

Kurukshetra Summary February 2018

DOUBLING FARMERS' INCOME

- According to the Socio-Economic and Caste Census (SECC) in 2011, out of 24.39 crore households in the country, 17.9 million households live in villages and are mostly dependent on agriculture. But when we look at the condition of Indian farmers, picture does not look very encouraging, and main reason for this being that the focus of our economic policies so far has been on increasing the farm production rather than the farmer himself.
- Recently, India declared the goal of doubling the farmer's income instead of increasing the agricultural production. It brings farmers at the core of economic policy instead of agriculture.

Seven-point strategy by PM for 'Doubling Farmers' Income

Prime Minister has set a target to double the farmers' income by 2022. To achieve this target, he has advocated a seven-point strategy:

1. Special focus on irrigation with the aim of "Per Drop More Crop"
2. Provision of quality seeds and nutrients based on soil health of each field.
3. Large investments in Warehousing and Cold Chains to prevent post-harvest crop losses.
4. Promotion of value addition through food processing.
5. Creation of a National Agriculture Market.
6. Introduction of a new crop insurance scheme- 'PM Fasal Bima Yojna' to mitigate risks at an affordable cost.
7. Promotion of ancillary activities like poultry, beekeeping, and fisheries.
 - Looking at the current scenario of agriculture in India, 69% of the farmer families have less land than one hectare land. 17% of the families have land between one two hectares. According to NSSO, 36 percent of the farmers are landless.
 - Economic Survey of 2015-16 states that 48.9% of the total workforce population is contributing only 17% of GDP. And in the current financial year, the growth rate of agriculture and allied sectors is expected at 2.1 per cent.
 - As according to the available NSSO data for 2012-13, the average monthly income of the country's farmer is Rs. 6426.
 - It is to be noted that the minimum income doubles automatically in six to seven years, whereas it takes about 20 years to double the actual income. In such a situation, doubling the actual income by 2022 would require three times the current momentum of ongoing efforts.
 - Despite the increase in production triggered by the Green Revolution, the socio-economic impact was not very encouraging, due to which ill effects on soil, water, environment as well as on human health could be seen. The cost of farming *Vis a Vis* production value led to farmers in heavy debt. As per the 2013 survey, about 52 to 56 per cent of the farming families in the country are under debt burden. And the debt amount on each family was about Rs. 4800.
 - If the government pricing policy is unfair, then the community can never thrive. The government declares the minimum support price for 24 agricultural commodities.
 - The cost value estimated by CACP is based on all-India Level average. Often MSP is less than the cost price of farmers. Therefore, the price of crops should be determined by the

CACP in proportion to the increase in the value of other commodities and services in any previous year as base year.

- Secondly, it also needs to be ensured by the government that the prices of all such commodities in the markets do not go below the MSP and purchase should be guaranteed because currently, only six per cent of the crops are purchased on MSP. Remaining agricultural commodities fetch 10-30% less price in the market.
- Due to the lack of adequate food processing industry and technology, farmers get only 20 to 30 per cent of the consumer purchase price.
- Transmission from the fields to markets is also not easy. Contrary to the expectations of farmers, the basic structure of moneylenders, middlemen and government procurement centres is exploitative. It serves the interest of middlemen rather than farmers and consumers. The Central Government had sent a proposal to the State Governments in 2003 to implement the Model APMC Act which was neither properly accepted nor implemented.
- Govt has started taking steps to bring about a radical change in agricultural marketing in the year 2016. There is a provision to integrate 585 mandis of the country through Integrated National Agricultural Market (e-NAM).
- The Ministry issued a Model Marketing Act in 2017, which was named "Agricultural Produce and Livestock Marketing (Facilitation and Promotion Act 2017)". After adoption by the states, this Act will provide diverse marketing channels and end the APMC's monopoly. Its purpose is to increase competition and provide options to farmers so that they can take advantage of the competitive price of their produce.
- Along with reforming the domestic marketing system, there is a need to set right the import-export policy. Therefore, during the harvesting of the crops, such agricultural commodities should not be imported and it should also be ensured that they should not be imported at the prices below minimum support price declared by the government. Apart from this, agricultural exports should also be promoted so that the price of agricultural commodities will not go down in the local markets and farmers will continue to get remunerative places.
- It is necessary to increase yield per hectare. In comparison to the international level, it is found that there is widespread possibility of increasing the average yield of major crops in the country.
- But the role of three factors in augmenting production per hectare in fields is very important, one-climate, second-knowledge level of farmer and third-investment. India has 127 agro-climatic zones in terms of climate. Out of 64 soil types found across the globe, 46 soil types are found in the country.
- We are the world's most prosperous country in terms of water and biodiversity. But in the field of agricultural education, India is counted among very backward countries. In India, 12 per cent of student enroll in science-based graduate courses out of which only 0.65 percent student enroll in agricultural science. Due to such gross neglect, the field of agricultural research and agriculture extension is in bad shape.
- Third, the investment- the monthly average income of the country's farmer and average monthly consumption expenditure leaves him with nothing to invest in quality seeds, fertilizers, insecticides, high value crops, irrigation, agricultural machinery and technology.
- Despite the investment in irrigation so far, more than half of the agriculture sector does not have irrigation facilities. The average yield of foodgrains in the irrigated agricultural areas of

the country is 4 tonnes per hectare, while in the rainfall dependent areas it is only 1.2 tonnes per hectare.

- The government has increased the long term agricultural irrigation funds. Besides, to achieve the goal of “more crop per drop”, a dedicated micro irrigation fund has been set up and the budget of the Pradhan Mantri Krishi Sinchai Yojna has been increased.
- Seventy per cent of the farmers are involved in animal husbandary business who possess around 80 per cent of the total livestock. It is noticeable that for landless farmers small animals are the means of livelihood and dealing with poverty.
- Recently the Central Government has launched schemes viz. “Rastriya Gokul Mission” and “Kamdhenu Prajanan Kendras” for the conservation and development of the indigenous breeds of cow. This will lead to the development of indigenous breeds and production of high quality A2 milk in view of climate change.
- “World Food India 2017” was organized by the Food Processing Industry Ministry to double the income of the farmers and make Food Processing Industry attractive for investment.
- Along with attracting huge investment and generation of employment, wastage of huge quantities of horticultural crops can also be prevented.
- However, farmer will remain the raw material producer only and the entire profit of value addition will be pocketed by the companies. Secondly, the crop pattern according to the geographical conditions would end diversity of food and taste. Unemployment crisis will loom in front of the people engaged in small and cottage industries. The food processing companies use millions of tones of plastic, which turns the soil barren and poison the ground water. In addition to generating raw material, if the farmer is engaged in the work of value addition through co-operatives, he will get additional employment and profit making opportunities.
- It is utmost important to increase the size of the farmland and reduce the burden of the population dependent on the farm to boost the income of farmers. Therefore, the NITI Aayog has prepared the “Model Agricultural Land Leasing Act 2016”.
- Due to creation of legal framework, the fear among landowners of losing ownership on the leased land will be over. The lessee will also be able to get easily all the facilities available for farming including the government’s crop loan, crop insurance.
- National Skill Development Council has also set a target of decreasing the number of the work force in agriculture from 57% to 38% by 2022 i.e. about 20% people will have to find employment avenues in non-agricultural sector.
- To improve the agricultural conditions, there is a need to adopt such crop cycle in the agricultural system, which would focus on the local agriculture, geographical area and village and capable of providing self-sufficiency in food security and wiping away malnutrition.
- Nutrients are easily available in natural farming. Now the pulse based mixed crop system in natural farming is the best method, which along with easy nutrition providing system is capable of keeping the soil soft and airy and also maintains its fertility and health. In this system, due to moisture in soil, the consumption of ground water is also reduced to half the required amount. In addition, this method is fully capable of coping with the effects of changes in weather.
- Conventional farming system would reduce the subsidy given in the name of fertilizers and food security and this reduce the fiscal deficit. This will further reduce the expenditure on health and control inflation too.

- Besides government efforts, the farmers have to set up, in addition to biological or high quality production, value addition activities and marketing network to reform their economic conditions.
- For example, Vrindavan Tharparkar Club, Pune, has not only improved the indigenous Tharparkar cow breeds and developed products of dung and cow urine of the international standards, but has also set up centre of Panchgavya medicine.
- We have to think about the all-round development of farmers and agriculture by placing our farmers at the centre. For doubling the income of the farmer if the attention is given to develop the whole country as a large market system, then we will repeat the same mistake which happened during the Green Revolution.
- It should begin from the village, and then should move upward in a bottom up approach. Strong villages only can make a strong nation.
- We have to develop agriculture system in such a way that our most skilled and talented people can also get a glimpse of good, natural and prosperous life. Agriculture should become a glorious business again and farmers earn respect in society as it was before.

EVERGREEN REVOLUTION

- The concept of evergreen revolution is, indeed, a sequel to the green revolution of the 1960s which made the country self-sufficient in foodgrains.
- The prime objective of transforming the Green Revolution into an evergreen revolution, is to expand it to all crops and all regions with minimal unhealthy consequence.
- The scope for expanding cropland has dried up. Landholdings are getting smaller and fragmented, adversely affecting the viability of farming. Agricultural marketing continues to suffer from some formidable disabilities. The marketing network is neither adequate nor efficient to ensure reasonable returns to farmers for their produce. Moreover, rural labour is turning scarce and costly.
- The noted agricultural scientist, Dr M.S. Swaminathan, who spearheaded the advent of the green revolution, was also the first to sound the note of caution about the adverse fallout of the exhaustive high-yielding crop production technology.
- The need, therefore, is to produce more from less and with less water and less cost-intensive inputs. Such an approach is considered essential to preserve not only the livelihood security of the large agriculture-dependent population, but also ecological security to sustain the green revolution.
- This may be possible by integrating traditional systems of farming with the modern and scientific ways of agriculture. The use of chemical fertilisers should be strictly need-based as determined by the requirement of the crop and land fertility. Supplementing the fertilisers with organic manures would help safeguard soils' physical, chemical as well as microbial health. "More crop per drop" is the mantra for the evergreen revolution.
- There is need to create agriculture clusters on the pattern of the industrial clusters. Different areas could be identified for growing particular crops suited to the agro-climate conditions. This would help in streamlining transportation, storage and processing facilities for different crops taking care of their specific needs.
- The NITI Aayog has put forth a multipronged agenda for agricultural development. It involves increasing productivity of crops, boosting production of livestock, enhancing input-use efficiency to

reduce costs, increasing crop intensity by taking more crops from the same piece of land and several other well-chosen reforms-oriented measures.

- There are basic issues which need to be addressed to prepare the ground for an evergreen revolution.
- There are also large regional variations in the crop yields within the country. Bridging these gaps can go a long way in laying the foundation of the evergreen revolution. This requires development of new cost-effective technology and transferring it to the poor farmers, besides empowering them financially to put this into practice.
- Secondly, most farmers at present do not get remunerative prices for the crops.
- The procurement-based market intervention to provide price support has remained confined to a few crops.
- The existing agricultural marketing network is highly inadequate, besides being inefficient and non-transparent.
- Thirdly, the size of the farm holdings of the majority of agricultural households has shrunk to unviable level, nudging farmers to leave farming and look for jobs elsewhere.
- Fourthly, the present measures for relief and loss reimbursement to the farmers at the time of natural disasters are inadequate and suffer from procedural inefficiencies and delays.
- Fifthly, the agricultural potential of the eastern region is grossly underexploited. This region has unique agro-climatic conditions for the production of several products.
- With these broad imperatives in view, the NITI Aayog has already chalked out detailed action plans for at least three areas which can ultimately form part of the overall plan of action for doubling farmers income and ushering in an evergreen revolution. One, it proposes greater involvement of the National Food Security Mission for boosting the production of pulses.
- To upgrade the quality of seeds, especially of the farmers' self-produced and saved seeds, the government is already running a seed village programme. Under this, financial assistance, by way of 50 to 75 per cent subsidy, is provided on foundation and certified seeds of various crops like pulses, oilseeds and fodders to small and marginal land holders.
- In another significant move aimed at ensuring better quality of agricultural products and providing assured marketing at pre-negotiated prices, the NITI Aayog has helped the agriculture ministry to prepare a Model Contract Farming Act for the guidance of the state governments.
- The Ministry of Agriculture and Farmers Welfare, too, has prepared a roadmap for ushering in an evergreen revolution and doubling farmers' income by 2022.
- The Agricultural Ministry's plan of action seeks to promote the agriculture's allied activities which can supplement farm incomes and contribute to strengthening food and nutrition security.
- Deep sea fishing is sought to be promoted to increase overall production and availability of fish for domestic consumption and exports.
- Technology-driven efficiency and precision would, therefore, have to be the byword for every farm operation to transform green revolution into an evergreen revolution.

- In a bid to protect farmers against losses occurred because of frequency changes in weather patterns, the Pradhan Mantri Fasal Bima Yojna (PMFBY) was launched in 2016. The scheme seeks to provide farmers with uniformly low premium that would help them sustain agriculture in case of crop losses arising out change in climate.
- The government formulated the PMFBY mainly to plug the holes in the older crop insurance schemes, the National Agriculture Insurance scheme (NAIS) introduced in 1999 and the Modified NAIS(MNAIS) initiated in 2011.
- Prior to launch of PMFBY, only 20 million of an estimated 140 million farmers in the country, earning for a population four to five times as many, had crop insurance cover in 2014-15. The scheme was only against the cost of cultivation and barely provided any income protection to farmers.

About the Scheme:

- Under the new scheme which was implemented since Kharif season of 2016, the premium paid by farmers, had been reduced to 2% of the insured value for the more rain-dependent Kharif crop and 1.5% for the Rabi season, compared with 3.5-8% charged for the two earlier schemes, NAIS and MNAIS. In case of horticultural crops, farmer's premium burden had been fixed at 5% of the sum assured or 50% of the total premium.
- NAIS and MNAIS have been discontinued from *Kharif* 2016, but the Weather Based Crop Insurance Scheme (WBCIS) and Coconut Palm Insurance Scheme would continue to operate while premium to be paid under WBCIS has been brought on a par with PMFBY.
- PMFBY aims at supporting sustainable production in agriculture sector by way of:
 - Providing financial support to farmers suffering crop loss or damage arising out of unforeseen events.
 - Stabilizing the income of farmers to ensure their continuance in farming.
 - Encouraging farmers to adopt innovative and modern agricultural practices.
 - Ensuring flow of credit to the agriculture sector, which will contribute to food security, crop diversification and enhancing growth and competitiveness of agriculture sector besides protecting farmers from production risks.
- Another unique feature of PMFBY has been that there would be no upper on government subsidy provided by centre and state governments.
- In the earlier of crop insurance schemes, there was a provision of capping the premium rate which resulted in low claims being paid to farmers.
- Losses incurred by them at any stage of the farming activity, from the sowing to the post-harvest season, is being covered. Earlier, only post-harvest losses can be offset by the insurance facility under the two existing schemes.
- The scheme also provide insurance cover at individual farm level to crop losses due to occurrence of localized calamities such as landslides, hailstorm and inundation affecting part of a notified unit or a plot.
- The Agriculture Ministry had empanelled state-owned Agriculture Insurance Company of India (AIC) and private companies for implementation of the mega scheme.

Process so far:

- According to official data, during 2016-17, 30% of Gross Cropped Area has been covered under PMFBY in comparison to 23% crop area covered in 2015-16.
- For promoting transparency in the implementation of crop insurance scheme, Central Crop Insurance Portal has been developed which integrates farmers and other stakeholders and also provides for online registration of Farmers.
- Provision has been made for use of advanced technology such as drone, remote sensing etc. For promoting transparency and immediate settlement of insurance claims.

Challenges in terms of Implementation:

- In the earlier crop insurance schemes due to non-adoption of improved technology, there was considerable delay in settlement of claims of the farmers. Under PMFBY, the States are required to give Crop Cutting Experiment (CCE) date to insurance companies within one month of harvest and the companies have to settle the claims within three weeks of receiving the CCE data.
- To eliminate this delay and to promote transparency, the government has made mandatory to use Smartphone or CCE Agri App for capture and transmission of yield data to crop insurance portal.
- PMFBY if implemented properly across the country would mitigate farm distress to a large extent especially when the erratic climates have become a norm rather than exception.

PRESERVING SOIL HEALTH FOR SUSTAINABLE PRODUCTION

- Soil is formed through a complex process which takes thousands of years to make an inch of soil. But it can easily be contaminated, eroded and destroyed in a very short span of time, if managed unscientifically.
- Our consumerism attitude or greed results in indiscriminate use of fertilizers, pesticides and land resources, which disturbs the harmony existing within the soil thereby affecting the physico-chemical properties of the soil system.

Soil Health:

- Soil health is like animal health where the soil sustains production depending upon the status of soil health attributes.
- Soil health concept involves integration of physical, chemical and biological properties of a soil and role of this harmonious blend in sustaining growth, productivity and environmental security.

What is a Healthy Soil?

A healthy soil has the following characteristics:

- It has good soil tilt, i.e., crumbly, well structured, dark with good amount of organic matter, and possesses no hard pans.
- It has sufficient depth through which roots can grow to find water and available nutrients.
- It has good water storage and good drainage capabilities.

- It has sufficient nutrient supply, to achieve optimal production and also for balanced cycling of nutrients within the ecosystem.
- It should contain abundant population of beneficial organisms that help in cycling of nutrients, decomposition of organic matter, maintenance of soil structure, biologically suppressing plant pests, etc.
- It should be free of potentially harmful chemicals and toxins.

Current Status of Soil Health in India:

- According to National Academy of Agriculture Sciences, out of total 142 Mha net sown area of India (2010) around 105 mha farm land has been degraded by various factors like soil erosion, followed by soil acidity, soil alkalinity/sodicity, soil salinity and water logging etc.

Soil Health: Causes of Deterioration

- **Population pressure:** Due to high population, the soils have to be exploited beyond carrying capacity to feed the proliferating humans and also for production of clothing material.
- **Decline in forest and tree cover:** Forest and tree cover prevent erosion, helps in soaking of precipitation/rainfall and building the soil fertility.
- **Intensive soil farming:** Intensive cropping system requires exhaustive tillage which breaks down soil organic carbon (SOC) to carbon dioxide and removes plant cover; this exposes the organic rich top soil to erosion by wind or water.
- **Mounting use of pesticides:**

Strategies of Soil Health Management:**1. Conservation agriculture approaches:**

- **Diversified crop rotations:** Use of different crops in crop rotations, particularly cereal-pulses system increases soil organic matter, nutrients and biodiversity in the soil.
- **No tillage/Minimum soil disturbance:** As too much plowing helps in nutrient loss and causes soil erosion, no or minimum tillage is used for growing crops without disturbing the soil.
- **Residue retention/incorporation:** Applying plant residues to the soil surface to compensate for loss of residue due to excessive tillage. It increases soil organic matter, moderates soil temperature, conserves soil moisture and reduces erosion from soil and wind.

2. Nutrient management approaches:

- **Balanced use of fertilizers:** Use of fertilizer has to be based on 4R principle: Right time, Right place, Right dose and Right source.
- **Soil-test-based fertilizer recommendation:** It reduces the overuse of fertilizers and increases the fertilizer use efficiency.
- **Application of biofertilizers:** It help in nitrogen fixing, phosphate solubilizing and mobilizing microbes or the microbial consortium to the crop plants has beneficial effect on crop growth, yield and soil fertility and sustainability in natural soil ecosystem.

Soil Health Card vis-à-vis Soil Health:

- Government of India has launched the Soil Health Management (SHM) Scheme under National Mission for Sustainable Agriculture.

- It aims at promoting integrated Nutrient Management (INM) through judicious use of chemical fertilizers including secondary and micro nutrients in conjunction with organic manures and bio-fertilizers for improving soil health and its productivity, strengthening of soil and fertilizer testing facilities to provide soil test based recommendations to farmers for improving soil fertility, ensuring quality control requirements of fertilizers, bio-fertilizers and organic fertilizers; upgradation of skill and knowledge of soil testing laboratory staff, extension staff and farmers through training and demonstrations; promoting organic farming practices etc.
- Soil Health Card (SHC) is a practical report that can enable anyone interested in their soil to monitor soil health. It gives information on the status of soil with respect to 12 parameters.
- Based on this, the SHC indicates fertilizer recommendations and soil amendment needed to maintain soil health in the long run.
- The proper implementation of the SHC scheme will increase significantly the efficiency of costly and heavily subsidized fertilizers.
- Awareness is being created by mass awareness activities on World Soil Day (December 5) every year. Soil health cards are being distributed, and location and crop-specific sustainable soil management practices are being popularized among the farmers for maintenance of soil health.

INTEGRATED FARMING SYSTEMS: A NEW APPROACH

- Integrated farming system has been defined as - “A judicious mix of two or more components using cardinal principles of minimum competition and maximum complementarity with advanced agronomic management tools aiming for sustainable and environment friendly improvement of farm income, family nutrition and ecosystem services”.
- The essential components of integrated farming systems are:
 - Enrichment of soil
 - Management of temperature
 - Conservation of soil and rain water
 - Harvesting of sun energy
 - Self-reliance in inputs
 - Maintenance of life forms
 - Integration of animals
 - Use of renewable energy
 - Recycling
 - Meeting the basic needs of family
 - Round the year income for meeting social needs
- The Food and Agriculture Organization (FAO) classified the integrated farming systems as natural and intentional integrated systems. The natural integrated systems are one which is practiced by farmers where in linkage among components/enterprises of the system often do not exist.

Multiple Benefits of Integrated Farming System Approach:

- **Productivity enhancement:** Farming system provides an opportunity to increase the yield and economics/unit time by virtue of intensification of crop and allied enterprises. The results of study conducted at Andaman and Nicobar Islands reveal that integration of crop with fish + poultry and cattle resulted in higher productivity than cropping alone.
- **Income enhancement:** Integrated farming system as a whole provides opportunity to make use of recyclable waste material of one component as input for other at the least or no cost at farm level. Thus there is a possibility for reduction of production cost of enterprises from one to another and finally the return per rupee invested is very much enhanced.
- **On-farm employment generation:** Integration of other components with cropping increases the labour requirement and thus provides scope to employ family labour round the year without much lean and peak demand for labour.
- **Meeting the household food and nutrition and reducing market dependency** - Every farm household should be self-reliant in 6F's (Food, Fodder, Feed, Fuel, Fibre and Fertilizer). Diversified farming systems having cropping systems + livestock + fisheries + horticulture + boundary plantations can produce sufficient quantity of cereals, pulses, etc. per annum as per ICMR standards to meet the nutritional requirement within the farm.
- **Soil health improvement through recycling:** Residue recycling is an integral part of the farming systems which is one of the most promising approaches of recycling agriculture residues for sustainable development, the adoption of which paves way for higher input use efficiency.
- Small and medium size water bodies can be brought under multi-component production system using in and around areas which will ultimately lead to improved income, nutrition and livelihood of small farm holdings.
- **Risk reduction:** IFS approach also helps to reduce the risks involved in farming especially due to market price crash as well as natural calamities. Due to the presence of multiple components at a time, price crash of one or two crop produce may not affect the economy of the household.
- **Land configuration based farming systems:** Raised and Sunken Bed (RSB) system in Andaman and Nicobar Islands can serve as climate proof technology in the rice based farming system especially in the coastal areas where inundation of rice fields are expected due to the sea level rise.
- Because of the long term sustainability, easy to adopt and efficient utilization of land area, this technique is having lot of potential especially for the coastal areas. This type of system gives scope models have been tested in West Bengal also and found successful.

Way Forward:

- Diversification of existing farming systems clearly demonstrates the advantages. It has been observed that productivity and profitability gain of 2 times is possible with improved systems. Further, resources saving of 40 to 50% can also be ensured besides providing round the year income.
- The following steps are essentially required for up scaling of science based integrated farming system.

1. Focus should be given mainly on market-oriented diversification and livelihood improvement.
2. Initiation of National Mission on Integrated Farming Systems by converging the schemes of crops, horticulture, livestock and fisheries.
3. Large scale spread of IFS concepts through front line demonstrations in farming systems.
4. There is a need to move from soil health card comprising the health components of soil, plant, livestock and human at household level.
5. Capacity building of stake holders.
6. Crop and forage rotation: Includes crops, forages and high value crop options including vegetables, fruit trees, medicinal and aromatic plants, orchards.
7. Introduction of farmer perception based location specific livestock components.
8. Integration of less land requiring activities such as mushroom farming, bee keeping etc in the existing systems.

INSTITUTIONAL CREDIT FOR SMALL FARMERS

- Government has taken several measures to increase institutional credit flow and to bring more and more farmers including small and marginal farmers within the institutional credit fold. These are:
 - **Interest Subvention Scheme**
 - **Priority Sector Lending Guidelines**
 - **Kisan Credit Card:** aimed at providing adequate and timely credit support from the banking system under a single window to the farmers for their cultivation and other need.
 - **Joint Liability Groups:** To bring small, marginal, tenant farmers, oral lessees, etc. taking up farm activities, off-farm activities and non-farm activities, into the fold of institutional credit, Joint Liability Groups (JLGs) have been promoted by banks.
 - **Relief measures during natural calamities**

Steps for Fertilizer Availability Round the Year

1. **Urea Pricing Policy, 2015:** New Urea Policy 2015 was notified to maximize indigenous urea production; to promote energy efficiency in the urea units; rationalize the subsidy burden on the Government.
2. **Neem coating of Urea**
3. **Introduction of 45 kg. urea bags replacing the existing 50 kg. bags**
4. **Reduction in the rates of P&K fertilizers:**
5. **Removal of the minimum annual production**
6. **Revival of Sindri & Gorakhpur units of FCIL and Barauni unit of HFCL.**
7. **Model fertilizer retail shop:** In the Budget 2016-17, announcement was made for opening up of 2000 Model Fertilizers Retail Shop over a period of three years. It will provide mandatory services like selling of quality fertilizers at genuine rates, soil testing, seed testing, promotion of balanced use of nutrients etc.
8. **Policy on promotion of city compost:** Policy for promotion of City-Compost has been notified by the Department of Fertilizers on 10.2.2016.
9. Pilot projects are underway for Direct Benefit Transfer scheme in fertilizer subsidy scheme.

VAJIRAM & RAVI
NATIONAL AGRICULTURE MARKET ONE INDIA, ONE MARKET

- Government of India is committed to the welfare of the farmers and the Budget 2016-17 makes an explicit announcement to double the income of the farmers in the country by the year 2021-22.
- The next phase of transformation of India's agriculture will need reforms in agricultural marketing system.
- The post-harvest management including agricultural marketing has not kept pace with the changes in economy, particularly relating to setting up of an efficient supply chain.
- There is enormous concern over several aspects of our agricultural marketing system.
 - Agriculture marketing is administered by the States as per their agri-marketing regulations under which state is divided into several market areas, each of which is administered by a separate Agricultural Produce Marketing Committee (APMC) which imposes its own marketing regulation (including fees).
 - As a consequence, this fragmentation of markets, even within the state hinders free flow of agri commodities from one market area to another and multiple handling of agri-produce and multiple levels of mandi charges end up escalating the prices for the consumers without commensurate benefit to the farmer.
- A pan India online trading platform is expected to promote uniformity and streamlining to procedures across the integrated markets, remove information asymmetry between buyers and seller and promote real time price discovery based on actual demand and supply, promote transparency in auction process, and access to a nationwide market for the farmer prices commensurate with quality of his produce and online payment and availability of better quality produce and at more reasonable prices to the consumer.
- NAM is a pan-India electronic trading portal which seeks to network the existing APMC and other market yards to create a unified national market for agricultural commodities.
- While material flow (agriculture produce) shall continue to happen through mandis, an online market would reduce transaction costs and information asymmetry.
- Small Farmers Agribusiness Consortium (SFAC) is implementing the national e-platform.

Challenges Faced:

1. Non-uniform Quality standards across various States specifically in case of Horticulture produce is a hindrance. SFAC as a lead implementing agency is exploring the possibilities of bringing uniformity in the quality standards. In the process, the quality assaying parameters for 90 commodities have been prepared and notified for all e-NAM mandis to follow.
2. States are required to establish the appropriate quality testing facilities equipped with the trained manpower and suitable assaying equipment.
3. In order to promote the inter-MANDI AND Inter State trade, States are required to promote the issue of Unified trade licenses in sufficient numbers to the traders. Till date, very few traders have applied for unified licenses.
4. Online payment directly to the farmer's bank account by the buyers is another area of concern where the progress is quite slow. This involves the change management as traditionally Commission agents are making payments to the farmers and providing credit to the sellers, while e-NAM envisages the direct payment by buyers to farmers on the lines of Direct Benefit Transfer policy of Government of India.

VAJIRAM & RAVI

PRADHAN MANTRI KRISHI SINCHAI YOJANA (PMKSY)

- The Pradhan Mantri Krishi Sinchayee Yojana was launched in 2015 with the motto of 'Har Khet Ko Paani' for providing end-to-end solutions in irrigation supply chain.
- PMKSY not only focuses on creating sources protective irrigation by harnessing rain water at micro level through 'Jal Sanchay" and "Jal Sinchan".
- It also focuses on improving water use efficiency "Per Drop More Crop".

Objectives of PMKSY:

- The major objective of PMKSY is to achieve convergence of investments in irrigation at the field level, expand cultivable area under assured irrigation, improve on-farm water use efficiency to reduce wastage of water, enhance the adoption of precision-irrigation and other water saving technologies, enhance recharge of aquifers and introduce by exploring the feasibility of reusing treated municipal waste water for peri-urban agriculture and attract greater private investment in precision irrigation system.

Structure of the Scheme:

- PMKSY has been conceived amalgamating ongoing schemes vis. Accelerated Irrigation Benefit Programme (AIBP) of the Ministry of water Resources, River Development & Ganga Rejuvenation (MoWR, RD & GR), Integrated Watershed Management Programme (IWMP) of Department of Land Resources (DoLR) and the On Farm Water Management (OFWM) of Department of Agriculture and Cooperation (DAC). The scheme is being implemented by Ministries of Agriculture, Water Resources and Rural Development.

PMKSY Components

1. Accelerated Benefits Programme (AIBP)
2. Har Khet Ko Pani
3. Per Drop More Crop
4. Watershed Development

Benefits of Micro Irrigation:

1. Reduction in input costs and significant cost savings observed for irrigation.
2. Labour savings on account of irrigation, weeding, fertilizers and other operations
3. Electricity consumption reduced after installation of micro irrigation system.
4. Saving of fertilizers
5. Irrigated area increased
6. Increase in area under horticulture crops after adoption of micro irrigation by farmers.
7. Average productivity of fruits and vegetables increased by about 42.3% and 52.8% respectively.
8. Farmer's income increased in the range of 20% to 68% with average of 48.5%.

- The rising import of pulses to the tune of 5.797 million tonnes (MT) during 2015-16 and further import of 6.60 MT pulses during 2016-17 warranted the Government of India to implement planned strategies effectively to tackle the situation.
- Price of pulses in domestic market crashed for almost all pulses excluding chickpea and up to some extent lentil. Since, research and development machinery of Government of India was vigilant on the issue of pulses; scheme for procurement of pulses; scheme for procurement of pulses directly from farmers was implemented immediately without time lapse.
- This resulted in procurement of about 2 MT of the pulses by the Government using price stabilization funds to maintain buffer stock. This initiative of Government of India along with other strategies like ensuring timely availability of quality seeds of high yielding varieties, large scale demonstrations on newer and high yielding varieties and matching production and protection technologies has encouraged farmers to grow more pulses which is evident from marginal increase in area under rabi pulses over 2016-17 which was ever maximum in history of pulse cultivation in India.
- India has potential not only to sustain current level of production but to attain self sufficiency in pulses production. The record sowing in current rabi pulses (16.91 m ha) has set tone for harvesting more pulses during 2017-18, and to be closer to attaining self-sufficiency in pulses production in India.
- India, pulse production also attained highest peak of 22.95 MT breaking previous record of 19.78 MT (2013-14). During last three consecutive Plan period (2002-2017) pulses area, production and productivity has shown continuous increase.
- The record production of pulses during 2016-17 was mainly due to higher prices of pulses during previous year, good agronomic practices and quality seed of newer varieties, use of phosphoric fertilizers and agro-chemicals, favourable weather, policy support in terms of minimum support price (MSP), procurement of pulses at MSP, Pradhan Mantri Fasal Bima Yojna (PMFBY) and Pradhan Mantri Krishi Sinchai Yojna (PMKSY) etc.
- In India, Madhya Pradesh is the largest producer of pulses followed by Rajasthan, Maharashtra, Karnataka, Uttar Pradesh, Andhra Pradesh and Odisha.
- There is sample scope in states like Tamil Nadu, Jharkhand, Chhatisgarh, Odisha, Bihar and West Bengal for expansion of pulses cultivation.
- **Demand and Supply of Pulses:** India is the largest consumer of pulses and demand of pulses is likely to increase further as more and more people are becoming health cautions.
- The estimated demand suggests that India need to manage 26.50 MT of pulses to fulfil the pulse demand by 2020 which may further go up in subsequent years. This will help in maintaining present level of protein availability @38g per capita per day for human consumption and demand for seed and other users.
- If present level of area under cultivation can be sustained with even marginal increase in productivity which is not difficult task, country can achieve self sufficiency in pulses production in near future.
- However, there will be need of good investments for generation of new varieties, integrated pulse production and protection technologies, accelerated quality seed production, farmers' centric policies, empowerment of growers through training, efficient transfer of technologies network, market, remunerative minimum support price and procurement, bringing pulses in

mid-day meals and public distribution system and other social schemes, etc. so that required annual growth rate can be achieved for attaining self sufficiency in pulses production.

- **Issues and strategies:** Pulses are largely grown under rainfed and residual moisture which is one of major reason for low yield. If appropriate measures are taken, most of these can be addressed for increasing indigenous production of pulses.

Strategies for Enhancing Pulses production:

- Production of pulses can be enhanced substantially in India following two approaches i.e., horizontal expansion by bringing additional area, and vertical expansion by increasing production per unit area of pulses cultivation.
- **Farm Mechanization**
- **Making Quality seed available:** In case of pulses, quality seeds supplies always remain a major production and productivity constants.
- Considering importance of the quality seed, Department of Agriculture, Cooperation and Farmers Welfare, Government of India has approved in ICAR project “**Creation of seed hubs for increasing indigenous production of pulses in India**” to establish 150 seed-Hubs in 24 states.
- **Human Resource Development:** Empowerment of farmers and other stakeholders.
- **Technology Transfer:** Central Government has launched massive program “**Cluster front Line demonstrations**” on pulses and it has paid dividends.
- **Value addition:** Store grain pests cause huge losses to pulses grains when stored without splitting. Therefore, capacity development needs to be taken up for value addition and small scale processing and milling machineries development for pulses.
- **Procurement and Storage of Pulses:** Procurement and storage of pulses cannot be in similar manner as it is for two major cereals- wheat and rice. Therefore, storage facilities need to be created for pulses’ grains/seeds.

ORGANIC FARMING PRACTICES IN INDIA

- Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity.
- Application of scientific approaches to organic farming practices maintain and in some cases, increase the yield in the long run. It sustains bio-diversity, soil fertility and natural ecosystem processes and other services that underpin the agriculture. It allows the farmers to overcome the risk of crop failures and increased cost of production, encourages production of healthy food and fiber of high quality.
- There are three categories of organic farmers in India. The first category of organic farmers are those who are in ‘no-input or low-input’ use zones, for them organics is a way of life and they practise it as a tradition. Second category of farmers is those who have recently adopted the organics in the wake of ill effects of conventional agriculture. The third category comprise of farmers and entrepreneurs who have systematically adopted the commercial organic agriculture to capture the emerging market opportunities and premium prices.
- The area under organic cultivation in India is about 5.71 million hectares (2015-16).

- Madhya Pradesh has the highest area under organic farming in India followed by Maharashtra and Rajasthan. Besides these states, Meghalaya has committed to have two lakh hectares of certified organic land by 2020 and Sikkim is aiming to become 100 per cent organic which was an official announcement during 2016.
- The soils for organic farming should be friable and must have the sufficient organic matter content with an ideal pH of 6.5 and 7.5 to help the microbial activity, called as living soil.
- Farm yard manure (FYM), poultry manure, cow dung slurry, animal urine, crop residues, green manures and green leaf manures are permitted in organic farming. The inputs under restricted use such as blood meal, bone meal, compost, fish meal, urban washes, vermicompost etc are allowed after confirming the absence of chemical impurities.
- Bio-fertilizer is another important source of nutrients. Rhizobium is a bacterium lives in the root nodules of leguminous plants and fixes atmospheric nitrogen in crops like redgram, greengram, blackgram, bengalgram, groundnut and soybean.
- *Panchagavya*, an organic product has the potential to play the role of promoting growth of the plant and providing immunity in plant system. It consists of five products of cow viz., cow dung, cow urine, milk, curd and ghee.
- *Jeevamrutham* is one of the cheapest source nutrient applied through irrigation water during the critical stages of the crop.
- In organic farming system, the weed controls are achieved through *in-situ* incorporation with rotovator. Crop rotations, hoeing, mulching, hand-weeding, mechanical weeding, cover cropping and poly cropping also helps in weed control in organics. Rice bran, tamarind seed powder, corn flour gluten and sunflower stalk extracts are used in organic weed management.
- Agro forestry is one of the important components of organic farming. Live fence is also useful as wind breakers.
- Pest management in organic farming is possible through agronomic practices selection of resistant crop varieties, timely planting, crop rotation with non-host crops, inter and mixed cropping techniques.
- Light traps are a mechanical device used to monitor the prescience of an insect pest in organic farms.
- Border cropping technique is one in which the taller and dense foliage producing crops like maize, sorghum are planted in 3-5 rows around the primary crops like vegetables and pulses to restrict the movement of insects into the cropped area.
- Utilization of botanicals in pest management is popular among organic farmers in India. Nearly 2400 plant species have been identified in their toxic effects against insect pests.
- Predators and parasites are effective bio-control agents in organic crop protection. *Trichogramma* is an egg parasitoid and is recommended for the management of various lepidopteran pests in paddy, sugarcane, cotton, maize, sorghum, castor etc.
- Disease management in organics is achieved through bio-control agents like *Trichoderma vividi*, *Pseudomonas fluroscens* and *bacillus Subtills*.

SOUTH ASIA REGIONAL CENTRE (ISARC)

The Union Cabinet has approved the establishment of the international Rice Research Institute (IRRI), South Asia Regional Centre (ISARC) at campus of National Seed Research and Training Centre (NSRTC) in Varanasi.

Benefits from ISARC:

1. The Centre will help in utilizing the rich biodiversity of India to develop special rice varieties. This will help India to achieve per hectare yield and improved nutritional contents. India's food and nutritional security issues will also be addressed.
2. The Centre will support in adopting value chain based production system in the country. This will reduce wastage, add value and generate higher income for the farmers.
3. The farmers in Eastern India will benefit in particular, besides those in South Asian and African countries.

VALUE ADDITION THROUGH FOOD PROCESSING

- Food processing is where agriculture meets industry. The consumption of processed foods is synchronous with the rise in incomes as income elasticity of these foods is very high. It is worth noting that our country reached the status of 'lower middle-income' among the countries in the world and therefore, the share of processed food in the food basket of our population is bound to go up.
- Processed foods were considered rich people food for a long time and suffered heavy taxation, riddled with so many taxes including steep taxes for packaged products.
- Concept of cold chain was non-existent until the late nineties and post-harvest losses were very high with poor infrastructure. Transport costs are relatively high made import from other countries cheaper than transporting from one part of the country to another. Standards and protocols for food safety and laws for food safety were absent until recently.
- The consistent rise in per capita incomes and the shifting of the incomes after 1981 to a higher growth path led to the rise in middle classes, who have the purchasing power to buy the processed foods. The growth of manufacturing industry also necessitated encouraging food processing sector. The central government, in view of these changes, has started attempts to invigorate the sector by forming a separate ministry for food processing industries in 1988.
- The entire sector was deregulated and no license is required except in case of items reserved for small-scale sector and alcoholic beverages. Automatic approval for foreign investment up to 100 per cent equity in food processing industries is available except in a few cases.
- The concept of food parks, agri-export zones, mega food parks, cold chains and human resources development have been initiated besides several incentive schemes during food processing policy in 2001 and again in 2005. The new agro-processing industries set up to process, preserve and package fruits and vegetables are allowed under income tax Act, a deduction of 100 per cent for five years and 25 percent of profits for the next five years since 2004-05.
- Most recently, centre has allowed 100% FDI in trading of food products including through e-commerce to boost growth of the sector.

- The growth of food processing and increasing exports from this segment of value chain has been increasing its interactions with other segments like farmers for sourcing of raw materials either directly through contract farming or through wholesalers and other means.
- Direct links between agribusiness firms and farmers help in the contract farming to be more inclusive and positive outcomes.
- **Cold Chain and Value Chains:** Lack of awareness on building cold chain as a way of reducing losses and improving efficiency and farmer profitability has been costing the farming community for a long time in the country.

Way Forward:

- There is need to infuse more technology in both the organized and unorganized segments with liberal provision of credit. Value of land poses the biggest threat to unorganized manufacturing in general and food processing in particular, and needs attention to the policy makers. Some of the tax slabs in GST also can have negative impact on this sector.
- Recent initiatives like mega food parks and cold chain schemes are well conceived and showing signs of positive impact.

TECHNOLOGICAL INNOVATIONS FOR AGRICULTURE

- Recently, there have been enormous innovations in agricultural production, not only improving productivity, but just as importantly, safeguarding the environment.
- With the introduction of geographic information system (GIS), global positioning system (GPS) and remote sensing (RS), farmers can now refine nutrient the site-specific conditions of each field.

Technological Innovations for Water management

- The total projected demand of water for irrigation sector will be more than the present level so there will be three major challenges vis.
 - (i) “more crop per drop of water” by efficient and productive use of available water resources in irrigated areas,
 - (ii) Increased productivity of sub-productive challenged ecosystem, i.e., rainfed and waterlogged areas, and
 - (iii) Making use of grey water (waste water) for agriculture production.

There are following practices which will save precious water resources and enhance the productivity:

- **Deficit Irrigation Supplies:** Irrigation strategies based on meeting the partial crop water requirements should be adopted for more effective and rational use of water.
- **Reducing Crop Water Demand:** The reduction in Crop water demand can be done by promoting innovative techniques and uses such as conjunctive use of surface and groundwater, promoting precision irrigation and water-saving crop-production technologies, appropriate policies regulatory mechanism and governance.
- **Pressurized Irrigation System:** Pressurized irrigation system, which included both drip and sprinkler irrigation is proved to be an efficient method in saving water and increasing water-use efficiency as compared to the conventional surface method of irrigation, where water-use efficiency is only about 35-40 per cent.

- Drip irrigation is more effective in the soil with poor water retention and higher drainage rate. Drip irrigation along with fertilizer (fertigation) reduces the wastage of water and chemical fertilizers, and subsequently, optimizes the nutrient use by applying them at proper place and time, which finally increases the water and nutrient-use efficiency.
- **Subsurface Drip Irrigation:** Subsurface drip is a highly efficient irrigation system that uses buried drip tubes or drip tape to meet crop water needs. Since the water is applied below the soil surface.
- The effects of surface infiltration, such as crusting, saturated condition of ponding water, and water losses via evaporation and surface runoff (including soil erosion) are eliminated.
- Wetting occurs around the tube and water moves out in all directions. Moreover, water is applied directly to the root zone of the crop as opposed to the soil surface where most weed seeds hibernate. As a result, germination of annual weeds is reduced. This lowers the pressure on valuable crops. Furthermore, some crops may benefit from the additional heat provided by dry surface conditions, and produce more biomass.
- **Resource Conservation Technologies:** There are many resource conservation technologies like zero tillage, bed planting etc. Which have shown promise in enhancing water productivity. No tillage wheat after harvesting of rice is the most effective RCT in the Indo-Gangetic plains in India.
- **On-Farm Reservoir (OFR):** Rainwater harvesting, and efficient water use are inevitable options to sustain rainfed agriculture in future.
- **Tank-cum-well system:** A tank-cum-well system was conceptualized for micro-level resources development on watershed basis for plateau areas with slope of 2 to 5%. This involves construction of tanks and well in series along the drainage line in a watershed.
- **Other soil and water conservation techniques:** Few measures such as contour and graded bunding, continuous, contour or staggered trenches, water harvesting structures and drainage line treatment are covered under the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS).
- **Agro-forestry systems:** Owing to the multifarious advantages associated with the tree systems, the acceptance of these systems is observed and the area under these systems is gradually expanding.
- **Integrated Farming Systems**
- **Small-Farm Mechanization:** Many efficiency low-cost farm implements were designed for various operations. This reduced 20-59 per cent of the operation cost, saved 45-64 per cent in operation time, saved 31-38% seed and fertilizer, and increased productivity of dryland crops by 18-53%.
- **Precise Nutrient Management:** The ability to apply site specific nutrient to match spatially and temporally variable conditions can increase application efficiencies, reduce environmental impacts, while improving yields. Precision farming technologies have now been developed to spatially vary nutrients within a field based on various information sources.
- Precision agriculture involves the integration of the modern technologies (including GIS, GPS and RS) to allow farm producers to manage within field variability to maximize to benefit cost ratio.
- For example, chlorophyll meters, a recent development in agriculture, are used for corrective nitrogen (N) management where N fertilizers are applied based only on crop needs to ensure increases in fertilizer use efficiency and return on fertilizer investment.

- **Conservation Agriculture (CA):** Conservation agriculture refers to the system of raising crops without tilling the soil while retaining crop residues on the soil surface. Land preparation through precision land leveling and bed and furrow configuration for planting crops further enables improved resources management.
- **Three key features of conservation agriculture are :** i) minimum soil disturbance by adopting no-tillage and reduced traffic for agricultural operations, ii) maximum soil cover by leaving and managing the crop residues on the soil surface, as cover/mulch and iii) adopt spatial and temporal crop sequencing/crop rotation to derive maximum benefits from inputs and minimize adverse environmental impacts.
- The main advantages of CA are reduction in cost of production, reduced incidence of weeds, saving in water and nutrients, increased yields, environmental benefits, crop diversification opportunities, improvement in resource-use efficiency, etc. The CA practices include laser land leveling, conservation tillage, bed planting, direct-seeded rice, brown manuring with Sesbania, crop residue management and crop diversification.

Climate Smart Cropping

- In changing climate scenario, developing cultivars resistant to climate change may become important adaptive mechanism for maximizing resources-use efficiency. For example, crop varieties that are resistant to lodging (e.g., short rice cultivars), may withstand strong winds during the sensitive stage of crop growth, are viable alternative. Similarly, change of planting dates to minimize the effect of temperature increase and reducing spikelet sterility can be used to enhance yield stability, by avoiding the flowering period to coincide with the hottest period.
- **Integrated Crop Management (ICM):** ICM suggests the use of good agricultural practices (GAP) which is an alternative system of crop production, which conserves and enhances natural resources while producing quality food on an economically viable and sustainable foundation. It combines the best of traditional methods with appropriate modern technology for balancing the economic production of crops with positive environmental management.

Innovations in Agriculture to improve Nutrition:

Recently significant efforts have been made to identify the practices that can improve both food and nutritional security. These are:

- Progress has been made to enhance protein, vitamin A, iron, and zinc nutrients in food through biofortification.
- **Biofortified Rice:** The ICAR-National Rice Research Institute, Cuttack has developed a high protein rice variety CR Dhan 310 with an average 10.3% protein in milled rice, by improving the popular high yielding variety Naveen.
- Rice Biofortified with zinc DDR Dhan 45 was released by ICAR.
- **Biofortified Maize:**
- **Biofortified Pearl-Millet:** Pearl-millet has been biofortified to improve its iron and zinc nutrients to target hidden hunger of undernourished malnourished people.
- Biofortified pearl millet, with higher iron and zinc content, is already being grown widely in Maharashtra.
- **Iron Rich Bean:** Biofortified beans can improve iron status in women.
- **Vitamin A rich Sweet Potato:** Orange flesh sweet potato contains elevated levels of beta-carotene which is building block for vitamin A.