर्गति देखते हुए, हरित क्रांति के जनक डॉ. स्वामीनाथन ने इस वर्ष के बजट में कृषि क्षेत्र में महिलाओं की सहभागिता बढ़ाने की बात को प्रमुखता से उठाया यह कहते हुए कि देश में खेती से जुड़े ५० फीसदी से अधिक कार्यों में महिलाएं शामिल हैं. इसके बावजूद भारत में महिला किसानों के लिए कोई बड़ी सरकारी नीति नहीं बनाई गई है. समस्या की गहराई को समझते हुए माननीय प्रधानमंत्री. श्री. नरेन्द्र मोदी ने २०१६ में महिला विधायकों के राष्ट्रीय सम्मेलन में कहा, 'अब वक्त आ गया है कि हम महिला विकास की बजाय महिलाओं के नेतृत्व में विकास के बारे में कदम उठाएं और यह तभी हो पाएगा जब हम कृषि और ग्रामीण क्षेत्रों में महिलाओं की भूमिका को ज्यादा सार्थक बनाएंगे'.

हमारे गाँवों में महिलाएं पुरुषों के साथ बराबरी तो क्या उनसे भी अधिक भागीदारी कर बहुआयामी भूमिका निभा रही हैं.



बुवाई से लेकर रोपण, निकाई, सिंचाई, उर्वरक डालना, पौध संरक्षण, कटाई, भंडारण यहां तक कि मवेशी प्रबंधन, चारा संग्रह, दुग्ध संग्रहण, मधुमक्खी पालन आदि में भी सक्रिय हैं। लेकिन क्या इतना अधिक योगदान होने के बाद भी हम अपनी नारी शक्ति की श्रमपूंजी के साथ न्याय कर पा रहे हैं? विश्व खाद्य एवं कृषि संगठन के आंकड़े बताते हैं कि भारत के ४८ फीसदी कृषि संबंधित रोजगार में औरतें लगी हैं। अध्ययन यह भी बताता है कि हिमालय क्षेत्र में, प्रति वर्ष एक पुरुष प्रति हेक्टेयर औसतन १ हजार २१२ घंटे जबकि एक महिला ३ हजार ४८५ घंटे काम करती है। एन.एस.एस.ओ. के आंकड़ों के हिसाब से देश के २३ राज्यों में कृषि, वानिकी और मछलीपालन में कुल श्रमशक्ति का ५० फीसदी हिस्सा महिलाओं का है। यहां तक कि नदियों के किनारे बने खेतों में काम करने वाली औरतें परम्परागत रूप से जैविक पुनर्चक्रण को अपनाकर मिट्टी की उपजाऊ शक्ति को बरकरार रखना, फसलों में अंतराल करना और विविधता लाना भी सीख चुकी हैं।

बात स्पष्ट है, आज पुरुष तो खेतीबाड़ी से पलायन कर रहे हैं जबकि महिलाओं की सहभागिता और निष्ठा बरकरार है, तो उनकी पहुँच खेती के संसाधनों जैसे भूमि, जल, ऋण, नयी तकनीकों और प्रशिक्षण तक भी बढ़ाई जाए। वर्तमान सरकार ने इसी को समझते हुए बजट में चल रही सभी सरकारी योजनाओं, कार्यक्रमों और विकासपरक गतिविधियों में कुल आबंटित बजट की ३० फीसदी राशि महिला लाभार्थियों के लिए चिन्हीत की है। साथ ही, देश का शीर्षस्थ बैंक नाबार्ड, जिसके स्वयं सहायता समूह—बैंक लिंकेज कार्यक्रम के अंतर्गत पुरे देश में चल रहे लगभग ८६ लाख समूहों में से ९०% महिलाओं के हैं, विभिन्न प्रकार का आयअर्जक प्रशिक्षण देकर, उनकी क्षमता का निर्माण करके माइक्रो क्रेडिट दिलवाने से लेकर सामाजिक मंचों पर उनकी भागीदारी बढ़ाकर, जीवन के महत्वपूर्ण आर्थिक व सामाजिक निर्णय लेने में उन्हें सक्षम बनाने का बीड़ा उठा रहा है। सरकार की विभिन्न नीतियों जैसे जैविक खेती, स्वरोजगार योजना, भारतीय कौशल विकास योजना आदि में भी महिलाओं को प्राथमिकता दी जा रही है।

कृषि और सम्बन्ध क्षेत्रों में महिलाओं को और अधिक सशक्त बनाने के लिए कृषि एवं किसान कल्याण मंत्रालय ने किसानों के लिए बनी राष्ट्रीय नीति में उन्हें घरेलू और कृषि भूमि दोनों पर संयुक्त पट्टे देने जैसे नीतिगत प्रावधान किए हैं। इसके अलावा भारतीय कृषि अनुसंधान परिषद (ICAR) के अंतर्गत १९९६ में भुवनेश्वर में केन्द्रीय कृषिरत महिला संस्थान की स्थापना की गई। यह संस्थान कृषि में महिलाओं से जुड़े विभिन्न आयामों पर कार्य करता है। कृषि मंत्रालय के

आंकड़ों पर गौर करें तो, अकेले २०१६—१७ के दौरान महिलाओं से संबंधित २१ तकनीकों का पुनरीक्षण करके २.५६ लाख महिलाओं को कृषि से सहबन्ध गतिविधियों जैसे सिलाई उत्पाद बनाना, पशुपालन, मुर्गीपालन, मछलीपालन आदि में प्रशिक्षित किया गया, देश में कार्यरत ६८० कृषि विज्ञान केन्द्रों में हर एक में एक महिला वस्तु-विशेषज्ञ (गृह विज्ञान) तैनात है।

भारत सरकार ने राज्य सरकारों को निर्देश दिये हैं कि वे गाँवों में ऐसी महिलाओं की पहचान करें जो विधवा, परित्यक्ता या बेहद गरीब हों और मनरेगा योजना के तहत उन्हें कम से कम १०० दिन का दिहाड़ी काम दिया जाना सुनिश्चित किया जाए। पूर्वोत्तर के ०७ राज्यों और उत्तरी भारत के हिमाचल प्रदेश और जम्मू कश्मीर जैसे राज्यों, जहाँ की अर्थव्यवस्था बागवानी प्रधान है, में भी महिला किसान अधिक लगी हैं और देश में पैदा हो रहे २८ मिलियन टन फलों और ६६ मिलियन टन सब्जियों के उत्पादन, जिसके कारण भारत पूरी दुनिया में फल और सब्जी उत्पादन में दूसरे स्थान पर आता है, का श्रेय इस देश की महिला किसानों को जाता है। लिहाज़ा, केन्द्र सरकार ने पिछले साल से १५ अक्टूबर महिला किसान दिवस के रूप में मनाने का फैसला भी किया है।

सच पूछिए तो, उपर दिए गए तथ्य और आंकड़े आधा सच है, बाकी का आधा सच यह है कि केवल योजनाएं बनाने से इस समस्या का हल नहीं हो सकता। भारतीय समाज के बंधन यहां की आधी आबादी के लिए आज भी इतने कड़े हैं कि न तो ज़मीन उनके नाम होती है, न परिवार की कोई और सम्पदा और न ही जीवन के महत्वपूर्ण निर्णय लेने का अधिकार उनको मिलता है। आज भी हमारे देहातों की महिलाएं अशिक्षित, अर्धशिक्षित हैं, अज्ञानता के अंधकार में जी रही हैं। घर या खेती की चारदीवारी में मानो उन्हें कैद करके रख दिया है। पढ़े—लिखे न होने के कारण न तो उन्हें कम्प्यूटर, इंटरनेट की जानकारी हो पाती है, न खेती की आधुनिक प्रथाओं, उपकरणों और तकनीकों की। जो महिलाएं पढ़—लिख रही हैं, जागरूक हो चुकी हैं, उनकी आवाज़ भी हमारे पुरुष—प्रधान समाज के मर्दों द्वारा दबा दी जाती है। डेटा के डिजिटाइज़ेशन को तैयार हमारे देश में अभी तक भूमि स्वामित्व पर लिंग के आधार पर अलग किया गया डेटा नहीं है। हम यह पता नहीं कर सकते कि देश और राज्यों में कुल कितनी ज़मीन महिलाओं के नाम पर है और कितनी ज़मीन साझे तौर पर महिलाओं और पुरुषों की है। २०१०—२०११ की कृषि जनगणना के मुताबिक ग्रामीण महिला श्रमिकों में से ७५ फीसदी कृषि कार्य में लगी हैं। जबकि महिलाओं का ऑपरेशनल लैंड पर हक महज़ १२.७९ फीसदी ही है।



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इसमें से भी कुल १०.३६ फीसदी ज़मीन ही खेती योग्य है. आज ज़रूरत इस बात की है कि महिला किसानों को किसान का दर्जा केवल दिवस मनाकर नहीं बल्कि सही अर्थों में दिया जाए. रेडियो, टीवी के कृषि—प्रधान कार्यक्रम हों, वेबसाइट या विज्ञापन, केवल पुरुष किसानों के चित्र या संबोधन देखने—सुनने में आते हैं. इस धारणा को बदलने में मीडिया प्रभावी भूमिका निभा सकती है.

सभी कृषि योजनाओं में सब्सिडी और फायदे मालिक के खाते में जाते हैं. सोच बदलने में दशक लग जाते हैं, महिला किसानों को ज़मीन का मालिकाना हक मिलने में वक्त लगेगा अतः कृषि योजनाओं को ज़मीन के मालिकाना हक से जोड़ कर न लागू किया जाये. ज़मीन पर खेती करने वालों की पहचान करके उन्हें इन योजनाओं का फायदा दिया जाये.

पुरुष अधिकतर खेती में जुताई और कटाई का काम करते हैं, इन कामों के लिए तकनीक और उपकरण बाज़ार में जल्दी आते हैं, लेकिन महिलाओं के कामों से जुड़े हुए उपकरणों और तकनीक पर मुश्किल से ही ध्यान दिया जाता है. सरकार ध्यान दे कि धान जैसी फसल जिसे बोने, जिराई—गुड़ाई करने में उन्हें घंटों मेहनत करनी पड़ती है, के लिए आसानी से इस्तेमाल किए जा सकने वाले उपकरण उपलब्ध कराए जाएं.

भले ही पिछले कई वर्षों से भारत के जी.डी.पी. में कृषि का योगदान घटता जा रहा है और यह मात्र निर्वाह कृषि बन कर

रह गई है किंतु ६ लाख से भी अधिक गाँवों के इस देश में जहाँ आज भी लगभग ६० जनसंख्या गाँवों में निवास करती है, खेती सिर्फ एक बड़ी आबादी का पेट भरने का ज़रिया और जीविकोपार्जन का साधन ही नहीं, एक परंपरा है जिसका लगभग सारा बोझ महिलाओं के कंधों पर है. वे इस बोझ को खुशी—खुशी उठाना भी चाहती हैं. ऐसे में सरकार की ज़िम्मेदारी है कि इन किसानों की समस्याओं को समझे ताकि हम न सिर्फ एक बड़ी आबादी को आत्मनिर्भर होते देख सकें बल्कि कृषि उत्पादों के लिए विदेशी बाज़ारों पर अपनी निर्भरता को भी कम कर सकें.

ग्रामीण इलाकों में रोज़गार के विकल्पों की कमी के कारण भविष्य में पुरुषों के अल्पकालिक प्रवास में वृद्धि होने की अधिक संभावना है, इसलिए नीति—निर्माताओं की यह ज़िम्मेदारी है कि वे भौतिक व वित्तीय संसाधनों पर खेती—बाड़ी से जुड़ी महिलाओं की पहुँच को अधिकाधिक बढ़ाएँ ताकि इनके लिए अनुकूल वातावरण बनाया जा सके और इन महिला किसानों को यह न कहना पड़े.—

“बंजर सी धरती से सोना उगाने का मादा रखती हूँ,
पर अपने हक की लड़ाई लड़ने से डरती हूँ,
बहुत गीत बने, बहुत लेख छपे कि मैं महान हूँ,
पर दुर्दशा न देखी मेरी किसी ने, ऐसी मैं किसान हूँ।”

Source - The Indian Banker



दुधारु पशुओं के लिए हरे चारे को साइलेज और हे बनाकर संरक्षित करना

डा राम निवास¹ और चारु शर्मा²

पशुओं से अधिकतम दुग्ध उत्पादन प्राप्त करने के लिए उन्हें पर्याप्त मात्रा में पौष्टिक चारे की आवश्यकता होती है। इन चारों को पशुपालक या तो स्वयं उगाता है या फिर कहीं और से खरीद कर लाता है। चारे को अधिकांशतः हरी अवस्था में पशुओं को खिलाया जाता है तथा इसकी अतिरिक्त मात्रा को सुखाकर भविष्य में प्रयोग करने के लिए भंडारण करने से उसमें पोषक तत्व बहुत कम रह जाते हैं। इसी चारे का भंडारण यदि वैज्ञानिक तरीके से किया जाए तो उसकी पौष्टिकता में कोई कमी नहीं आती तथा कुछ खास तरीकों से इस चारे को उपचारित करके रखने से उसकी पौष्टिकता को काफी हद तक बढ़ाया भी जा सकता है।

हे बनाना

हे बनाना के लिए हरे चारे या घास को इतना सुखाया जाता है जिससे की उसमें नमी की मात्रा १५—२० प्रतिशत तक ही रह जाए। इससे पादप कोशिकाओं तथा जीवाणुओं की एन्जाइम क्रिया रुक जाती है लेकिन इससे चारे की पौष्टिकता में कमी नहीं आती, हे बनाने के लिए लोबिया, बरसीम, रिजका, लेग्यूमस तथा ज्वार, नेपियर, जवी, बाजरा, ज्वार, मक्की, गिनी अंजन आदि घासों का प्रयोग किया जाता है लेग्यूमस घासों में सुपाच्य तत्व अधिक होते हैं तथा इसमें प्रोटीन व विटामिन ए डी व ई भी पर्याप्त मात्रा में पाए जाते हैं। दुग्ध उत्पादक के लिए ये फसलें बहुत उपयुक्त होती हैं। हे बनाने के लिए चारा सुखाने हेतु निम्नलिखित तीन विधियों में से कोई भी विधि अपनाई जा सकती है।

चारे को परतों में सुखाना

जब चारे की फसल फुल आने वाली अवस्था में होती है तो उसे काटकर परतों में पूरे खेत में फैला देते हैं तथा बीच—बीच में उसे पलटते रहते हैं जब तक की उसमें पानी की मात्रा लगभग १५% तक न रह जाए। इसके बाद इसे इकट्ठा कर लिया जाता है तथा ऐसे स्थान पर जहां वर्षा का पानी न आ सके इसका भंडारण कर लिया जाता है।

चारे को गड्ढर में सुखाना

इसमें चारे को काटकर २४ घंटों तक खेत में पड़ा रहने देते हैं इसके बाद इसे छोटी—छोटी ढेरियों अथवा गड्ढरों में बाँध कर पूरे खेत फैला देते हैं। इन गड्ढरों को बीच—बीच में पलटते रहते हैं जिससे नमी की मात्रा घट कर लगभग १८% तक हो जाए।

चारे को तिपाई विधि द्वारा सुखाना

जहां भूमि अधिक गीली रहती हो अथवा जहां वर्षा अधिक होती हो ऐसे स्थानों पर खेतों में तिपाइयां गाढ़कर चारक की फसलों को उन पर फैला देते हैं इस प्रकार वे भूमि के बिना संपर्क में आए हवा व धूप से सुख जाती है कई स्थानों पर घरों की छत पर भी घासों को सुखा कर हे बनाया जाता है।

साइलेज बनाना

हरा चारा जिसमें नमी की पर्याप्त मात्रा होती है को हवा की अनुपस्थिति में जब किसी गड्ढे में दबाया जाता है तो किण्वन की क्रिया से वह चारा कुछ समय बाद एक अचार की तरह बन जाता है जिसे साइलेज कहते हैं। हरे चारे की कमी होने पर साइलेज का प्रयोग पशुओं को खिलाने के लिए किया जाता है। वर्षा ऋतु में हरा चारा ज्यादा होने पर इसका पूरा उपयोग नहीं हो पाता है इसमें से अधिकांश चारा सुखकर नष्ट हो जाता है जिसका कोई उपयोग नहीं हो पाता है। फसल की कटाई प्रातः १० बजे करनी चाहिये ताकि उस पर ओस बूंदें नहीं रहे। फसल की कटाई फुल आने की अवस्था में अर्थात् फसल ना ही ज्यादा पकी हुई हो और ना ही ज्यादा कच्ची हो। फसल को काटने के उपरान्त एक से डेढ़ घंटे तक खेत में ही पड़े रहने दे और ये सुनिश्चित कर ले ताकि चारे में ८० प्रतिशत से ज्यादा नमी नहीं रहे। इसके बाद इस चारे का एक से डेढ़ इंच के टुकड़ों में कुटी कर लेते हैं।

बैग में भरना

कटे हुये चारे को साइलेज बैग में भर लेते हैं यह बैग ऐसे बने हुए होते हैं ताकि हवा अन्दर नहीं जा सके। इस बैग में कुटी

१ विषय विशेषज्ञ (पशुपालन), २ विषय विशेषज्ञ (गृह विज्ञान प्रसार शिक्षा), कृषि विज्ञान केन्द्र (स्वामी केशवानंद राजस्थान कृषि विश्वविद्यालय), पोकरण— ३४५२१ (जैसलमेर)



Grams : KRISHI BANK

PHONE : 2587040/2587069



The Haryana State Co-operative Agriculture and Rural Development Bank Ltd., Panchkula.

Shakarita Bhawan, Bays No.31-34, Sector-2, Panchkula, Haryana.

The Haryana State Cooperative Agriculture and Rural Development Bank Ltd. is the specialized institution in the State, which caters to the Long term credit needs of the farmers for the upliftment of the economic position of the agriculturists and allied fields.

The Bank advances Long Term loans to the farmer for the following purpose.

| Sr. No. | Name of the Scheme | Period | Scale of finance |
|---------|---|----------------|----------------------------------|
| 1 | Minor Irrigation, WCS/UGPL | 7 year | ₹ 1.20 lacs to 5.00 lacs |
| 2 | Farm Mechanisation | 5 - 7 year | 85% of cost of mechanisation |
| 3 | Purchase of land | 7 year | Upto 15.00 lacs |
| 4 | Horticulture/Farm Forestry Medicinal & Aromatic plant | 5 - 9 year | ₹ 65000 to Rs. 4.40 lac per acre |
| 5 | Animal Husbandry | 5 - 9 year | ₹ 75000 to 14 lac. 5 unit |
| 6 | Rural Godowns | 7 year | 90% of the Project Cost |
| 7 | Rural Housing | Up to 10 years | 2.00 lacs to 7 lacs |

NON-FARM SECTOR

| Sr. No. | Name of the Scheme | Period | Scale of finance |
|---------|--------------------------------|---------------|-------------------------|
| 1 | Marriage places | Upto 10 years | 90% of the Project Cost |
| 2 | Community Hall | -do- | |
| 3 | Village/Cottage Industry | -do- | |
| 4 | Public Transport Vehicles | -do- | |
| 5 | Rural Education Infrastructure | -do- | |
| 6 | Other SSI Units | -do- | |

The Loan for the purpose of Non-Farm Sector, Rural Housing and Purchase of land are being advanced @ 13.50% p.a. w.e.f. date 07.6.2018.

Note: For further details, kindly contact the Haryana State Cooperative Agril & Rural Dev. Bank Ltd., Panchkula and the District Coop. Agril & Rural Dev. Banks at Districts level and its branches at Tehsil & Sub-Tehsil level in the State.

DHANESH ADALAKHA
Chairman
Phone: 0172-2583408

NARESH GOYAL
Managing Director
Phone: 0172-2587040



दबा दबाकर भर दी जाती है और बैग आधा भरने के बाद इसमें ३ प्रतिशत गुड़ के घोल का छिड़काव कर देते हैं। बैग पूरी तरह भर जाने के बाद इस तरह बंद कर लिया जाता है ताकि वायु उपर से अन्दर नहीं जा सके और इस बैग के उपर पत्थर रखकर इसको ४५ दिनों तक छोड़ देते हैं।

सावधानियाँ

- फसल काटने के २ घण्टे बाद साइलेज बनाये
- फसल को पुष्प अवस्था में ही काटे
- बैग में चारे को दबा दबाकर भरे ताकि उसमें हवा नहीं रहे
- साइलेज बैग जहाँ रखे वो जगह साफ़ सुथरी होनी चाहिए
- बैग भरते समय अंदर की प्लास्टिक फटनी नहीं चाहिये
- पूरा बैग एक बार में भी भरना चाहिए
- बैग भर जाने के बाद उसे उपर से ढक दे।

साइलेज बैग को खोलना

भरने के ४५ दिनों बाद बैग को खोल लिया जाता है तथा चारे को निकाल लिया जाता है इस समय चारा हल्का भूरा रंग का हो जाता है तथा लसलसा रहता है इसे सीधे भी खिलाया जा सकता है या सुखे चारे के साथ मिलाकर भी खिलाया जा सकता है।

साइलेज के गड्डे साइलोपिट्स

साइलेज जिन गड्डों में भरा बनाया जाता है उन्हें साइलोपिट्स कहते हैं। साइलोपिट्स कई प्रकार के हो सकते हैं जैसे ट्रेन्च साइलो बनाने में सस्ते व आसान होते हैं। आठ फुट गहराई वाले गड्डे में ४ पशुओं के लिए तीन माह तक का साइलेज बनाया जा सकता है। गड्डा ऊँचा होना चाहिए तथा इसे भली प्रकार से कुटकर सख्त बना लेना चाहिए। साइलो के फर्श व दीवारों पक्की बनानी चाहिए और यदि से सम्भव न हो तो दीवारों की लिपाई भी की जा सकती है। साइलेज बनाने के लिए जिस भी हरे चारे का इस्तेमाल करना हो उसे उपयुक्त अवस्था में खेत से काट कर २ से ५ सेंटीमीटर के टुकड़ों में कट्टी बना लेना चाहिए ताकि ज्यादा से ज्यादा चारा साइलो

पिट में दबा कर भरा जा सके कुट्टी किया हुआ चारा खुब दबा—दबा कर ले जाते हैं। ताकि बरसात का पानी ऊपर न टिक सके फिर इसके ऊपर पोलिथिन की शीट बिछाकर ऊपर से १८—२० सेंमी. मोटी मिट्टी की परत बिछा दी जाती है इस परत को गोबर व चिकनी मिट्टी से लीप दिया जाता है दरारें पड़ जाने पर उन्हें मिट्टी से बंद करते रहना चाहिए ताकि हवा व पानी गड्डे में प्रवेश न कर सकें। लगभग ४५ से ६० दिनों में साइलेज बन कर तैयार हो जाता है जिसे गड्डे को एक तरफ से खोलकर मिट्टी व पोलिथिन शीट हटाकर आवश्यकतानुसार पशु को खिलाया जा सकता है साइलेज को निकालकर गड्डे को पुनः पोलिथिन शीट व मिट्टी से ढक देना चाहिए तथा धीरे—धीरे पशुओं को इसका स्वाद लग जाने पर इसकी मात्रा २०—३० किलो ग्राम प्रति पशु तक बढ़ाई जा सकती है।

साइलेज बनाने योग्य फसलें

साइलेज लगभग सभी घासों से अकेले अथवा उनके मिश्रण से बनाया जा सकता है जिन फसलों में घुलनशील कार्बोहाइड्रेट्स अधिक मात्रा में होते हैं जैसे की ज्वार, मक्की, गिन्नी घास नेपियर सिटीरिया आदि, साइलेज बनाने के लिए उपयुक्त होती है फली दार जिनमें कार्बोहाइड्रेट्स कम तथा नमी की मात्रा अधिक होती है को अधिक कार्बोहाइड्रेट्स वाली फसलों के साथ मिलाकर अथवा शीरा मिला कर साइलेज के लिए प्रयोग किया जा सकता है साइलेज बनाने के लिए चाहिए साइलेज बनाते समय चारे में नमी की मात्रा ८०% होनी चाहिए।

साइलेज बनाने के लाभ

- पशुओं को वर्षभर हरा चारा मिलता है
- चारे की गुणवत्ता में गिरावट नहीं आती है
- हरे चारे की अपेक्षा कम स्थान की आवश्यकता होती है
- चारे के स्वाद में बढ़ोतरी होती है
- इसको निरंतर खिलाने से पशुओं के दुध में वसा और एस एन एफ में कमी नहीं आती है।



Kharif foodgrains output estimated at record 141 million tonne

Production of kharif foodgrains for 2018-19 crop year (July-June) has been estimated at a record 141.59 million tonne on the back of increased acreage under paddy and expected better yield in pulses and coarse cereals. Last year's kharif output was 140.73 mt as per the latest (fourth) estimate, up from 134.67 seen in the first estimate. The robust output could potentially increase pressure on the government to buy the crops at the MSPs if market rates fall below the benchmark rates on bumper arrivals at mandis.

Rice output in kharif 2018-19 is estimated to be a record 99.24 million tonne in this kharif season, up from 97.5 million tonne in the previous season. The sowing area under paddy was 2.36% higher at 38.6 million ha as of September 20 as against the year-ago period. The moong MSP for kharif 2018 was increased 25% from the last year level as part of a government promise to set the benchmark prices at 150%

over their production costs (A2+FL).

According to the first estimates of the kharif crops, the production of pulses such as tur, urad and moong is likely to be 9.22 million tonne, down from last year's 9.34 million tonne, mainly due to decline in area under urad. The tur production is estimated at 4.08 million tonne, moong at 1.58 million tonne and urad at 2.65 million tonne.

The total output of kharif-grown coarse cereals is seen at 33.13 million tonne, including 21.47 million tonne of maize. The output of jowar is estimated at 1.88 million tonne, bajra at 7.77 million tonne and ragi at 1.68 million tonne. Among the cash crops, cotton output for this year has been pegged at 32.5 million bales (of 170kg each), down from 34.9 million bales last year. Sugarcane production is likely to jump to 383.9 million tonne from 376.9 million tonne.

Rajasthan farmers benefited from solar water pumps: study

A scientific study conducted by Birla Institute of Technology & Science, Pilani, has found mismatch between investment in solar energy sources and employment generation in the sector, but has stated that the farmers in Rajasthan have immensely benefited from the solar photovoltaic (SPV) water pumping systems. The study has also found a significant decline in the consumption of fuel in the agriculture sector. Scientist Krishna M. led the study as the principal investigator of a project funded by the Indian Council of Social Science Research for addressing some distinct aspects of renewable and non-renewable energy sources at micro and macro levels. A micro-level analysis indicated that the SPV water pumping systems had provided some direct benefits to farmers, including the saving from diesel generators.

'Greenhouse effect'

"Farmers used to operate diesel generators for 6 to 7 hours a day, consuming two litres of diesel per hour. The use of SPV pumps has resulted in a drastic reduction of fuel consumption, which was also a cause of greenhouse effect," Dr. Krishna said. While the grid-connected electricity is supplied to agriculture sector mostly during the night, the farmers can irrigate the land during daytime with the SPV system, making their access to water easy. Besides, the SPV system has been found to be cost effective because of the State government's subsidy and the beneficiary's share is recovered in about four years.

20th livestock census from October 1, last count in 2012

India's 20th livestock census will be conducted from October 1 in all districts across the country. The last census was conducted in 2012, putting total livestock population at 512.05 million and poultry population at 729.2 million. Various species of animals (Cattle, Buffalo, Mithun, Yak, Sheep, Goat, Pig, Horse, Pony, Mule, Donkey Camel, Dog, Rabbit and Elephant) and poultry birds (Fowl, Duck, Emu, Turkeys, Quail and other poultry birds) possessed by the households, household/non-household enterprises and

institutions will be counted at their site during the Census operation. So far, 19 such Census have been conducted in the country, beginning 1919-20. The livestock census usually covers all domesticated animals and head-counts of those animals will be carried out during a specific time period. The upcoming Census will for the first time use tablets/computers and a mobile application (app) software, developed by National Informatics Centre (NIC), for collecting and transferring the data online.

Cooperative eco model a viable alternative to capitalism, socialism: PM

Prime Minister Narendra Modi said that the cooperative model is a viable economic alternative to the capitalist and socialist models. He hailed India's first home minister Vallabhbhai Patel; who was also founder of the Amul dairy

cooperative movement in Gujarat, as the leader who showed people the importance of the cooperative movement as an economic model. "It fills me with pride that it is the result of farmers' cooperative movement of over seven decades that



Amul has become an identity, inspiration and necessity in the country," Modi said.

Terming it a huge achievement, he said it is not just an industry or a milk processing plant, but is also "an alternative economic model". On one hand, there is the socialist economic model, and on the other is the capitalistic model.

The world has been inspired by these two models, he said. "Sardarsaheb sowed the seed for a third economic model — controlled neither by government nor capitalists. Instead, it was created with the cooperation of farmers and people and everybody was a part of it. This is one viable alternative to socialism and capitalism," Modi said.

Average size of farms falls to 1.08 ha in 2015-16

In an indication of further deepening of a crisis in the agricultural sector, the average size of operational agricultural holdings in the country has declined to 1.08 ha in 2015-16 as compared to 1.15 ha in 2010-11, according to the freshly-released provisional agriculture census data. According to the census, there was a loss of 2.45 million ha (mha) of cultivated land due to urban sprawl and other developmental activities. The operated area in 2015-16 has come down to 157.14 mha. The sharpest fall in operational

holdings happened in Goa, at 28%. Semi-medium and medium operational holdings (of 2-10 ha) dropped to 13.22% from 14.29% and large holdings (above 10 ha) slipped to 0.57% from 0.71% in 2010-11.

There has been a marginal increase in holdings owned by female farmers. The share of female operational holders has increased to 13.87% in 2015-16 from 12.79% in the previous census.

Female participation rising in farm sector

The government released agriculture census for 2015-16 that showed a 1.53% decline in total operated area at 157.14 million hectare as compared to 2010-11 data, but a rise in both operational holdings and female participation. The census also found out that the percentage share of female operational holders has increased from 12.79% in 2010-11 to 13.87% in 2015-16. In terms of operated area, the share of women increased from 10.36% to 11.57%. "This shows that more and more females are participating in the management and operation of agricultural lands," an official statement said.

The average operational holding was highest in Nagaland (5.06 ha) and lowest in Kerala (0.18 ha). The latest data show UP at 23.82 million, had the highest number of operational holdings, followed by Bihar (16.41 million), Maharashtra (14.71 million), Madhya Pradesh (10 million), Karnataka (8.68 million). In the operated area, Rajasthan reported highest of 20.87 mha, followed by Maharashtra (19.88 mha), Uttar Pradesh (17.45 mha), MP (15.67 mha) and Karnataka (11.72 mha). The highest variation in the number of operational holdings was reported in MP at 12.74%, followed by Andhra Pradesh (11.85%).

Chilli prices set to fall due to higher acreage, output in Madhya Pradesh

Prices of red chilli, the largest exported spice from India, are likely to fall in the coming weeks owing to an increase in sowing area and higher output in Madhya Pradesh. A revival in export demand, which remained subdued in the past few months, may however restrict the fall. Chilli is currently selling at ₹ 90-100 per kg. The first chilli harvest starts in Madhya Pradesh, usually in November. The crop from the main producing regions of Andhra Pradesh and Telangana, which together account for 60% of India's total output, arrives about three months later. Madhya Pradesh has become the third largest chilli-producing state in the country, overtaking Karnataka, as per the Spices Board data. From

just over 1.3 lakh tonnes, production in the state more than doubled two years ago to over 3 lakh tonnes. Last year saw a drop of about 12% following a virus attack.

About 90% sowing in Andhra Pradesh and Telangana has been completed.

Chilli crop saw a record increase of 60 per cent to about 24 lakh tonnes in 2016-17 from a year earlier. As prices fell more than 50% last year, the crop declined but the total stock remained high at over 23 lakh tonnes against the usual 15 lakh tonnes.

State to distribute 7,000 solar pumps to farmers

The Maharashtra State government approved the distribution of 7,000 solar farm pumps under a central scheme, at a cost of ₹239.92 crore, which will enable farmers to irrigate the farm during the day. The Cabinet also agreed to draw up a State scheme to install over one lakh solar farm

pumps, which may cost the government around ₹3 lakh per pump. Of the 7,000 solar farm pumps, 13.5% will be reserved for farmers from the scheduled castes and 9% for those from scheduled tribes.



The Centre will bear ₹50.19 crore of the total cost, while the State and beneficiaries will pay ₹11.99 crore and ₹10.54 crore respectively. The rest of the ₹239.92 crore will be raised from funds available with the Maharashtra Energy Development Agency (MEDA) and from additional power sales tax. The

government expects to bring 14,000 hectares of land under irrigation and save ₹123.5 crore with the scheme. It will also save around ₹63 crore on subsidies and ₹168.25 crore on cross-subsidies.

Cotton Corp gears up for MSP operations

The Cotton Corporation of India (CCI) is set to start purchases of the fibre crop for the 2018-19 season at minimum support price (MSP) from Telangana. CCI has geared up for large-scale MSP operations across the country as the Centre announced an MSP increase of 26-28 % for the fibre crop over last year. For the long staple variety, MSP has been increased by 26.16% to ₹ 5,450 per quintal, while for the medium staple, MSP hike has been 28 % to ₹ 5,150 per quintal.

"We have already opened 330 centres and if required, may go upto 390," said P Alli Rani, Chairman and MD, CCI. Procurement is likely to begin in the next few days in Telangana since the moisture content is approaching 12% there due to dry weather, Alli Rani said. Historically, the MSP procurement in cotton generally starts in the third or fourth week of October. Market arrivals in small quantities have begun across the key producing States of Punjab, Rajasthan, Gujarat, Telangana, Maharashtra and Karnataka.

Maha begins online registrations of farmers for MSP procurement

The Maharashtra government has commenced online registrations for farmers as part of the process of procurement of moong (green gram), urad (black gram) and soybean at Minimum Support Price (MSP). The registration process has begun from September 25, 2018. Prices of moong, urad and soybean are currently ruling under MSP and therefore farmers in the state have been demanding that the commodities be purchased by the government under MSP.

According to senior government officials, the production of moong is expected to be 14.7 lakh quintal and proposed procurement is 4 lakh quintal. For urad, the expected production is 14.7 lakh quintal and proposed procurement is 3.50 lakh quintal. For soybean, expected production is 450 lakh quintal and procurement is expected to be around 25 lakh quintal. The MSP for moong is ₹ 6,975 per quintal, urad at

₹ 5,575 per quintal and soybean at ₹3,390 per quintal. Moong is currently trading at ₹ 3,800 per quintal to ₹ 5,400 per quintal in Latur - one of the key pulses producing regions in the state while the MSP has been fixed at ₹ 6,975 per quintal. Urad is trading at ₹3,800 per quintal to ₹ 4,450 per quintal when the MSP is ₹ 5,600 per quintal.

Officials said that a delegation from China has opened dialogue with the Maharashtra government and are keen on de-oiled soya cake from Maharashtra. Last year, some 88 centres were opened in 23 districts of the state for procurement of 10 lakh quintal of soybean, 3.70 lakh quintal of urad and 3,47,500 quintal of moong. The government has set parameters of 12% moisture content for the procurement of these pulses. Pulses production is projected to drop marginally to 92.2 lakh tonne from 93.4 lakh tonne last year due to the fall in moong, urad and tur output.

India to export raw sugar for first time in three years

Mills in the world's second biggest sugar producer were reluctant to sign new export contracts until recently as global prices were trading far below local prices. But a rally in international raw sugar prices along with a rupee hitting a record low has made exports viable. Mills have contracted to export 150,000 tonnes raw sugar at around \$280 per tonne on a free-on-board (FOB) basis for shipment in November-

December, the dealers said.

More Indian exports could weigh on global prices and trim the market share of rivals Brazil and Thailand, the world's top two sugar suppliers. Indian mills traditionally produce white sugar for local consumption, but this year they are planning to export raw sugar as the country faces a surplus harvest for the second straight year.

Maharashtra government pays ₹106 crore in subsidy to dairy farmers

Subsidy worth over ₹106 crore has been paid by the government of Maharashtra following the submission of bank account details of dairy farmers in the state. The state government had taken a decision to provide a subsidy of ₹ 5 per litre of milk to the co-operative and private producers to convert it into milk powder. To provide the subsidy in a transparent manner, the authorities have also asked for bank

account details of dairy farmers so that the amount can be transferred directly to them. Once the bank accounts are verified by the authorities, the subsidy amount would be released, officials said. The subsidy rate of ₹ 5 per litre of milk is applicable from August 1. The state produces an excess milk production of about 10 lakh litres. This includes milk powder production and entails a daily subsidy of ₹ 50 lakh.



With 4.9 GW installed, India second largest solar market in H1: Mercom report

India installed 4.9 GW of solar power, consolidating its position as the second largest solar market in the world, during the first half of calendar year 2018. The country was ranked second, following China during the January-June period, according to a report by Mercom Communications India. India was the fifth-largest solar market in the world for total installations, the study, 'India Solar Market Leader board 1H 2018', said.

There were about 300 utility-scale project developers in the country with projects of at least 5 MW or more in operation. Adani remained the largest project developer in terms of total cumulative installations and top installer in terms of capacity installed through the end of the first half. There are around 70 large-scale project developers with a pipeline of 5 MW or more in India. ReNew Power had the largest project pipeline.

During the period, about 16% of solar installations were in

the rooftop solar sector, standing at 805 MW. Rooftop installations rose by 55% Y-o-Y with cumulative installations totalling nearly 2,410 MW as of June 2018. The top 10 installers made up only 27% of all rooftop projects installed in India, leaving all other rooftop developers with 73% of the share, a reflection of the fragmented nature of the market, it said.

Sterling and Wilson was the top engineering, procurement and construction company cumulatively and during the first half. Tata Power Solar had the largest cumulative rooftop portfolio, and CleanMax emerged as the top rooftop installer in 1H 2018. During the first half, ABB remained at the top of the list in terms of solar inverter shipments to the country, while the top five module suppliers accounted for over 37 % of the market. As of June end, Trina Solar was the leading module supplier to India in terms of cumulative shipments while ZnShine was the top supplier.

Funds to be credited to irrigation devp corporations

All the irrigation projects under the Prime Minister Krishi Sinchai Yojana (PMKSY) for which funds would be provided by the Centre-NABARD, it would be directly credited to the state's irrigation development corporations. The decision was taken in the Cabinet meeting with the objective to curtail the procedural delays. The decision would also put the 26 irrigation projects under PMKSY and 91 projects in drought districts of Vidarbha, Marathwada and parts of North Maharashtra on fast track. The state government has conveyed its decision to the Centre and NABARD. There are five major corporations under which projects are executed regionwise. They are Vidarbha Irrigation Development Corporation, Godavari Marathwada Irrigation Development Corporation, Tapi Irrigation Development Corporation, Maharashtra Krishna Development Corporation and Konkan Irrigation Development Corporation.

Under the PMKSY, 26 irrigation projects are to be expedited between 2016-17 to 2019-20. The Centre has provided ₹ 3,830 crore. Apart from this the loan of ₹ 12,773 crore has been approved by NABARD for a tenure of 15 years with interest rate at 6%. The direct funds to corporations will also apply to 112 irrigation projects in Vidarbha, Marathwada and parts of North Maharashtra which are prone to farmers' suicides. The funds for these projects would be shared by the Centre and state in ratio of 25:75. Under this scheme 91 projects worth ₹ 3,831.42 crore will be received from the Centre. NABARD will provide ₹ 11,494.24 crore. It includes 86 irrigation projects from Vidarbha and Marathwada, three in North Maharashtra, and two in Western Maharashtra. The completion of these projects will create irrigation potential 3.76 lakh hectares.

Centre's nod for ₹ 7,522 cr. fisheries fund

The Centre has set up a ₹ 7,522/- crore fund to create infrastructure facilities for the fisheries sector and help boost annual fish production to 20 million tonnes by 2022-23 from the current production of 11.4 million tonnes. The establishment of the Fisheries and Aquaculture Infrastructure Development Fund (FIDF) was approved by the Cabinet Committee on Economic Affairs, said an official statement. Entrepreneurs, fishermen, cooperatives will get loans at subsidised interest rate and two years moratorium on repayment of principal amount. The credit facilities will help attract investment in fisheries development, boost fish production by 67% in next four years, the government said.

Loan lending will be over a period of five years till 2022-23 and maximum repayment will be over a period of 12 years, inclusive of a moratorium of two years on repayment of principal.

The credit from the fund will help generate over 9.40 lakh direct and indirect employment of fishermen and others in fishing and allied activities, he said. There are about 1.5 crore people engaged in the fisheries sector. NABARD, NCDC and all scheduled banks are the designated NLEs in disbursement of the fund. The department of animal husbandry will frame guidelines, likely in next three months, to operationalise the



fund during which the interest rate will be decided, the official said. However, sources said the lending might be kept at 6% rate of interest as done in the NABARD-operated dairy sector fund. While NABARD may be allowed to disburse to state governments and scheduled banks, the cooperatives will be allowed to avail the funding through the NCDC. Individuals and private entrepreneurs will have to approach banks and state governments to avail the loan under the

CropIn Technology to expand digitisation drive

Encouraged with the success of its pilot project, CropIn Technology Solutions is all set to digitise details of another 20,000 farmer beneficiaries in 200 drought and flood-prone villages of Madhya Pradesh and Bihar next year. CropIn, a Bengaluru-based agtech startup had, in 2017, digitised 20,000 farmers' data in the two States to empower them in the World Bank-funded climate resilience project. Seventy per cent of these farmers are women. The platform aims to digitise two crore farmers in the world in the next five years, he said, adding the startup has so far digitised 265 crops and 3,500 crop varieties globally. The 20,000 farmer beneficiaries in India under the World Bank-supported project are from 200 villages in the flood-prone Madhubani district of Bihar and the drought-prone districts of Sheopur and Mandla, and Gaya (Bihar).

Data-driven farming

CropIn enables data-driven farming by connecting the different players in the agro-ecosystem, including companies working in seed production, agri-input, banking, insurance, government bodies, and development agencies. It operates in 29 countries, mostly emerging markets, and has digitised over 31 lakh acres of farmland, impacting the lives of nearly 16 lakh farmers globally. The Karnataka Government has partnered with CropIn to adopt data-driven farming solutions in 30 districts, he said.

Changing trends in weather parameters have a significant impact on agriculture, thereby affecting food security, terrestrial ecosystems, economy, human health and social life. To ensure sustainability of farming, the Food and Agriculture Organization (FAO) had advocated building climate resilience practices empowering farmers to respond to climate extremities.

The Union Ministry of Rural Development (MoRD), supported

Maharashtra deregulates all agri-produce from APMC Act

The Maharashtra government has promulgated an ordinance deregulating all agricultural produce from the APMC Act. This means farmers can now sell all agri-commodities outside regulated APMC markets in the state.

FIDF, the sources said. Listing out the benefits, the government said this fund would help in creation of fisheries infrastructure facilities both in marine and inland fisheries sectors. The government aims to achieve a sustainable growth of 8-9% between 2020 and 2023. Under the Blue Revolution programme, the government had targetted 15 million tonne fish production by 2020.

by the World Bank, initiated the Sustainable Livelihoods and Adaptation to Climate Change (SLACC) Project, implemented the pilot project in Madhya Pradesh and Bihar, in partnership with National Rural Livelihoods Project (NRLP) and supported by the State Rural Livelihood Missions (SRLM).

For this project, CropIn provided its climate-smart, weather-based agro advisory module to SLACC to help farmers adapt to climate change. Through this module, CropIn digitised over 90,000 farm plots and helped farmers build sustainability and boost productivity over the last 18 months. The module provided season-wise crop configurations for all the major crops as well as weather-based advisory to SLACC farmers in their local dialect. It encouraged farmers to achieve optimal harvests amid extreme weather by providing end-to-end advisories on farming, from choosing the right crop to identifying the time for harvest. Making traditional farmers adapt to technology-based advisories was the biggest challenge faced by SLACC. The project empowered over 200 SRLM-appointed locally-trained village resource professionals, equipped with mobile apps, to disseminate information among farmers. With an advisory adoption rate of 90% and query/issue resolution rate of over 92%, these farmers were able to boost their productivity by 20%. Through this initiative, smallholder and marginal farmers also saved on consultancy/advisory costs.

The Crop in platform has been validated and recommended by the World Bank as a model project for other districts to follow, Prasad said, adding talks are on with the two State governments in this regard. A 2017 climate study report stated that for every one degree centigrade rise in temperature, crop yield decreases by 3% to 5%. The mean temperature in India is expected to increase by 0.4° to 2.0°C in the Kharif (monsoon) season and 1.1° to 4.5°C in the Rabi (winter) season by 2070.

In July 2016, the state government amended the Act to deregulate vegetables and fruits. Now, flowers, oilseeds and foodgrains have also been taken out of the purview of the APMC Act. The ordinance comes into immediate effect,



dismissing reports that this could impact the revenue of market committees. The changes have been made in accordance with the Centre's Model Agricultural Produce and Livestock Market Act 2017, adding that the scope of the Act in the state has been widened to include promotion and facilitation instead of regulation.

Maharashtra has taken the lead to frame a policy to encourage and grant the status of Markets of National Importance to some of the APMCs in the state. The move aims to strengthen the agricultural marketing system in the state and encourage export and trading among states. If any APMC receives more than 30 % arrivals of the total from two other states then that committee would be declared as

Tamil Nadu begins export of long-shelf, high-quality bananas to Europe

RythuBeema, life insurance scheme for farmers, has been kicked off in Telangana, with the Agriculture, Finance and Power Ministers organising meetings in different parts of the State to give away the policy bonds to the eligible farmers. Beginning August 15, farmers in Tamil Nadu has started the export of long-shelf, high-quality bananas to Europe. Developed with an Italian technology, the first batch of the 'Grand Naine' range of bananas will be exported to Italy and subsequently to other countries in Europe. In continuation of the success of quality banana production, with financial support by Port of Trieste, Italy, a unique post-harvest handling system called 'Cable Way Conveyor' was developed by the Tamil Nadu Agricultural University, Coimbatore, in collaboration with Tamil Nadu Banana Growers Federation. The Cable Way Conveyor will facilitate reduction of the post-harvest loss in handling the banana bunches from the farm to pack-houses, and also avoids human handling and physical drudgery. It is suitable for use in large farms and also for the collective small holdings in transporting the farm inputs as well as the produce. It paves the way for opening up professional banana export from Tamil Nadu and explores business opportunities for India-grown banana varieties such as Grand Naine, Red banana, Ney Poovan and Nendran to the European continent, said a state government press release. This attempt is the first of its kind from India to Europe for the banana crop.

As a part of this pioneering attempt, a Cable Way Conveyor was fabricated and erected in an identified farm at Kudalore of Theni district, and banana bunches were harvested and transported by the conveyor to farm-laid pack-houses; about

APMC of national importance. This means that markets such as Mumbai, Pune, Nashik and Nagpur APMC's may fit into this criterion. Therefore instead of a elected body on the APMCs which is the current case, in such markets a nominated board would come into existence.

Maharashtra has 306 APMCs. If some of the APMCs become MNIs and do away with elected bodies they can grow beyond local markets and can also export produce to over season countries. The APMCs are now monitored by elected bodies that usually end up keeping the local interests in mind and therefore the presence of professionals could change the outlook of the market as well as encourage inter-state trading, a senior officials said.

400 kg of samples were sent by air shipment to the University of Udine, Italy, on an experimental basis and positive results were received of superior shelf life compared with the conventional harvest. In continuation of this, during September 2018, to learn the essential practice of pre and post-harvest requirement for long-duration sea voyage, a Static Inland Simulation Trial was conducted at Chennai by keeping a container fully stuffed with banana packed pallets under climate-controlled atmosphere for three weeks, under the supervision of National Research Centre for Banana, partnering with shipping liner MAERSK and Tamil Nadu Banana Growers' Federation. Subsequently, the first trial shipment for Italy has been now kept ready along with the requisite post harvest protocol, for transshipping the Grand Naine variety of banana harvested from Theni district. This container is to depart from Cochin port on a 24-day sea voyage to reach Port of Trieste. age group of 18 to 59 years will get an insurance cover of ₹5 lakh each. The premium per head has been pegged at ₹2,271. Farmers' unions, however, demand that the upper age limit of 59 years is too low as farmers much older than that practice agriculture in large numbers. The State Government has tied up with the LIC to roll out the scheme. The Government is spending ₹ 1,000 crore towards premium payment on behalf of the farmers. In case of death of the insured farmer, the kin will get the insured sum within ten days of the death. "the RythuBandhu scheme, which provides a financial assistance of ₹ 8,000 to every farmer, and RythuBeema would go a long way in protecting the interests of farmers," the Minister said.

Water ATMs may help in bridging safe water gap

For thousands of communities across India, the process of getting drinking water is now the same as the process of getting cash: they head to an ATM. With 82 crore people who still do not have access to piped water and 70% of water in

the country contaminated by pollutants, the government is increasingly starting to accept small water enterprises such as water ATMs and community purification plants as an alternative solution to the safe drinking water challenge.



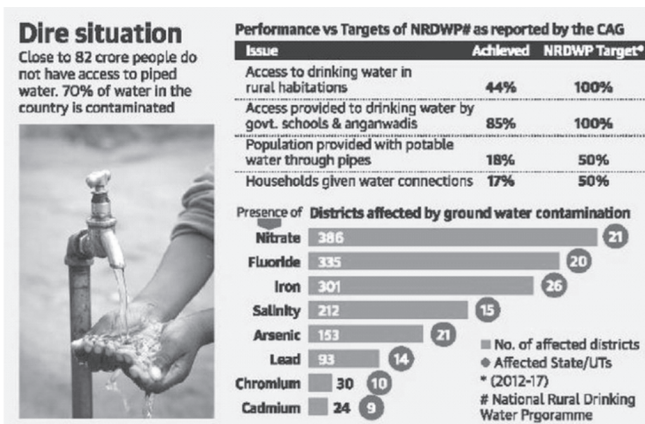
A new report by Safe Water Network (SWN) says the government needs to spend ₹44,000 crore on 2.2 lakh small water enterprises to provide safe drinking water to about 37 crore people, mostly in urban slums where piped water infrastructure is difficult to build, and in rural areas with contaminated water sources. While such enterprises cost only a fraction of piped water infrastructure, policy changes and at least a doubling of tariffs are needed to help them bridge the safe water gap, says the report released this week.

70% contaminated

India is ranked at 120 out of 122 countries on the Water Quality Index, said Niti Aayog, adding that 70% of the country's water supply is contaminated.

The water ATM is a dispensation system, which can be automatic with a coin or smart card, or manual," explained Poonam Sewak, vice president at the SWN. "Essentially, it's a community RO. "Community water purification plants have grown from less than 12,000 in 2014 to almost 50,000 in

2018, according to the SWN, as they have been incorporated into government planning. To reach the government's HarGhar Jal target of 100% piped water by 2030, almost ₹5 lakh crore of infrastructure investment will be required, says government data. SWN estimates that if the government is willing to spend less than 10% of that amount on small water enterprises, it could provide safe drinking water at a fraction of the cost.



Job promotion scheme, 1 lakh units covered, 85 lakh beneficiaries

After a lacklustre initial year, the Pradhan Mantri Rojgar Protsahan Yojana (PMRPY), the Government's flagship scheme to promote job creation launched in August 2016, has picked up momentum. While about 6,600 establishments were covered under the scheme at July-end 2017, the number has since shot up to the current strength of over a lakh. The scheme's beneficiaries were just over 3 lakh one year after its launch, but by March 2018 there was a tenfold jump and the latest figure is 85 lakh. Under PMRPY, the government bears the entire employers' entire contribution (12% of basic pay) towards employees' provident fund (EPF) for workers earning less than Rs 15,000/month during the first three years of employment. Clearly, the scheme gained considerable traction since the

Budget 2018-19 which increased the government's EPF contribution to 12% from 8.33% earlier and extended the scheme to all sectors. The textile sector had availed the 12% scheme (Pradhan Mantri Paridhan Rozgar Protsahan Yojana) even earlier but for other sectors, the government contribution was capped at 8.33%.

In all, the government has spent a total of ₹ 2,404 crore for both the schemes since their launch more than two years ago. For PMRPY, the budget 2018-19 allocated ₹ 1,652 crore. The success of PMRPY schemes lies in its ability to move out of informal work to formal work by providing them with the much needed social security safety net.

Govt approves norms for Operation Greens

The Government approved guidelines for ₹ 500 crore 'Operation Greens' programme to boost production and processing of tomato, onion and potato as part of an objective to check price volatility in these three key kitchen staples.

The programme was announced in the Union Budget 2018-19 with an outlay of ₹500 crore to stabilise the supply and prices of tomato, onion and potato (TOP) crops. "Price volatility of TOP crops wreaks havoc in the households of this country. This is a revolutionary scheme which has evolved after sustained dialogue with all stakeholders and we have

decided the strategy to stabilise prices of TOP crops and to make sure that TOP crops reach all households in the country round the year," Badal said.

The government has laid down special measures and grants-in-aid under the scheme to ensure enhanced production of TOP crops and to augment value chain, she added. The 'Operation Greens' programme was announced to promote farmer producers organisations, agri-logistics, processing facilities and professional management. The major objectives of this programme include enhancing sales realisation of farmers growing these crops by strengthening



production clusters and their FPOs, and linking/connecting them with the market. It also seeks “price stabilisation for producers and consumers by proper production planning in the TOP clusters and introduction of dual use varieties”.

The scheme aims to reduce post-harvest losses by creation of farm gate infrastructure, agro-logistics and storage capacity. It would help increase processing capacities and

value addition. The eligible organisation for availing financial assistance would include State Agriculture and other Marketing Federations, Farmer Producer Organizations (FPO), cooperatives, companies, Self-help groups, food processors, logistic operators, service providers, supply chain operators, retail and wholesale chains and central and state governments and their entities/organisations.

Tripura to give 10,000 cows to farmers via bank loans : CM

Tripura chief minister Biplab Kumar Deb has said that his government will soon launch a project to provide 10,000 cows to 5,000 farmer families through bank loans to generate employment and meet the demand of milk in the state. Under the project, farmers will have to buy cows with the help of bank loans, interest of which will be paid by the state government, “The government will provide 10,000

cows to 5000 farmer families... to help solve unemployment problem to some extent, fulfil the demand of milk and help crushing malnutrition,” the chief minister said. The government will also take measures to procure milk and arrange marketing, he said, adding that the project would be operational by December this year.

Recurring drought: State government makes drip irrigation mandatory

The State government has decided to make drip irrigation mandatory across Maharashtra in an attempt to manage cultivation at a time of recurring drought. The government provides subsidy to farmers who adopt the drip irrigation method and is likely to provide 20% more than the current amount. Now, Rs 800 crore is provided in terms of subsidy. To begin with, all water-intensive crops will have to be shifted under drip irrigation for which the government is bringing low-cost technology that would be affordable by farmers with small and medium land holding.

According to the state economic survey, in 2016-17, the area under drip irrigation was 1.33 lakh hectare and sprinkler irrigation was 45 thousand hectare. The total expenditure on subsidies for drip and sprinkler irrigation was ₹ 575.27 crore. In the current fiscal, the government has allocated ₹800 crore as subsidy for drip and sprinkler irrigation. In 2015-16, the area under drip irrigation was 1.02 lakh hectare and sprinkler irrigation was 33,898 hectare and the expenditure was ₹445.98 crore of the total 355 talukas in the state, drought has been declared in 151 talukas recently.

Groundwater depletion alarming in northwest, central India

With 230 billion metre cube of groundwater drawn out each year for irrigating agriculture lands in India, many parts of the country are experiencing rapid depletion of groundwater. The total estimated groundwater depletion in India is in the range of 122–199 billion metre cube. The Indo-Gangetic Plain, north-western, central and western parts of India account for most intensive ground water-based irrigation. And among these regions, western India and the Indo-Gangetic Plain have more than 90% of the area irrigated using groundwater.

Significant depletion

Based on Central Ground Water Board (CGWB) data of nearly 5,900 wells which have long-term data (1996–2016), a team of researchers led by Vimal Mishra from the Department of Civil Engineering at IIT Gandhinagar found that a majority of districts in India experienced significant depletion in groundwater storage. The satellite data confirms the well data. The results were published in American Geophysical Union’s journal *Earth’s Future*.

While districts with significant decrease in groundwater are

located in the Indo-Gangetic Plain, northwest, and central (Maharashtra) regions, a few districts in Punjab show substantial decline in groundwater table. With depletion occurring at a rate of 91 cm per year, Punjab has been witnessing a steep decline in groundwater table since 1996. “In north-western India, the amount of groundwater extracted exceeds the total recharge leading to groundwater depletion,” says Prof. Mishra. In contrast, some districts in western India, east coast and peninsular India have witnessed an increase in groundwater levels. “If groundwater is depleted and the region experiences drought for two–three years consecutively, there will be serious challenges. Availability of even drinking water will be a huge problem,” says Prof. Mishra. “Natural recharge during monsoon may not help much if groundwater depletion becomes acute, as rainfall of past several years controls the current groundwater storage levels.”

The study published in June this year found that groundwater recharge has declined between 1996 and 2016 in northwest and north central India due a reduction in low-intensity



rainfall. Low-intensity rainfall during the monsoon is responsible for groundwater recharge in northwest and north central India. The study also found that carbon dioxide emission from pumping groundwater and release of carbon dioxide into the atmosphere from the soil when groundwater is depleted is less than 2-7% of the total carbon dioxide emissions in India.

Groundwater management

More than 500 tensiometers to visually monitor soil moisture conditions in rice fields and irrigate the crops only when required were used in five districts in Punjab. Irrigation based

on information provided by the tensiometers helped farmers in the five districts save 10–36% groundwater. Using groundwater to irrigate the field only when necessary led to a reduction in electricity consumption and greenhouse emissions.

According to Prof. Vatta, the instrument is quite accurate in monitoring soil moisture. One device per farm would be sufficient, especially when the terrain is nearly flat. So far, over 22,000 tensiometers, manufactured by Punjab Agriculture University, have been given to rice farmers in Punjab. It costs just ₹300 per piece.

Soybean output may go up to 110 lakh tonne on high acreage

The country's soybean output is likely to touch 105 -110 lakh tonne due to an increase in acreage in addition to conducive weather conditions, industry associations said. For the current season, the association estimates the production to touch 105 lakh tonne to 110 lakh tonne. The Minimum Support Price (MSP) for soybean has been fixed by the government at ₹3,390 per quintal.

DN Pathak, executive director, Soybean Processors Association of India (SOPA) said that crop is likely to touch 110-115 lakh tonnes since the area under cultivation has increased. "SOPA in its first survey of soybean crop for 2018-19 season has estimated the total area under soybean for the year 2018 at 108.396 lakh ha. The area has increased by 6.83 lakh ha (6.7%) as compared to previous year," he said.

As per SOPA estimates, the area under cultivation in

Maharashtra is 36.390 lakh ha which is 10% less than the government estimates of 40.433 lakh ha. Similarly the actual area in Rajasthan is 9.212 lakh ha as compared to 10.112 lakh ha given by the government. The area in Madhya Pradesh has however, increased to 54.100 lakh ha in 2018 as against 50.100 lakh ha in 2017. The average yield here is expected to touch 1,094 kg per ha from 838 kg per ha in 2017. Similarly in Telangana, the area for 2018 is 1.791 lakh ha. In 2017 it was 1.652 lakh ha and the expected yield is 877 kg per ha in 2018 as against 638 kg per ha. In Karnataka, the area has gone up from 2.710 lakh ha in 2017 to 3.190 lakh ha in 2018. It is likely to result in a production of 911 kg per ha in 2018 from 640 kg per ha. The average yield for the year 2018 is estimated as 1059 kg/ha as against 823 kg/ha during the year 2017.

Govt launches credit scheme for cooperative startups

Agriculture Minister Radha Mohan Singh announced the launch of a scheme that aims to provide cheaper loans to startups in the cooperative sector and those having innovative projects costing up to ₹ 3 crore. The 'Cooperative Enterprise Support and Innovation Scheme' will be implemented by the National Cooperative Development Corporation (NCDC) and will be linked to its Cooperative Startup and Innovation Fund (CSIF) that has an annual corpus of ₹ 100 crore. "The new scheme aims to encourage newly formed cooperatives to take advantage of innovative ventures, especially by societies having new and innovative ideas," Singh said after inaugurating the 65th All India Cooperative Week organised by the National Cooperative Union of India (NCUI). Cooperatives operating for at least for one year and having a positive net worth are eligible to avail

credit under the scheme for new and innovative project ideas, he said.

The project cost should not exceed ₹ 3 crore and there will be two years moratorium on payment of principal amount, he said, adding that the period of moratorium may vary depending on type of project and ability to generate revenue. As an incentive, the minister said the credit will be provided at 2% less than the applicable interest rate on term loan for the project activities. The interest rate incentive would be applicable only for timely repayers. The scheme would be liberal to cooperatives in the north eastern region, those registered and operating in 'aspirational districts' identified by think-tank Niti Aayog as well as cooperatives which have 100% women and SC/ST members.

NCDC has sanctioned ₹ 12,965 crore loans till November 13 of the current fiscal.

While emphasising on the role of cooperatives in achieving the government's target of doubling farmers income by 2022, the minister called upon all 8 lakh cooperatives to

focus on improving their governance and efficiency by computerisation. Solar-powered crop drying technology to help farmers. Farmers in Odisha will soon have a handy tool



to bring down quantitative and qualitative losses caused by high moisture content during post-harvest operation.

An innovative drying technology, Solar Bubble Dryer, developed jointly by International Rice Research Institute, Philippines; Grainpro, a leading post-harvest solution providing company; and University of Hohenheim, Germany, was introduced to farmers. Krishi Vigyan Kendra Khordha, affiliated to the Indian Council of Agricultural Research Central Institute of Freshwater Aquaculture, held a demonstration of the technology which is claimed to dry up crop at minimal cost. "The SBD is a low-cost drying technology that aims to provide a simple and flexible alternative to sun-drying, while protecting from spillage, animals, weather and vehicles running over the grains," said

P.N. Ananth, Director, KVK. Dr. Ananth said the technology was demonstrated for the first time in Odisha by IRRI, Philippines.

"The quantitative loss in traditional sun-drying method is estimated to be in the range of 15 to 30% between harvesting and milling. Due to quality loss, farmer do not get proper price of their produce," said Martin Gummert, an IRRI scientist. After harvesting, moisture content in paddy is found between 20 to 24% and it needs to be brought down to below 14% in order to protect the stock from insect attack and fungus formation, he said. The new technology has been developed in such a way that farmers can dismantle the machinery and reassemble it on their own. Power can be drawn both from solar energy and traditional electricity.

Sonalika Tractors to offer customized crop residue management to farmers

Pune-based Sonalika Tractors has partnered with Italy's farm machinery & Baler manufacturer, Cicoria to offer crop residue management in India. Sonalika Tractors will address growing concerns of crop residue management in the country in association with Cicoria by offering customized balers for efficient and quality solutions to farmers, the company said in a statement. "We have partnered with

Cicoria for introducing customized and specialized balers for baling in toughest paddy straw and sugar cane trash. These balers are globally known for their quality performance, reliability and ease of use," Mittal said. The partnership is specially targeted towards the current environmental issues being faced by Indian farming community.

Making farmers do wonders with this grass

Vetiver, 'the wonder grass' of Tamil Nadu, which has a wide range of applications in the pharma and cosmetic industries, besides anti-soil erosion properties, is spreading roots in the State. The grass, which grows up to five feet and whose fragrant root reaches up to 10 feet, has huge global demand in the aromatic industry. The grass is popular for its quality to combat soil erosion and absorb carbon dioxide, thus erasing carbon footprints. In the last few years, niche products have been created with vetiver by value addition. Vetiver is ideal for the long coastline, as it is suited for sandy soil, says C.K. Ashok Kumar of the India Vetiver Network, which is involved in popularising cultivation in association with Tamil Nadu Agricultural University.

"It is easy to harvest this crop, which fetches very high returns. The vast coastline can be utilised to raise vetiver in a big way," says Mr. Ashok, who has been encouraging youngsters, especially those in fishing hamlets, to turn agripreneurs. The grass can be used to purify polluted water bodies, especially temple tanks, and to arrest soil erosion in

ghat sections, especially in Kerala and Kodaikanal. The grass is now a favourite among inland farmers as well. The yield is low, compared to coastal areas, but the quality of grass is high, says C. Pandian, who grows vetiver on a 10-acre farm in Kuruvadipatti village of Sivaganga district. Against a yield of two to 2.5 tonnes per acre in coastal areas, inland farmers get 1.5 lakh tonnes. Essential oil recovery is 0.8% in coastal grass and 1.49% in inland grass. One kg of essential oil fetches between ₹30,000 and ₹58,000.

One kg of vetiver yields 300 grams of oil and it is possible to realise over ₹1.5 lakh per acre, excluding all expenses, over a period of 10 months, says Mr. Pandian. Its moisture retention property makes vetiver a natural choice for soil conservation and replenishment of ground water. It is ideal for dry land cultivation using organic farming practices, says Mr. Pandian. It is also used in ethanol extraction, as cattle feed and for making handicrafts. Another quality of vetiver is that it is an anti-depressant.

Govt allows ethanol extraction for blending from foodgrains, too

The Centre has extended the ambit of the Ethanol Blended Petrol (EBP) programme to extract the fuel from surplus quantities of maize, jawar, bajra and fruit/vegetable waste. This decision will be applicable for procurement for

the ethanol supply year 2018-19. Till now, only excess sugarcane production was allowed to be converted into ethanol for procurement under the fuel blending programme. An official statement said the decision will



benefit farmers by enabling them to make additional money from surplus production and broaden the sources for producing ethanol for the EBP programme.

“The National Policy on Biofuels 2018 has empowered the National Biofuel Coordination Committee (NBCC) to allow conversion of surplus quantities of foodgrains for production of ethanol during an agriculture crop year when there is projected oversupply of foodgrains as anticipated by the Ministry of Agriculture and Farmers Welfare,” the statement said. According to the Ministry of Petroleum and Natural Gas, the Department of Agriculture, Cooperation and Farmers Welfare (DAC&FW), under the Ministry of Agriculture and Farmers Welfare, has provided the projection of surplus quantities of foodgrains for production of ethanol under the EBP programme for the ethanol supply year 2018-2019 (December 1, 2018 to November 30, 2019). “The matter was taken up during the first meeting of the NBCC on November 14, which has approved the procurement of ethanol produced from surplus quantities of maize, jawar and bajra, as projected by the Ministry of Agriculture and Farmers

Welfare, for the EBP programme for the ethanol supply year 2018-2019,”. “The NBCC has also approved the proposal to produce ethanol from other feedstock such as fruit and vegetable wastes for the EBP programme,” the statement added.

Target for OMCs

Under the EBP programme, the Centre has asked the oil marketing companies (OMCs) to target 10 per cent blending of ethanol with petrol by 2022. However, there is a major shortfall in the availability of ethanol as sugar mills currently tap only ‘C-heavy’ molasses for ethanol production.

According to data compiled by the Indian Sugar Mills Association, the nationwide average for ethanol blending stood at 4.02 per cent as on October 1. Keeping this in mind, the government earlier this year came out with a modified biofuels policy which incentivised sugar mills that tap ‘B-heavy’ molasses and cane juice for producing ethanol. This, would also address the issue of the glut in sugar production in the country in bumper sugarcane production years.

NCDC launches scheme to promote young entrepreneurs

National Cooperative Development Corporation (NCDC) has created ₹1000 crore Cooperative Startup and Innovative Fund and has accordingly launched a scheme for encouraging cooperative start-ups and business ventures with innovative ideas in agriculture and allied sectors. The heavily incentivized scheme has a component of subsidy, as well as interest subvention. Cooperatives registered even one year ago will be eligible to avail the scheme.

Launching the scheme at the inaugural function of the 65th All India Cooperative Week at NCUI headquarter in New Delhi. Union Minister for Agriculture and Farmers Welfare Radha Mohan Singh said NCDC has created a dedicated fund with liberal features to enable youth to avail the scheme. “The newly launched scheme – Cooperative Enterprise Support and Innovation Scheme – will be linked to the new

fund will encourage cooperatives to venture into new and innovative areas,” he said.

The funding of a project under the scheme will be up to 80% of the project cost for special category of people from north-eastern region, aspirational districts and cooperatives with women or Scheduled Castes or Scheduled Tribes or people with Disabilities. For general category, the funding will be up to 70% of the project cost. Other than the subsidy, the scheme envisages 2% interest subvention on the term loan for the project cost up to ₹3 crore including 2 years moratorium on payment of principal. Another incentive is that all cooperatives in operation for at least one year, rather than three years shall be eligible to avail loan under the scheme.



Centre to Study Karnataka's agri-dashboard model to ensure timely market intervention

The Centre has decided to study Karnataka's latest agri-dashboard model that indicates if mandi prices of crops are ruling below the minimum support price (MSP), so that the government can make timely intervention to protect interest of farmers, a senior state government official said.

The agri-price analysis dashboard, which the Karnataka government launched in July known as KRIPA, provides analysis of whether spot prices are ruling below MSP and also forecasts rates for next three months.

"In a meeting with the Union Agriculture Ministry officials Wednesday, our dashboard was discussed in detail. The centre has in-principally agreed to study it and see if it can pursue with other states to implement," agri-price advisory body Karnataka Agricultural Prices Commission Chairman T N Prakash Kammardi told reporters here.

The dashboard provides prices prevailing in 176 APMC mandis in Karnataka, the arrival and sale of crops as per

varieties among other details on a daily basis, he said. "Based on this data, the government can quickly decide whether it has to intervene in the market immediately and start procurement at the MSP and save farmers from distressed sale," he added.

Recently, the state government had submitted a proposal before the central government for timely procurement of green gram at MSP based on this data. Declaring MSP alone is not important, it is necessary to ensure farmers get it. There is a strong mechanism to buy wheat and rice in the country. The dashboard will help to ensure MSP to farmers for other crops, he added.

The state official said that the Centre's recently approved market assurance scheme, price deficiency payment and private procurement will go a long way in ensuring MSP to farmers.

NITI Aayog proposes cashback facility under PMFBY

To make its flagship crop insurance scheme more attractive, the government is considering a proposal by the NITI Aayog to return 75% of the premium paid by the farmers enrolled under the Pradhan Mantri Fasal Bima Yojana (PMFBY) if they don't file claims for crop damages for four-six consecutive seasons.

Officials reckon that such a move would attract more farmers into the insurance fold. Only 29% of the 12 crore farmers/cultivators in the country have crop insurance cover at present. However, the proposed change in the scheme may not find favour among insurers. The officials are of the view that insurers are estimated to have made a surplus of nearly ₹ 10,000 crore (including operational costs) in the past two kharif seasons.

In kharif 2016, insurance companies collected ₹16,276 crore premium under PMFBY while the claims paid were ₹10,425 crore, resulting an estimated surplus of ₹5,851 crore. In kharif 2017, the difference between premium collected and paid was ₹4,077 crore. Since the burden on farmers is only 2% of the sum insured, no claim bonus is needed, an insurance company executive said. The premium for kharif is

12% of the sum insured with 5% each borne by the Centre and the state concerned.

One complaint about the scheme is that a farmer is not able to receive compensation if the entire village's/panchayat's crop is not damaged. So the incentive could encourage more farmers to seek the cover.

The coverage of farmers under PMFBY came down from 4.02 crore in kharif 2016 to 3.46 crore in kharif 2017, partly due to disinterest among a section of farmers but also for farm loan waivers implemented by six states in FY18. Loanee farmers are covered under PMFBY. "Insurers have also not brought any new product for farmers based on their region and requirement," the official said. Now products are at the panchayat level, they need to bring individual farmer or village -level products, he added. Given the vagaries of nature that hit farming in India, the Centre recently changed norms to allow states to appoint insurers for a period of three years instead of one year, to ensure that insurers don't pick only good years for providing cover and leave out bad crop years.

RBI to provide 2% interest subvention on crop loans

To provide relief to farmers availing short-term crop loans and those affected by natural calamities, the RBI said an interest subvention of 2% per annum will be made available to banks for the first year on the restructured loan amount.

Such restructured loans will attract normal rate of interest from the second year onwards, the RBI said in its updated 'Master Directions on Relief Measures by Banks in Areas affected by Natural Calamities'. While the rate of interest will



be in accordance with the Master Directions on Interest Rate on Loans and Advances, the RBI said within the area of their discretion, banks shall take a sympathetic view of the difficulties of the borrowers, and extend a concessional treatment to calamity-affected people.

In respect of default in current dues, no penal interest will be charged. Banks will also suitably defer the compounding of interest charges.

Banks will not levy penal interest and consider waiving penal interest, if any, already charged in regard to the loans converted/rescheduled. Depending on the nature and severity of the natural calamity, the State Level Bankers' Committee (SLBC)/ District Credit Committee (DCC) will take a view on the interest rate concession that could be

extended to borrowers so that there is uniformity in approach among banks in providing relief.

The RBI said that under the Prime Minister's Fasal Bima Yojana (PMFBY), all Seasonal Agricultural Operations (SAO) loans for notified crops in notified areas are to be compulsorily provided insurance cover for all stages of the crop cycle, including post-harvest risks in specified instances.

Farmers' details are required to be entered by banks in the unified portal for crop insurance to facilitate assessment of coverage of crops insured, and premiums deducted, among others.

IARI breeds nutrient-rich hybrid maize

Cereal grains are high in carbohydrates (65-75%) and low in protein (7-12%). Even their proteins are deficient in essential amino acids such as lysine and tryptophan, which the human body cannot synthesise and have to be supplied through diets.

The Indian Agricultural Research Institute (IARI) has bred a hybrid maize — Pusa Vivek QPM 9 Improved that is claimed to be the world's first ever rich in lysine and tryptophan as well as pro-vitamin A. Normal maize kernels have 8-10% protein and, within that, 1.5-2.5% lysine and 0.3-0.4% tryptophan. Pro-vitamin A content, too, is only 1-2 parts per million (ppm).

The new maize hybrid has 2.67% lysine and 0.74% tryptophan in the protein, besides 8.15 parts ppm of pro-vitamin A. "The original hybrid (Vivek 9) was developed by the ICAR-Vivekananda Parvatiya Krishi Anusandhan Sansthan at

Almora, Uttarakhand. The improved version incorporates an Opaque-2 gene that enhances lysine and tryptophan content, and another gene crtRB1, which results in higher levels of carotenoids (beta-carotene, alpha-carotene and beta-cryptoxanthin) that convert into vitamin A in the body. Normal maize has more of lutein and zeaxanthin, which are carotenoids that cannot convert into vitamin A," explained Firoz Hossain, senior scientist (maize genetics and breeding), IARI.

It has been mainly developed for J&K, Himachal Pradesh, Uttarakhand and the North-East states, with 93-95 days maturity and average and potential yield of 5.6 and 8 tonnes per hectare, respectively. It is also suited for growing in the southern states and Maharashtra, where the average and potential yields are higher (5.9 and 9.4 tonnes) with only 83-85 days duration.

Precision farming is a game-changer

All these have meant that farmers spend more than what they should when it comes to input cost and end up with lower than potential yield. This coupled with dependence on unpredictable monsoons has made agriculture, the riskiest business in India. But it does not have to be. Precision farming is one where all critical decisions taken on the field by farmers is based on data and technology that interprets the data for them to make a value judgement. Some enterprising farmers have even gone to the extent of deploying Blockchain technology to interpret the volumes of data they have generated from their fields kick-starting what is come to be called 'digital farming'.

By taking up precision farming farmers bring in a measure of accuracy in everything they do. Tractors fitted with sensors are available to help them till the land to the exact depth that

the crop needs. They can divide their fields into various quadrants and test them for NPK and other nutrients. Today even satellite imagery can be used to identify nutrient level in the soil. Remedial actions can be taken based on need. Also, the crop can be watered by measuring soil moisture using sensors and using drip irrigation to deliver the right quantum of water. Sensors come in handy to spot pest attacks accurately. Satellite images can also be used to determine the density of growth and identify sections of the field where growth is poor. Fertilisers/pesticides can be applied only in those areas using the drip infrastructure. And harvesting can be done after ascertaining the crop maturity.

Benefits of precision farming are significant. It reduces input costs by 18-20% and enhances yield by anywhere between 30% (rice and wheat) and 100% (sugarcane, fruits and



vegetables). If such benefits are ignored, the only way to double farmers income is by raising crop prices to unsustainable levels.

The cost factor

Yes, precision farming comes at a cost — ₹2 lakh per hectare. Also, adapting technology for typical small Indian farms and illiterate farmers is a challenge too. But models are already available to deal with these issues. Farmers with small land holdings are already hiring tractors and other farm equipment, instead of buying them, from custom hiring centres in various States or from other private initiatives like Mahindra group's Tringo App or TAFE's J-Farm Services

platform to name a few. This network can also be used to offer precision farming related services on a pay per use basis. The government, for its part, should re-orient subsidies away from products to technology based farming. It must also enhance capacity building, especially among extension workers, to teach precision farming to the farmers. Markets need to be developed to absorb the additional output that will come with special emphasis on value addition through processing of the produce. Otherwise, the benefits of precision farming will be lost due to low prices. Finally, precision farming makes agriculture less risky and more engaging which will draw youngsters into the profession. It is also a good way to ensure India's food security.

TAFE rolls out tractor, farm equipment rental app

Tractors and Farm Equipment (TAFE), India's second-largest tractor manufacturer, announced the national roll-out of 'JFarm Services' and the 'JFarm Services App', which will bring the benefits of the technology-enabled sharing economy to boost the income of the country's farmers.

JFarm Services facilitates the hiring of tractors and modern farm machinery to farmers free of cost. Farmers looking to rent their existing tractors and farm equipment are linked directly to farmers seeking to hire them through the free of cost 'Farmer-to-Farmer' (F2F) model of the JFarm Services app, which enables them to contact farmer entrepreneurs, negotiate rental prices and fulfill their respective requirements. In a press release here, TAFE said despite nearly 65% Indians working in the farm sector, India's agricultural yields trail global and emerging market averages. More than 20 crore Indian farmers have little or no access to

mechanised tools. Any effort to bring about a paradigm shift in productivity and farm income has to be centred on small farmers, who account for 86% of India's farmland holding.

The JFarm Services App and on-ground custom hiring centres, which are operated by tractor and equipment owners, will provide farmers with affordable farm mechanisation services in a transparent manner. With JFarm Services' tremendous early success, TAFE is collaborating with various state governments such as Bihar, Odisha, Andhra Pradesh, Karnataka, Tamil Nadu and Assam to roll out the JFarm Services platform. JFarm Services' initial pilot roll-out covers Madhya Pradesh, Rajasthan, Gujarat and Uttar Pradesh, directly benefitting around 60,000 users resulting in over 100,000 orders, adding up to about 250,000 hours in hired farm machinery usage.

Tapping the N-E's organic farming potential

India's North-East, comprising eight States, is largely unspoilt by modern agricultural practices, which involve heavy use of agro-chemicals and chemical fertilisers. For this precise reason, the region is a natural choice for promoting organic farming in the country. Sikkim, the first organic State in India, has already shown the way for the other States in the region.

According to the estimates available with the Agricultural and Processed Food Products Export Development Authority (APEDA), as of 2017-18, nearly 90,500 hectares of land in the NE region is already under organic cultivation. Even though Sikkim accounts for more than three-fourths of this, other States such as Meghalaya and Assam have shown tremendous progress in embracing organic farming. As per the available statistics, another 77,600 ha. is in the process of switching over to organic cultivation. The conversion process normally takes three years.

Huge potential

Considering that there is nearly 5.5 million hectares of cultivated land available in the North-East, organic farming barely covers 3% of arable land. Studies by experts like Ghosh have been instrumental in the Central government coming up with a strategy to promote organic farming in the region. About three years ago, the Agriculture Ministry launched a scheme called Mission Organic Value Chain Development for North Eastern Region (MOVCDNER) which aimed at developing certified organic production in a value chain mode to link growers to consumers in other parts of the country and overseas. The idea behind the ₹400 crore, three-year mission was to develop a holistic organic farming ecosystem starting from inputs, seeds, certification and creation of facilities, aggregation, processing and marketing.

According to official data, MOVCDNER has helped bring an



area of 45,920 ha under organic cultivation as against the targeted 50,000 ha, mobilised 48,950 farmers, created 97 farmer-producer companies and 2,469 farmer interest groups. Considering that the size of landholdings is small, a cluster model of organic cultivation is promoted under MOVCDNER. "Each cluster comprises of many farmers

Oilseed farmers to get direct assistance of ₹ 3k-5k per hectare

After failing to achieve the targeted oilseeds production last year, the Centre has decided to provide direct assistance worth ₹ 3,000-5,000 per hectare to farmers who take up any oilseed crop as an intercropping model, so that the country's dependence on imports of edible oil is reduced. The assistance will be in the form of agriculture inputs like seeds, fertilisers and pesticides. The sops being planned are similar to those given to pulses farmers in the last two years.

The demand and supply gap in edible oils is huge as India imports about 60% of its edible oil requirement, mainly palm and soyabean oils. In 2016-17, 14.01 million tonne of oils worth Rs 73,048 crore were imported. Given the rising imports, the government had fixed 35.5 million tonne of

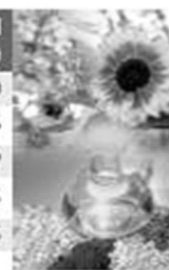
whose combined landholding is 20 hectares or more," says Mannu Choudhary, MD of Kolkata-based Prakriti Organic Farm Fresh India, who has been involved in setting up 75 such clusters in Meghalaya. His team is currently in the process of establishing 25 such clusters in Arunachal Pradesh.

oilseeds production in the 2017-18 crop year (July-June). But the production is estimated at 31.3 million tonne (mt) for 2017-18, nearly the same as the previous year.

Targets

| | Area (million ha) | Production (million tonne) | Yield (kg/ha) |
|----------|----------------------|-------------------------------|------------------|
| 2017-18* | 24.65 | 31.31 | 1,270 |
| 2018-19 | 28.50 | 38.00 | 1,335 |
| 2019-20 | 29.41 | 40.50 | 1,379 |
| 2020-21 | 30.30 | 43.10 | 1,423 |
| 2021-22 | 31.20 | 45.65 | 1,463 |

*Actual estimated output



With Small Farmers on Mind, M&M looks at Sub - ₹ 2 lakh Tractor

Mahindra & Mahindra is working on a new tractor that costs less than ₹2 lakh, which the company hopes will encourage small and marginal farmers shift to mechanised farming and open a huge market for it.

As much as 90% of India's small and marginal farmers — those with up to 5 acres of land — are estimated to be still using manual farming methods, which are labour intensive and weigh on their returns. For them, a tractor, one of the most basic components in mechanised farming, is often unaffordable. Mahindra is seeking to target this segment of

farmers with a tractor under its Trakstar range. It will cost about half a conventional tractor that starts around ₹3-4 lakh.

The company expects the product to also help it expand the Trakstar brand, which it had designed to help achieve its India market-share target of 50%. Mahindra, which sold 3,17,531 units in fiscal 2018, has a 43% share in the Indian tractor industry, after gaining 3 percentage points in as many years.

Farm exports rise 5% in April-August

Farm product exports continued to grow during the first five months of this fiscal on strong overseas demand for products such as basmati rice and buffalo meat, among others. Total farm exports during April-August this year touched \$7.7 billion, a growth of 5% over the corresponding period last year. In rupee value terms, the growth for the period was 10.28% at ₹51,913 crore (₹47,076 crore in the corresponding period last year), according to the Agricultural and Processed Exports Development Authority (APEDA).

Shipments of basmati rice, the largest product in India's farm export basket, topped \$2 billion for the period, registering a 8.7% growth. However, the increase in volumes was marginal as shipments stood at 1.85 million tonnes (1.84 mt). The growth in export value is on account of higher unit pricing at \$1,088 per tonne (\$1,005 per tonne). Basmati rice

accounts for a 26.3% share of India's total exports. Iran was the largest buyer, accounting for 36% of the shipments in April-August, followed by Saudi Arabia and Iraq.

Volumes down

Similarly, a higher per unit realisation has helped push up exports of buffalo meat in value. Volumes were down at 4.99 lakh tonnes (5.03 lakh tonnes). Buffalo meat is the second largest product in India's farm export basket, accounting for 20% of the export earnings. Vietnam, the largest buyer of India's buffalo meat, accounted for over half (50.6%) of the exports during the period, followed by Malaysia and Indonesia.

China, the largest buyer of rice, has opened up its market for Indian non-basmati rice and the first shipment was made last week from Nagpur. Exports of other products that have done



well during the period include pulses, processed vegetables, guar gum, groundnut and dairy products. Shipments of pulses have more than doubled in volumes during the period to 1.44 lakh tonnes (66,687 tonnes). In value, pulses exports increased by 30% to \$131 million.

Dairy products

Dairy product exports have also grown, both in volumes and

value, during the period. Their volumes crossed 50,000 tonnes (39,102 tonnes). In value terms, it stood at ₹957 crore. Though groundnut exports have increased in volumes to 2.01 lakh tonnes (1.57 lakh tonnes), the growth in value at \$194 million (\$184 million) has not kept pace. The oilseed has suffered a decline to \$962 per tonne (\$1,167/tonne in the corresponding period last year).

Key to boost nitrogen efficiency in rice found

For generations, the efficient use of fertiliser nitrogen content by plants has been limited due to various challenges. Now, in a significant finding, Indian researchers have identified the key to breaking this barrier in the rice crop. They have found some easily identifiable visual features to differentiate high yielding rice cultivars based on 'nitrogen use efficiency' (NUE).

Indian agriculture consumes over 30 million tonnes of chemical fertiliser N per year, but about 70% of it is not utilised by crops and causes pollution of soil, water and air. The immediate implication of the researchers' finding is that the fertiliser NUE could rise from the present 30%. It will have dual benefits—save on input costs and reduce environmental pollution. Nitrogen (N) compounds such as urea and ammonium nitrate are the most predominant and expensive components of chemical fertilisers. Traditionally, to increase crop yields and feed the growing population, farmers have been liberal with their usage of these fertilisers. "We have discovered the phenotype for fertiliser NUE in rice. It is crucial in seed germination and crop duration. It can also be used to screen robust rice cultivars," says the study published in the October 1 edition of the journal *Frontiers of Plant Science* by N Raghuram and Narendra Sharma from the Guru Gobind Singh Indraprastha University, New Delhi.

Orange trees thick with fruit in Kerala

Orange trees are in bloom in the hills of the Maryur range where it is a major fruit crop. Orange trees are largely grown as an inter-crop on the tea estates under the Kanan Devan Hills Plantations (KDHP) in Munnar, Thalayar, and Chatta Munnar in addition to farms in Kanthallur and Vattavada, the cool-season vegetable cultivating villages in the State.

The main varieties cultivated are Jaffa and Sathugudi and the price ranges between ₹50 and ₹60 in the open market. They are organically grown and it is estimated that the area under orange farms in Kanthallur has increased with many farmers turning to hybrid varieties.

Traditional variety

However, the traditional variety of orange grown in

According to the Indian Nitrogen Assessment (2017), co-edited by Raghuram, agriculture accounts for over 70% of all nitrous oxide emission in the Indian environment, out of which 77% is contributed by chemical fertilisers. Nitrous oxide is a greenhouse gas (GHG) that is 300 times more powerful than carbon dioxide. It has replaced methane as the second largest GHG emission from Indian agriculture over the last 15 years.

"As 75% of the market price of urea is subsidised, poor N use efficiency harms recovery of investment worth tens of thousands of crores and instead causes pollution. Drastic reduction in fertiliser usage without improving efficiency adversely impacts crop yields and farmer livelihoods. This is why we must improve the fertiliser nitrogen use efficiency of crops," said Raghuram, who was recently elected the Chair of the International Nitrogen Initiative.

Foodgrain crops account for over 69% of the total consumption of N fertilisers in India with rice topping the list at 37%, followed by wheat (24%). "We expect our findings in rice will also be relevant to other crops, though it needs to be validated. In any case, rice has the least NUE among cereals and is consumed by over half of the world's population," he told.

Kanthallur is the queen of all varieties. It is sweeter and has a long shelf life, though less preferred in the market. Valiyaveetil Chandran, an orange farmer at Kanthallur, said his cultivation includes the traditional variety of orange trees of over 40 years.

Productive

They are highly productive though they have no demand in the market. He said that unexpected rain and changed climatic conditions in June-July affected the growth of flowers and there was a drop in production, especially in the the hybrid varieties.

Compared to the market value, the traditional orange which usually is collected when fallen after fully ripened had



withstood the unfavourable weather conditions. There was not much drop in total production in the traditional variety as

compared to the hybrid varieties of the fruit, he said.

Pomegranate exports likely to run into EU roadblock

With a bumper pomegranate season in full swing, around 85,000 tonne is expected to be exported during 2018-19 season. However, several countries including Europe, Russia, Indonesia and China have imposed stricter Residue Monitoring Plan (RMP) for pomegranate imports from India this year. "The Residue Monitoring Plan (RMP) for grapes in Europe is normally 75 mg per kg but for pomegranates it has been brought down to 2 mg per kg thus making it difficult for pomegranate growers in the country to export the fruit," said Prabhakar Chandane, chairman, Maharashtra Pomegranate Growers Research Association (MPGRA). "We have written to APEDA to intervene and seek concessions from the European Union (EU) for bringing down the limits to 10 mg per kg," Chandane said. The association sought a similar concession last season without success. "Despite drought,

pomegranate production is likely to touch 15 lakh tonne and exports should be around 85000 tonnes," he said. Normally, the export season November every year to Europe.

India however, is looking to make inroads into new export markets such as China, Russia, Indonesia and Saudi Arabia. Last season, around 2 lakh hectare had come under pomegranate cultivation and total production crossed around 20 lakh tonnes. Significantly, a record 51,000 tonne of the fruit was exported to overseas markets including Europe. Normally, the country exports some 20,000 tonne pomegranates. Meanwhile, European markets look saturated with the arrival of pomegranate and grapes from Peru, Chile and South Africa, effectively challenging Indian exports.

Chant Vedic mantra in farms to increase yields: Goa govt to farmers

The Goa government is promoting a novel technique to improve crop yield: asking farmers to chant ancient Vedic mantra. The State government has started advising farmers to adopt 'cosmic farming' in which they need to chant the mantra in the farm for better quality and quantity of crop, an official of the Agriculture Department said. The government has been in talks with institutions like the Shiv Yog Foundation and Brahmakumaris who have expertise in this field.

Agriculture Minister Vijai Sardesai and Agriculture Director Nelson Figueiredo recently visited Guru Shivanand in Gurgaon in Haryana, the promoter of Shiv Yog Krishi, to see how 'cosmic farming' can benefit farmers in Goa, he said. "The Agriculture Department wants to tread the path of organic and eco-friendly farming. It has been holding talks with propagators of cosmic farming and other believers of similar activities, which can increase the farm yield in an organic way," Figueiredo said.

Farmers are being explained importance of 'cosmic farming' under the guidance of Shiv Yog Foundation, he said. "As part of this, a farmer needs to spend at least 20 minutes a day chanting the 'vedic mantra' for 20 days on the farm. The believers of cosmic farming claim that this draws the energy

of universe into the field and helps the seeds to sprout better and gives quality yield", Importance is being given to organic farming practise in Goa so that environmental stress due to use of fertilisers and chemicals reduces, he said.

"The State government is also in touch with Sustainable Yogic Farming project of the rural development wing of the Brahmakumaris, he said. "They (Brahmakumaris) claim that over 1,000 farmers in India are combining organic farming with meditation and it is showing remarkable results," he added. Figueiredo said farmers are also educated on how sustainable yogic farming can result in lower costs and reduce the pressure on environment.

Earlier this year, Sardesai had said the state's paddy yield would increase if its farmers chanted vedic mantra in their fields and adopted "cosmic farming" techniques. "Cosmic farming will give you safe food without any chemicals or fertilisers. Under this type of farming, no chemical is put on paddy and it will be grown with organic manure only,". Claiming that the technique proved beneficial for the farmers, he had said: "The testimonials of the beneficiary farmers make us believe that there is science beyond science and Shiv Yog Krishi may be the future of farming in the country."

A Kannur farmer grows more than 30 pepper varieties

Cultivation of different varieties of black pepper is a passion for this farmer from Ulickal (around 50 km from Kannur) in northern Kerala. Biju Narayanan, who cultivates 33 varieties of pepper, returned to farming 10 years ago after working as

a mechanical engineer for some years.

Speaking to Business Line at his farm at Ulickal in Kannur district recently, he said he has a total of 33 varieties of pepper – both bush pepper and vine pepper -- at his farm at



Kalanki (around 10 km from Ulickal) and in Wayanad district of Kerala put together. His target is to take the total number of varieties to 50 in the next two years, he said.

In his pursuit of collecting different varieties of pepper, he travelled to various pepper-growing locations in Kerala, Karnataka and Tamil Nadu, and also collected varieties from the Indian Institute of Spices Research and the Kerala Agricultural University.

The seven acres farm at Ulickal has become an experimental and demonstration plot for him. Showing the pepper varieties, he said Kumbukkal (which is a farmer's selection) variety and Vijay variety developed by Kerala Agriculture University are most-favoured varieties among farmers. Biju Narayanan, who has a pepper nursery at his Ulickal farm, said that he gets good number of queries from farmers for these two varieties. On the productivity of various varieties, he said Manjamunda variety, one of the 33 varieties he cultivates, gives good productivity. In a normal case, 100 kg of

green berries produce around 33 kg (33%) of dry black pepper in other varieties. However, the yield in Manjamunda variety is around 41 kg of dry pepper, he said.

Experiments

Apart from collecting and cultivating different varieties of pepper, Biju Narayanan also likes experimenting in cultivation methods. He said he has been experimenting the vertical column cultivation method with around eight vine varieties at his Ulickal farm now. Highlighting the advantage of this cultivation model, he said a farmer with a small holding can also get good productivity from his land. He said he is also experimenting with multi-level integrated cropping pattern in his farm at Kalanki to get maximum productivity from the land. For this, he has preferred Kuttiadi variety of coconut (around 40-ft-high) for the first level in his multi-level cropping pattern. This is followed by mangostene plants, and shade-tolerant pepper vines.

Commodity Focus of the Month: Cotton, Groundnut and Sunflower

Cotton, Groundnut and Sunflower carry immense importance for different sectors of the Indian economy. Cotton helps in sustaining the Indian cotton textile industry which provides gainful employment to millions of people engaged in different segments of the value chain, such as plucking, harvesting, marketing, ginning and pressing of cotton. Groundnut and sunflower, being oilseeds, are relatively low-priced source of valuable nutrients.

The trends in area under cultivation of these crops and their total output reveal valuable insights. The total area has declined from 18.14 million hectares in 2013-14 to 17.67 million hectares in 2017-18 (Table 1). Correspondingly, their

combined output has declined from nearly 50 million tonnes in 2013-14 to 42.37 million tonnes in 2017-18 (Table 2). A related worrisome phenomenon is the declining yield of these crops. Although all three crops have witnessed a decline in yield but the decline has been more pronounced for cotton. The yield of groundnut has declined from 1.76 tonnes per hectare in 2013-14 to 1.67 tonnes per hectare in 2017-18, while that of sunflower has reduced from 0.74 tonnes per hectare to 0.69 tonnes per hectare over the same period. For cotton, the decline in yield has been from 3.32 tonnes per hectare in 2013-14 to 2.72 tonnes per hectare in 2017-18.

Table 1: Area under cultivation of Cotton, Groundnut and Sunflower

(Million Hectares)

| | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 | CAGR (%) |
|-----------|---------|---------|---------|---------|---------|----------|
| Cotton \$ | 11.96 | 12.82 | 12.29 | 10.83 | 12.43 | 0.96 |
| Goundnut | 5.51 | 4.77 | 4.60 | 5.34 | 4.91 | -2.84 |
| Sunflower | 0.67 | 0.59 | 0.49 | 0.38 | 0.33 | -16.22 |
| Total | 18.14 | 18.18 | 17.38 | 16.55 | 17.67 | -0.65 |

Source: Price policy for Kharif crops, the marketing season 2018-19, CACP

Table 2: Production of Cotton, Groundnut and Sunflower

(Million tonnes)

| | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 | CAGR (%) |
|-----------|---------|---------|---------|---------|---------|----------|
| Cotton \$ | 11.96 | 12.82 | 12.29 | 10.83 | 12.43 | 0.96 |
| Goundnut | 5.51 | 4.77 | 4.60 | 5.34 | 4.91 | -2.84 |
| Sunflower | 0.67 | 0.59 | 0.49 | 0.38 | 0.33 | -16.22 |
| Total | 18.14 | 18.18 | 17.38 | 16.55 | 17.67 | -0.65 |

\$ Cotton Advisory Board (CAB) estimates of million bales of 170 kgs each

Source: Price Policy for Kharif crops, the marketing season 2018-19, CACP



Cotton

The average wholesale price of cotton during the current agricultural year (ie, July 2018- November 2018) has been higher at ₹ 5422 per quintal, as compared to ₹ 4754 per quintal during agricultural year (AY) 2017-18. This indicates a rise of nearly 14%. One of the primary reasons for this increase in market price is the increase in Minimum Support Price (MSP), from ₹ 4020 per quintal in AY 2017-18 to ₹ 5150 per quintal in AY 2018-19. Coefficient of Variation (CV) is also lower at 1.17% in current AY, as compared to 4.65% in the previous AY.

Policy Issues – Cotton, Groundnut and Sunflower

- The yield of most crops in India is low, as compared to international standards. A further decline, as indicated by the available data, is a cause of concern. Efforts need to be initiated to address this aspect.
- Ensuring remunerative prices for their produce is an essential component of doubling farmers' income. One way to achieve this is fixing a higher MSP, but in many cases, such as that observed for sunflower, an increase in MSP may not lead to an increase in prices. Implementing other schemes, such as providing farmers with the difference between realized market price and MSP, may be useful to increase the welfare of farmers.

Agri News Snippets

- An Accenture Study revealed that digital farming and connected farm services can impact 70 million Indian farmers in 2020, adding \$9 billion to farmer incomes.
- More than 84 lakh farmers, (15% of total farmers) insured in the first year under PMFBY in 2016-17, withdrew themselves from the scheme in 2017-18.
- Karnataka Govt.'s Agri Dashboard Model known as KRIPA provides prices prevailing in 176 APMC mandis in Karnataka, the arrivals and sales of crops as per varieties among other details on daily basis. Based on the data, the Govt. quickly decides its intervention in the market and start procurement at the MSP, if prices are below MSP, and save farmers from distressed sales.
- India's "100%" organic state Sikkim won the "Oscar for Best Policies" conferred by the FAO. The award was co-organised by FAO, The World Future Council (WFC) and IOFOAM - Organics International.

MoFPI approved operationalization strategy for Operation Greens

- Ministry of Food Processing Industry (MoFPI), GoI, on 05 November 2018, approved operational strategy for Operation Greens, an initiative announced in the Union Budget 2018- 19 with an outlay of ₹ 500 crore to stabilize the supply of Tomato, Onion and Potato (TOP) crops and to ensure availability of TOP crops throughout the country round the year without price volatility. The scheme also aims at enhancing value realization of TOP farmers, reduction in post-harvest losses and increasing food processing capacity.

- **The strategy comprises of following series of measures.**

i) Short Term Price Stabilisation Measures:

The Ministry will provide 50% subsidy for the transportation of TOP crops from production to storage, and for hiring appropriate storage facilities. NAFED will be the nodal agency to implement these price stabilisation measures.

ii) Long Term Integrated value chain development projects:

The Ministry will give financial assistance which aims at capacity building of Farmer Producers Organisation (FPO) and their consortia, ensuring quality production, post-harvest processing facilities, agri-logistics as well development of marketing and consumption points besides the creation of an e-platform for demand and supply management of TOP crops.

- The pattern of assistance will comprise of grants-in-aid at the rate of 50% of the eligible project cost in all areas, subject to maximum ₹ 50 crores per project. However, in case where Project Implementing Agency (PIA) is FPO, the grant-in-aid will be at the rate of 70% of the eligible project cost in all areas, subject to maximum ₹ 50 crores per project.
- **Eligible Organisations:** State Agriculture and other Marketing Federations, Farmer Producer Organizations (FPO), Cooperatives, Companies, Self-help Groups, food processors, logistic operators, service providers, supply chain operators, retail and wholesale chains and central and state governments and their entities/organizations.

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