

## 1. Examine the current status, potential and challenges of horticulture sector in India.

### Introduction

Horticulture is a science, as well as, an art of production, utilization and improvement of horticultural crops, such as fruits and vegetables, spices and condiments, ornamental, plantation, medicinal and aromatic plants, cashew etc. is nowadays recognized as an important sector for potential diversification and value addition in agriculture.

### Body

#### Current Status of Horticulture in India:

- Horticulture as a sector has performed remarkably in recent years. Production of fruits and vegetables has outstripped that of food grain for the 3rd straight year in 2015-16.
- In 2016-17, India's horticulture production stood at 300 Million Tonnes. Over 30 Million Tonnes more than Food grain Production.
- Share of horticulture in agricultural production was more than 33%. According to survey, over the past decade, the area under – horticulture crops has grown by 2.7% per year, fueling production, which increased at an annual pace of 7%.
- Share of plan outlay for horticulture, which was 3.9% during the 9th plan, increased to 4.6% during the 12th Plan (2017).
- Fruits and vegetables account for nearly 90% of total horticulture production in the country. The total horticulture production has increased from 211.2 million tonnes in 2007-08 to 311.71 million tonnes in 2018-19.
- India is the second largest producer of fruits and vegetables in the world with first rank in the production of Banana, Mango, Lime & Lemon, Papaya and Okra.

#### Potential of horticultural sector in India:

- Less resource input- pesticides, water etc. are required in little amount when it comes to horticultural crops.
- Horticulture is not merely a means of diversification, but forms an integral part of food, nutritional security and poverty alleviation, and also an essential ingredient of economic security.
- It is estimated that India has 240 million acres of cultivable wasteland, which is lying idle, which can be brought under orchard crops without curtailing the area under food crops. The country has abundant sunshine throughout year, a surplus labour and widely varied agro-climatic condition, which offers a high potential for successful and profitable commercial horticulture.
- Horticultural crops play a unique role in India's economy by improving the income of the rural people. Cultivation of these crops is labour intensive and

as such, they generate lot of employment opportunities for the rural population. India with more than 28.2 million tonnes of fruits and 66 million tonnes of vegetables, is the second largest producer of fruits and vegetables in the world, next only to Brazil and China.

- India is bestowed with diverse soil and agro climatic conditions suitable for growing a wide variety of horticultural crops. These crops form a significant part of total agricultural produce in the country comprising of fruits, vegetables, root and tuber crops, ornamental plants, medicinal and aromatic plants, spices, condiments and plantation crops.
- Diverse agro-climatic conditions in India ensure the production of all types of fresh fruits, vegetables and medicinal plants in different parts of the country.
- Health consciousness among people is increasing. Majority of the population in India is vegetarian. As a result, the demand of fruits and vegetables is also high. The production of horticultural commodities is far less as compared to the existing demand in the country. So, there is a vast scope to produce more horticultural crops. Major areas in

#### Challenges:

- Higher input cost than food crops such as rice and wheat
- High price fluctuation makes it challenging , especially for capital starved marginal farmers
- Limited availability of market intelligence, especially for exports
- Small farmers complain of limited support from local governments.
- Most growers do not get reasonable returns for their produce.
- Commodity Future market for horticulture produce is not well developed in India. Farmers are therefore not able to get remunerative prices for their produce.
- Improper post-harvest handling and lack of processing facilities.
- Farmers have been regularly affected by price slumps.
- Connectivity and transportation remain the biggest hurdles
- The awareness to fight pests insects and rodents were not given and farmer were not well trained
- Huge wastage while storing, because of inadequate cold storage systems and loss during transportation. Without any skilling, it becomes difficult for the farmers to get maximum possible output.

#### Conclusion

The horticulture sector has become one of the driving forces for overall development of agriculture sector. Its products have more demand in local, national and international markets. Despite significant growth in production, the yield growth rate of fruit was not very impressive. Therefore, it calls for technological innovation in the sector.

**2. What do you understand by the ‘intensity’ and ‘productivity’ of agriculture? In the Indian context, explain the significance of intensive cultivation and suggest measures to improve the productivity of cultivation.**

**Introduction**

India's economic security continues to be predicated upon the agriculture sector where agriculture supports 50% of the population, as against about 75% at the time of independence. In the same period, the contribution of agriculture and allied sector to the Gross Domestic Product (GDP) has fallen from 61 to 17%. Such a scenario has been due to the condition of 'intensity' and 'productivity' of agriculture in India

**Body**

- Cropping intensity refers to raising of a number of crops from the same field during one agricultural year; it can be expressed through a formula-
- $\text{Cropping Intensity} = \frac{\text{Gross Cropped Area}}{\text{Net Sown Area}} \times 100$
- Thus, higher cropping intensity means that a higher proportion of the net sown area is being cropped more than once during one agricultural year. This also implies higher productivity per unit of arable land during one agricultural year.
- Productivity of Agriculture is defined as the amount of crops production in per unit land. It can be expressed in formulaic form as-
- $\text{Agriculture productivity} = \frac{\text{Total agriculture crop production}}{\text{Total land area}}$
- Productivity levels in Indian agriculture in very low as compared to the productivity levels of other countries. In terms of global rank, the productivity levels of India in major agricultural crops is very disappointing.

At the same time, Intensive farming is associated with the increasing use of labour, high yielding varieties of crops, chemical and natural fertilizers, insecticides, pesticides and irrigation. The significance of intensive cultivation in India can be seen from the following points:

- Population of India- The extreme population pressure necessitates employing intensive cultivation on a large scale. (2011 census - 1.21 billion population of India)
- Land Fragmentation- Average land holding size has been constantly on decline in India since independence with 1.1 hectare being the present average land holding size.

**Table 3: Productivity of Land in Some Countries (2002)**  
(100 kgs per hectare)

Crop	Productivity	Crop	Productivity
<i>Wheat</i>		<i>Seed Cotton</i>	
U.K.	80.4	China	39.8
France	74.5	U.S.A.	19.0
China	38.9	Pakistan	18.7
India	27.7	India	7.5
Crop	Productivity	Crop	Productivity
<i>Rice (Paddy)</i>		<i>Groundnut (in shell)</i>	
U.S.A.	73.7	U.S.A.	28.7
Japan	65.8	China	29.9
China	62.7	Argentina	23.3
India	29.1	India	7.6

- Crop rotation and mixed cropping- Intensive cultivation helps in the suitable arrangement of successive crops in such a way that the different crops draw nutrients in different proportions or from different strata. Mixed cropping helps in similar manner.
- Use of Fast Maturing Varieties- These varieties can enable growing of more than one -crop within one growing season.
- Appropriate Plant Protection- Intensive cultivation helps in measures to use of pesticides and insecticides, seed treatment, weed control, rodent control measures, etc. These measures are effective when all the farmers in an area take these up collectively.
- Substantial Improvement in Yield- can be attained through soil improvement measures, such as land leveling, sloping, contour bunding, terracing, removal of salinity and alkalinity, etc.
- Others- Agricultural intensity could also important with regards to animal husbandry and fishery supplementing or complementing the crops grown.

Present scenario of Indian agriculture makes intensive agriculture an important part of agriculture growth story but it would be incomplete without commensurate improvements in the productivity of cultivation. Consequently, following measures can be considered to improve the productivity of cultivation in India:

- Proper Implementation of Land Reforms- Proper implementation of land reforms and land tenure system can bring up the productivity rate of Indian agriculture.
- Proper Education- Positive efforts have been taken by the government to educate the illiterate poor farmers about the new methods of technical farming.
- Adequate Land Water Resources- 329 million hectares of land is degraded in India. Hence an integrated and efficient management of our land is very necessary.
- Package Programme- Proper implementation of 'Package Programme (i.e. irrigation, high yielding variety seeds chemical fertilizers, modern machineries etc. is necessary to increase the productivity of the soil.
- Crop Protection- According to agricultural scientists in India nearly 5% of the total crop production are destroyed by different insects, pests and diseases. Maximum farmers are ignorant about the use of insecticides and pesticides.
- Research and Development- Government of India made Indian Council of Agricultural Research and several Agricultural Universities to organize several research and development programme for the improvement of cultivation.
- Focus on Information and Communication Technology (ICT)- enabled extension services, which play a crucial role in supporting agricultural activities by taking research, technology and know-how to farmers to improve adoption.
- Soil and Seeds- Improving soil health and considering improving the availability of certified seeds can help productivity improvement measures.

## Conclusion

Improving agricultural productivity is important in order to improve farmer incomes. Also the phenomenal benefits of focusing on improving intensity of agriculture highlight the need to prioritize policies that will achieve the most for farmers. Such a multi-pronged effort can help in achieving the goal of doubling farmers income by 2022.

**3. Plantation agriculture has got immense potential to be a source of gainful employment? Do you agree? Substantiate. Also, examine the need of developing efficient backward and forward linkages for improving the export of plantation products.**

## Introduction

Plantation agriculture are the crops which are grown commercially on a large area as cash crops. Tea, coffee, rubber, coconut are examples of plantation crops. Plantation crops being highly remunerative has immense scope for generating employment.

## Body

### Potential to be a source of gainful employment:

- Floriculture has immense potential for generating gainful self-employment among small and marginal farmers who can act as intermediaries for floriculture products such as cut flowers, pot plants, cut foliage which has demand worldwide.
- Most of the plantation crops like tea, coffee etc., are labour intensive who are involved in planting the samplings, plucking and later works till the product reaches the market.
- Indian agriculture is mainly characterised by disguised unemployment. If Plantation crops like rubber, horticulture replace some crops like wheat, paddy - it can reduce it as more workers are required in those sectors.
- Plantation crops are intermediary raw material for processed food. For instance, tomato for ketchup. Thus, it can generate employment in those sectors as well.
- The skills required in plantation is less and thus it can provide employment to unskilled and semi-skilled labourers. Also, the wage rate is less compared to other agriculture allied sector and hence it remains labour intensive.

### Need of developing efficient backward and forward linkages:

Indian plantation sector is constrained by low productivity, high cost of production, huge post-harvest losses, inefficient supply chain and poor market intelligence. Thus, there is a need to develop efficient backward and forward linkages which makes exports of plantation crops competitive.

- Land availability: promotion of practices like co-operative farming, land pooling etc., will help in growing plantation crops on a large area. This in turn will help in capital investment which is a necessity for plantation agriculture.
- Contract farming: This will help in adoption of latest technology, modern variety high quality seeds with support from private sector. This will help in high quality processed food products which have international demand and increase our exports. E.g. Pepsi collaborated with Punjab for orange procurement.
- Infrastructure development like road to transport will reduce the cost of final products which makes the plantation crops competitive in international market.
- Warehousing facility and cold storage will reduce the wastage of plantation crops off-season or during transportation which now stands as much as 30%. This reduction will result in surplus and to preservation the raw materials for longer durations for exports.
- Testing and standardisation facility: will help in grading the final product according to international requirements and hence will help in exporting to multiple countries. At present several countries including USA and some countries of Europe restrict Indian exports for lack of grade certification.
- e-marketing or supermarkets etc., will help in reducing the number of intermediaries and thus, making the plantation products competitive in international market.
- Chilling infrastructure: will help in transportation of plantation crops like flowers, fruits etc., into different countries without getting rotten. Thus, it helps in exports.

### Conclusion

Ashok Dalwai committee suggested mega food parks with sufficient backward and forward linkages which will help in agricultural exports. This applies to plantation sector as well. Further, High variety seeds, technology adoption along with support to farmers through schemes like PM Krishi Sampada Yojana etc., will help not only in making the horticulture sector remunerative, but also in generating employment directly and indirectly.

**4. Discuss the provisions of the Pradhan Mantri Krishi Sinchai Yojana. What are the challenges in its effective implementation? Examine.**

### Introduction

Government of India is committed to accord high priority to water conservation and its management. To this effect Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) has been formulated with the vision of extending the coverage of irrigation 'Har Khet ko pani' and improving water use efficiency 'More crop per drop' in a focused manner

with end to end solution on source creation, distribution, management, field application and extension activities.

### Body

#### PMKSY

has been formulated amalgamating ongoing schemes viz. 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).

#### Various Provisions of PMKSY

Provision has been made under PMKSY during 2015-16 for carrying out extension activities in the field with special focus on water harvesting, water management and crop alignment for farmers and grass root level field functionaries. Main component are as under:

- Accelerated Irrigation Benefit Programme (AIBP) & Command Area Development & Water Management (CADWM): To focus on faster completion of ongoing Major and Medium Irrigation, including National Projects.
- PMKSY (Har Khet ko Pani): Source augmentation, distribution, ground water development, lift irrigation, diversion of water from water plenty to water scarce areas, supplementing rain water harvesting beyond IWMP & MGNREGA, repair, restoration, renovation of traditional water bodies
- PMKSY(Per Drop More Crop): Micro level storage structures, efficient water conveyance & application, precision irrigation systems, topping up of input cost beyond MGNREGA permissible limits, secondary storage , water lifting devices, extension activities, coordination & management.
- PMKSY (Watershed): Ridge area treatment, drainage line treatment, soil and moisture conservation, water harvesting structure, livelihood support activities and other watershed works.

#### Challenges:

- Per Drop More Crop” requires higher investment to introduce costly sprinklers and drip irrigation which small landowning farmers cannot afford.
- Using treated waste water for peri urban and rural agricultural area is not feasible due to lack of adequate waste water treatment plants.
- The PMKSY contradicts the National Water Policy-2012, formulated by the government itself. While NWP-2012 aims at management of water from the perspective of hydrological unit, that is, river basin or sub-basin or watershed, PMKSY envisages water management at the level of the district — a lower order political boundary of governance.
- Wherever the watershed is divided by several districts, there could be several plans within a single watershed tearing up the watershed in different

directions. So, even before the start of the programme, the contradiction of hydrological unit versus district as a unit will torpedo the envisioned objectives of PMKSY.

- The requirement of agencies to possess land first before funding is not in the scheme of PMKSY. Therefore, two of its sub-components, namely AIBP and 'Har Khet Ko Pani' could be adversely affected and can fall short of the target.
- It's a bureaucratic mess. While specialists are the pillars of innovation and manufacturing in advanced countries, the PMKSY is loaded with generalists in the bureaucracy. The engineering component has been emasculated.
- There is also no reference to accountability when there is a failure to meet targets or to formulate any district plans.

### Conclusion

The government can implement a project through its agencies or through an NGO, but once they finish, who remains to sustain it? If local Panchayati Raj leadership and watershed user associations are not strengthened and empowered, any benefits will be cyclical and short-term only.

**5. What do you understand by the concept of 'more crop per drop'? Discuss. How do various micro irrigation techniques help in this regard? Explain.**

### Introduction

Government of India is committed to accord high priority to water conservation and its management. To this effect Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) has been formulated with the vision of extending the coverage of irrigation 'Har Khet ko pani' and improving water use efficiency 'More crop per drop' in a focused manner with end to end solution on source creation, distribution, management, field application and extension activities.

### Body

#### Concept of 'more crop per drop'

- As part of Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) Government of India has been implementing Centrally Sponsored Scheme on Micro Irrigation with the objective to enhance water use efficiency in the agriculture sector by promoting appropriate technological interventions like drip & sprinkler irrigation technologies and encourage the farmers to use water saving and conservation technologies.
- "Per Drop More Crop", an integral component of PMKSY focuses on maximizing water use efficiency at the farm level. Major activities under Per Drop More Crop can be categorized into "Micro Irrigation" including Drip, Sprinkler, Micro Sprinklers etc; and "Supplementary Water Management Activities (SWMA)/ Other Interventions".



- SWMA activities include farm level secondary storage structures such as individual or community water storage, Drought proofing structures such as water harvesting or recharge or ground water development, renovation of existing water bodies, enhancing water conveyance efficiency and water lifting devices.
- Pattern of assistance to beneficiaries under the component will be 55% for small and marginal farmers and 45% for other farmers. Funding pattern is 60% from the Central Government and 40% from the State. For North East and Himalayan States, the cost share is 90: 10 from the Centre and State. For UTs, the programme is funded 100% by the Central Government.

#### Various micro irrigation techniques and their help in realizing 'more crop per drop'

- **Drip irrigation system** also known as 'trickle irrigation system', is a method of applying the required amount of water directly to the root zones of plants through drippers or emitters at frequent intervals. In this system, water is applied drop-by-drop or by a micro jet on the soil surface or sub-surface at a rate lower than the infiltration rate of the soil.
- **Sprinkler irrigation system** is a method of applying water in a manner similar to rain. It is suited for most row, field and tree crops. Water can be sprayed over or under the crop canopy.
- **Sub-surface drip fertigation system** combined with conservation agriculture approaches used at least 40 percent less water and needed 20 percent less Nitrogen-based fertilizer, for the same amount of yields under flood irrigation, and still be cost-effective for farmers. Sub-surface drip fertigation systems involve belowground pipes that deliver precise doses of water and fertilizer directly to the plant's root zone, avoiding evaporation from the soil. The proposed system can work for both rice and wheat crops without the need to adjust pipes between rotations, saving money and labor.
- Water requirement in drip or sprinkler irrigation is much less as compared to any other conventional method of irrigation. This is because of irrigation of a smaller portion of land, decreased evaporation from the soil surface and reduction or elimination of run-offs. Waterlogging, which occurs under flat surface flood irrigation, is rare in case of micro irrigation. Since micro irrigation system allows high level of water control application, water can be applied only when needed and losses due to deep percolation can be minimized or avoided. Micro irrigation can reduce water usage by 25–40 per cent as compared to overhead systems and 45–60 per cent as compared to surface irrigation
- Micro irrigation systems ensure uniform water application. Therefore, all plants in a field receive equal amount of water. Higher uniformity results in efficient irrigation, thereby, causing less wastage of water, power and fertilisers. Consistent water application results in better and uniform crop yields as each plant is given the required amount of water and nutrients for optimum growth.
- Improves chemical application Micro irrigation system can apply chemicals to plants through fertigation unit. 'Fertigation' is the application of fertilisers used for making soil amendments in order to improve plant growth. Since the

fertilisers are applied directly to the root zones of the plants, a reduction in the total amount of fertiliser applied is possible, which saves an average of 25–50 per cent of the total cost. Micro irrigation systems apply the right fertiliser to the plants at a given time. Herbicides, insecticides and fungicides can also be applied through microirrigation systems, and thereby, help improve the crop yield.

- **Reduces weeds and diseases** Weeds compete with the crops for nutrients, moisture and sunlight, which can reduce the crop quality and the yield. These also serve as a habitat for diseases and insect-pests, which attack the main crop. Weed growth is inhibited in areas irrigated by drip irrigation as only a limited area gets irrigated. Hence, the threat of weeds and diseases is reduced.
- Drip and sprinkler irrigation systems are being promoted under “Per Drop More Crop” component of Pradhan Mantri Krishi Sinchayee Yojana (PMKSY). Under the scheme, 15% additional assistance is provided to small and marginal farmers for installation of micro irrigation systems compared to other farmers for area covered under Drought Prone Area Programme (DPAP), Desert Development Programme (DDP) and North Eastern and Himalayan States and 10% for other areas.
- As per available information, from Ministry of Agriculture & Farmers Welfare during the last three years (2013-14 to 2015-16), 14.3 lakh hectare area have been covered under drip and sprinkler irrigation systems (Drip Irrigation- 9.04 lakh hectare, Sprinkler Irrigation- 5.26 lakh hectare) in the country including Punjab and Haryana.

All the above data shows various micro irrigation techniques helping in realizing ‘per drop more crop’ in the country.

### Conclusion

Experts point out that the ‘per drop more crop’ an integral part of PMKSY, if implemented properly, will not only help in achieving India’s climate agenda for 2030 but will also provide various other social, economic and environmental co-benefits namely SDG1 (reducing poverty), SDG2 (increasing agricultural productivity), SDG 6 (judicious use of water), SDG8 (economic growth) and SDG12 (sustainable production).