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GUESS PAPER SERIES

SESSION -3

DATE- 27 July 2019

Agriculture & Associated Topics
(Paper-3)

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Page | 1

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Q1) What India can do to increase the Farmer's Income?

The Government has set a target of doubling of farmers' income by the year 2022. The Government has constituted an Inter-Ministerial Committee under the Chairmanship of Chief Executive Officer, National Rainfed Area Authority, Department of Agriculture, Cooperation and Farmers Welfare to examine issues relating to doubling of farmers' income and recommend a strategy to achieve doubling of farmers' income in real terms by the year 2022.

Parallely, the Government is aiming to reorient agriculture sector by focusing on income centeredness. In order to realise net positive returns for the farmer, schemes as follows, are being promoted and implemented in a major way through the States/UTs viz:- Soil Health Card (SHC) scheme; Neem Coated Urea (NCU); Pradhan Mantri Krishi Sinchayee Yojana (PMKSY); Paramparagat Krishi Vikas Yojana (PKVY); National Agriculture Market scheme (e-NAM); Pradhan Mantri Fasal Bima Yojana (PMFBY); National Food Security Mission (NFSM); Mission for Integrated Development of Horticulture (MIDH); National Mission on Oilseeds & Oilpalm (NMOOP); National Mission for Sustainable Agriculture (NMSA); National Mission on Agricultural Extension & Technology (NMAET) and Rashtriya Krishi Vikas Yojana (RKVY). In addition, schemes relating to tree plantation (Har Medh Par Ped), Bee Keeping, Dairy and Fisheries are also implemented. All these schemes are implemented to enhance production and productivity of agriculture and thereby enhance income of farmers.

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Minimum Support Price (MSP) is notified for both Kharif & Rabi crops based on the recommendations of the Commission on Agriculture Costs & Prices (CACP). The Commission collects & analyses data on cost of cultivation and recommends MSP.

Giving a major boost for the farmers' income, the Government has increased the Minimum Support Prices (MSPs) of all kharif crops for 2018-19 Season. This decision of the Government is a historic one as it redeems the promise of the pre-determined principle of fixing the MSPs at a level of at least 150 percent of the cost of production announced by the Union Budget for 2018-19.

Five ways to double farmers' income

There is a dire need to move away from the agri-production based model to a rural manufacturing based model

The Prime Minister's vision of doubling farmers income by 2022 is worth serious attention. This laudable objective could not only improve the well being of our farmers but can also be a trigger to boost agri-based manufacturing growth in rural India.

But it is also important to have a debate on how best to achieve this objective.

First we need to define our target. Doubling farmers' income implies increasing income from crop cultivation.

At the current 3-per-cent growth rate it would take 25 years to double farmers' income.

If a large number of agricultural households are connected to mass consumption markets — both domestic and global — the objective of doubling farm income doesn't seem daunting.

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The focus must shift from increasing per acre productivity to gainfully employing farm households in other farm-related activities.

The explosion of the services sector allowed that to happen in urban India. We need a similar catalyst for the lowest end of the income spectrum among rural households.

The goal should be to double incomes of rural, farm owning households in the bottom quartile income. A supplementary goal should be to use this effort to trigger a much needed boost to agriculture and to agri-related manufacturing.

An interesting experiment was taken up by the Gates Foundation in developing small-scale poultry farming around the villages of Itarsi. These poor households generated an annual supplementary income of around ₹50,000 per household. Solutions for doubling household income must centre around this "Itarsi Model".

There is the need to involve the under-employed adults in rural households in low-skilled non-crop activities that integrate output from these activities into the existing or future markets. Central to this approach is creating a market-place that supports a rural enterprise which is partly agricultural and partly non-agricultural.

The following five activities could be developed across India for booting rural incomes.

The menstrual hygiene market:

Thirty years ago, the shampoo market in India exploded, mainly driven by a spike in consumption due to a rupee denominated sachet, locally assembled in small units spread across rural areas in Tamil Nadu. Similarly, localising the assembling of sanitary napkins in small units set up by enterprising women in villages can create a rural-based production system that generates employment and creates basic industrial skills.

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Such enterprises can create supply chains and further employment generating economic activities. If 500,000 households in the poorest rural districts were brought into this production system, and each household produced up to 200 pads a day, realising ₹1 as conversion cost, that would lead to an incremental annual income of ₹60,000 per household.

Direct employment can be provided to 5 lakh women, and supporting employment from the household for another 2.5 lakh persons. The upstream employment generation potential for producing manual presses, the potential for repairs and maintenance of this equipment, additional employment for producing raw materials, storage and transportation of raw materials/finished goods and incremental income for the PDS network would be net incremental.

Goat rearing

On goat rearing, studies by various researchers point to the potential for net annual income of ₹1,200-1,300 per goat which can increase to ₹2,000 per goat through value addition to milk and leather processing. An average herd size of 10-15 goats can produce an annual income ₹12,000-19,000 per household which is also driven by the growing market for meat.

Collection of goat milk from above households and distribution through the milk co-operatives will create a large, broad-based collection, processing and storage infrastructure. Importantly goat rearing will integrate the most water-stressed regions into the milk grid. Including goat's milk into the mid-day meal scheme across India can create a massive market for goat milk and creates opportunities for setting up goat dairying infrastructure. There are opportunities in goat cheese production which is in great demand in overseas markets.

Goat hide is another opportunity for creating home-based production systems that engage the womenfolk and young adults. Leather garments, footwear, bags and wallets could be produced and marketed through organised retail both within and outside country.

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Honey production

The declining bee population is a cause of concern for agricultural scientists in India. Apart from helping in pollination of crops, apiaries can be a low-cost source of income for rural households. Each hive produces about 40 kg of honey. At ₹75 per kg, it has a revenue potential of ₹3,000 per hive. Each household can manage 10 to 15 hives to generate an annual income of ₹30,000-45,000 through this enterprise. A milk collection type system will ensure that the collected honey is processed, packaged and branded to international standards and made available to domestic retail outlets and for exports. Again, the mid-day meal scheme is an excellent outlet for providing this nutritional food to our children.

Value addition to crops

Some crops have great potential for value addition. Potato production in India has ranged between 45-48 million tonnes. Prices collapse when production touches the higher end of that range. If 5-7 mt were to be absorbed for use in the mid-day meals as processed potato flake-based products, a massive new food industrial segment would emerge.

Additionally, if the government were to mandate that all wheat flour sold in the country carries 5 per cent potato flour, the problem of glut in potato production can be overcome.

Kalahandi District, an under developed district, produces excellent quality turmeric. The curcumin content of that turmeric is of pharmaceutical grade. If pharma companies are incentivised to set up solvent-based extraction facilities in this district, it will increase the farm gate price for tribal farmers as they move from selling to spice traders to a value-added use of the turmeric.

Bio-fuel market:

Biofuel crops like Jatropha should be permitted for genetic modification for increased oil yields. Oil companies should help village entrepreneurs to set up

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collection and processing units for absorbing every kg of seed produced and the output blended with hydrocarbon fuels as done in Brazil.

Turning farm waste into fuel instead of burning is another worthwhile project. These will bring low income rural households into a commercial farming and encourage small enterprises for collection, processing and extraction of bio-fuels.

The current MSP driven model to increase farm income is not sustainable and does not increase productivity. The government should leverage the petroleum distribution network, the Army supply chain, the milk grid, and the mid-day meal scheme to re-orient existing subsidies towards developing markets for rural manufactured produce. This creates industrial jobs in rural India and generates employment and non-farm income for rural households.

A sudden withdrawal of subsidies will hurt the farmers, but creating industrial units in rural areas will create jobs and wean away the weakest from a debilitating, non-value creating model of dependency.

Why Double Farmers' Income?

Past strategy for development of the agriculture sector in India has focused primarily on raising agricultural output and improving food security. The net result has been a 45 per cent increase in per person food production, which has made India not only food self-sufficient at aggregate level, but also a net food exporting country.

The strategy did not explicitly recognise the need to raise farmers' income and did not mention any direct measure to promote farmers welfare. The net result has been that farmers income remained low, which is evident from the incidence of poverty among farm households.

Low level of absolute income as well as large and deteriorating disparity between income of a farmer and non-agricultural worker constitute an important reason for the emergence of agrarian distress in the country during 1990s, which turned

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quite serious in some years. The country also witnessed a sharp increase in the number of farmers suicides during 1995 to 2004 - losses from farming, shocks in farm income and low farm income are identified as the important factors for this. The low and highly fluctuating farm income is causing detrimental effect on the interest in farming and farm investments, and is also forcing more and more cultivators, particularly younger age group, to leave farming. This can cause serious adverse effect on the future of agriculture in the country.

It is apparent that income earned by a farmer from agriculture is crucial to address agrarian distress (Chand 2016) and promote farmers welfare. In this background, the goal set to double farmers' income by 2022-23 is central to promote farmers welfare, reduce agrarian distress and bring parity between income of farmers and those working in non-agricultural professions.

The concept and timeframe

Clarity on the following points is important to assess the possibility of doubling the income of the farmers. The substantive points are:

1. what is the period and targeted year for doubling the farm income;
2. what is to be doubled, is it output, value added or income earned by farmers from agricultural activities;
3. whether nominal income is to be doubled or real income is to be doubled; and
4. whether the targeted income includes only income derived from agricultural activities or would it also include income of farmers from other sources.

It is obvious that the targeted year to double the current income of the farmers or income for the agricultural year 2015-16 is by agricultural year 2022-23, which is

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seven years away from the base year 2015-16. And, if anything is to be doubled by the year 2022-23, it will require an annual growth rate of 10.4 per cent.

Again, it is important to clarify what is sought to be doubled. Is it the income of farmers, or the output or the income of the sector or the value added or GDP of agriculture sector? If technology, input prices, wages and labour use could result in per unit cost savings then farmers' income would rise at a much higher rate than the output. In nominal terms, the output became 2.65 times while farmers' income tripled in the seven years period. Therefore, doubling of farmers' income should not be viewed as same as doubling of farm output.

It is obvious that if inflation in agricultural prices is high, farmers income in nominal terms will double in a much shorter period. In a situation where non-agricultural prices do not rise, or, rise at a very small rate, the growth in farmers' income at real prices tends to be almost the same as in nominal prices. The government's intention seems to be to double the income of farmers from farming in real terms.

It is pertinent to mention that the latest data on number of cultivators is available only up to the year 2011-12. Therefore, while calculating per cultivator income, it is assumed that farm workers would continue their withdrawal from agriculture at the rate observed during 2004-05 to 2011-12. Presently, per cultivator income has been estimated as Rs 1,20,193 at current market prices.

Sources of Growth in Farmers' Income

Doubling real income of farmers till 2022-23 over the base year of 2015-16, requires annual growth of 10.41 per cent in farmers income. This implies that the on-going and previously achieved rate of growth in farm income has to be sharply accelerated. Therefore, strong measures will be needed to harness all possible sources of growth in farmers' income within as well as outside agriculture sector.

The major sources of growth operating within agriculture sector are:

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1. improvement in productivity
2. resource use efficiency or saving in cost of production
3. increase in cropping intensity
4. diversification towards high value crops

The sources outside agriculture include:

1. shifting cultivators from farm to non-farm occupations, and
2. improvement in terms of trade for farmers or real prices received by farmers.

Strategy for Improving Farmers' Income

The sources of growth in output and income can be put in four categories.

1. Development initiatives including infrastructure
2. Technology
3. Policies and
4. Institutional mechanisms

Roadmap and Action Plan

The quantitative framework for doubling farmers income has identified seven sources of growth. These are:

1. Increase in productivity of crops
2. Increase in production of livestock
3. Improvement in efficiency of input use (cost saving)
4. Increase in crop intensity

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5. Diversification towards high value crops
6. Improved price realization by farmers
7. Shift of cultivators to non-farm jobs

Doubling farmers income by 2022 is quite challenging but it is needed and is attainable.

Three pronged strategy focused on

- (i) development initiatives,
 - (ii) technology and
 - (iii) policy reforms in agriculture is needed to double farmers income.
- The rates of increase in sources underlying growth in output need to be accelerated by 33 per cent to meet the goal.
 - The country need to increase use of quality seed, fertiliser and power supply to agriculture by 12.8, 4.4 and 7.6 per cent every year.
 - Area under irrigation has to be expanded by 1.78 million hectare and area under double cropping should be increased by 1.85 million hectare every year.
 - Besides, area under fruits and vegetables is required to increase by 5 per cent each year.
 - In the case of livestock, improvement in herd quality, better feed, increase in artificial insemination, reduction in calving interval and lowering age at first calving are the potential sources of growth.

Research institutes should come with technological breakthroughs for shifting production frontiers and raising efficiency in use of inputs. Evidence is growing

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about scope of agronomic practices like precision farming to raise production and income of farmers substantially. Similarly, modern machinery such as laser land leveller, precision seeder and planter, and practices like SRI (system of rice intensification), direct seeded rice, zero tillage, raised bed plantation and ridge plantation allow technically highly efficient farming. However, these technologies developed by the public sector have very poor marketability. They require strong extension for the adoption by farmers. R&D institutions should also include in their packages grassroots level innovations and traditional practices which are resilient, Sustainable and income enhancing.

ICAR and SAUs should develop models of farming system for different types of socioeconomic and bio physical settings combining all their technologies in a package with focus on farm income. This would involve combining technology and best practices covering production, protection and post-harvest value addition for each sub systems with other sub systems like crop sequences, crop mix, livestock, horticulture, forestry. Such shift requires interdisciplinary approach to develop on knowledge of all disciplines.

About one third of the increase in farmers' income is easily attainable through better price realization, efficient post-harvest management, competitive value chains and adoption of allied activities. This requires comprehensive reforms in market, land lease and raising of trees on private land. Agriculture has suffered due to absence of modern capital and modern knowledge. There is a need to liberalise agriculture to attract responsible private investments in production and market. Similarly, FPOs and FPCs can play big role in promoting small farm business. Ensuring MSP alone for farm produce through competitive market or government intervention will result in sizeable increase in farmers' income in many states.

Most of the development initiatives and policies for agriculture are implemented by the States. States invest much more than the outlay by the Centre on many

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development activities, like irrigation. Progress of various reforms related to market and land lease are also State subjects. Therefore, it is essential to mobilise States and UTs to own and achieve the goal of doubling farmers' income. If concerted and well-coordinated efforts are made by the Centre and all the States and UTs, the Country can achieve the goal of doubling farmers' income by the year 2022.

Broad Strategy for Improving Farmers Income

- Improvement in agricultural output viz:
 - Productivity - Area- agricultural output has to be increased through access to irrigation and technological advancement.
- Resource use efficiency or saving in cost of production;
- Increase in cropping intensity, i.e. the ratio of Net Area Sown to the Total Cropped Area - By raising short duration crops after the main kharif and after the main rabi season so that agricultural land does not remain unused for half of the productive period.
- Diversification:
 - Towards high value crops like fruits, vegetables, fiber, condiments & spices and sugarcane.
 - Towards other allied enterprises like forestry, dairing rather than depending primarily on crop cultivation.
- Shifting cultivators from farm to non-farm occupations - Non-farm sectors provide 2.76 times more productive employment than agriculture sector in rural areas

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- Improvement in terms of trade for farmers or real prices received by farmers- Use of CPIAL (Consumer price index for agricultural labour) as a deflator to change nominal farm income to real farm income.

Measures Taken by Indian Government

Institutional Reforms

- Pradhan Mantri Krishi Sinchai Yojana, Soil health card, and Prampragat Krishi Vikas Yojana- Aiming to raise output and reduce cost.
- Pradhan Mantri Fasal Bima Yojana- To provide insurance against crop and income loss and to encourage investment in farming.
- Interlinking of rivers - To raise output and farm incomes.
- **'Operation Greens'** to address price volatility of perishable commodities like Tomato, Onion and Potato (TOP).
- PM Kisan Sampada Yojana to promote food processing in a holistic manner.

Technological Reforms

- **Initiating E-NAM:** The National Agriculture Market (eNAM) is a pan-India electronic trading portal which networks the existing APMC mandis to create a unified national market for agricultural commodities.
- **Technology mission on cotton** which aims to increase the income of the cotton growers by reducing the cost of cultivation as well as by increasing the yield per hectare through proper transfer of technology to the growers.
- **Technology Mission on Oilseeds, Pulses and Maize (TMOPM)**
 - The schemes implemented under TMOP are:
 - Oilseeds Production Programme (OPP)

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- National Pulses Development Project (NPDP)
 - Accelerated Maize Development Programme (AMDP)
 - Post Harvest Technology (PHT)
 - Oil Palm Development Programme (OPDP)
 - National Oilseeds and Vegetable Oils Development Board (NOVOD)
- **Mission for Integrated Development of Horticulture (MIDH)** a scheme for the holistic growth of the horticulture sector covering fruits, vegetables, root & tuber crops, mushrooms, spices, flowers, aromatic plants, coconut, cashew, cocoa and bamboo.
 - **Sugar Technology Mission** – aimed at reducing the cost of production of sugar and improving sugar quality through steps for improvements in productivity, energy conservation and improvements in capital output ratio.
 - **National Mission on Sustainable Agriculture** – aim at promoting sustainable agriculture through a series of adaptation measures focusing on ten key dimensions encompassing Indian agriculture namely; ‘Improved crop seeds, livestock and fish cultures’, ‘Water Use Efficiency’, ‘Pest Management’, ‘Improved Farm Practices’, ‘Nutrient Management’, ‘Agricultural insurance’, ‘Credit support’, ‘Markets’, ‘Access to Information’ and ‘Livelihood diversification’.
 - In addition, schemes relating to tree plantation (Har Medh Par Ped), Bee Keeping, Dairy and Fisheries are also implemented.

Suggestions

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- The country need to increase use of quality seed, fertiliser and power supply to agriculture.
- Area under irrigation has to be expanded by 1.78 million hectare and area under double cropping should be increased by 1.85 million hectare every year.
- Besides, area under fruits and vegetables is required to increase by 5 per cent each year.
- In the case of livestock, improvement in herd quality, better feed, increase in artificial insemination, reduction in calving interval and lowering age at first calving are the potential sources of growth.
- Adoption of agronomic practices like precision farming to raise production and income of farmers substantially.
- About one third of the increase in farmers' income is easily attainable through better price realization, efficient post-harvest management, competitive value chains and adoption of allied activities. This requires comprehensive reforms in market, land lease and raising of trees on private land.
- Most of the development initiatives and policies for agriculture are implemented by the States. Therefore, it is essential to mobilise States and UTs to own and achieve the goal of doubling farmers' income.
- There is a need to liberalise agriculture to attract responsible private investments in production and market. Similarly, FPO (Farmers producer organization)/FPC (Farmers producer company) can play big role in promoting small farm business.

Way Forward

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- The low level of farmers' income and year to year fluctuations in it are a major source of agrarian distress.
- To secure future of agriculture and to improve livelihood of half of India's population, adequate attention needs to be given to improve the welfare of farmers and raise agricultural income.
- It is essential to mobilize States and UTs to own and achieve the goal of doubling farmers' income with active focus on capacity building (technology adoption and awareness) of farmers that will be the catalyst to boost farmers income.
- Since India is a diverse country where majority of agriculture is monsoon dependent therefore interventions are needed which includes research, technology promotion, extension, post harvest management, processing and marketing, in consonance with comparative advantage of each State/region and its diverse agro-climatic features; and then the Country can indeed achieve the goal of doubling farmers' income by the year 2022.

Conclusion

- The low level of farmers income and year to year fluctuations in it are a major source of agrarian distress. This distress is spreading and getting severe over time impacting almost half of the population of the country that is dependent on farming for livelihood. Persistent low level of farmers income can also cause serious adverse effect on the future of agriculture in the country. To secure future of agriculture and to improve livelihood of half of India's population, adequate attention needs to be given to improve the welfare of farmers and raise agricultural income. Achieving this goal will reduce persistent disparity between farm and non-farm income, alleviate agrarian distress, promote inclusive growth and infuse dynamism in the agriculture sector. Respectable income in farm sector will also attract youth

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towards farming profession and ease the pressure on non-farm jobs, Which are not growing as per the expectations.

Q2) Discuss the factors determining the agriculture pattern of India? How in present time it is changing?

Cropping pattern in India is determined mainly by rainfall, climate, temperature and soil type.

Technology also plays a pivotal role in determining crop pattern. Example, the adoption of High Yield Varieties Seeds along with fertilisers in the mid 1960's in the regions of Punjab, Haryana and Western Uttar Pradesh increased wheat production significantly.

The multiplicity of cropping systems has been one of the main features of Indian agriculture. This may be attributed to following two major factors:

1. Rainfed agriculture still accounts for over 92.8 million hectares or 65 percent of the cropped area. A large diversity of cropping systems exists under rainfed and dryland areas with an overriding practice of intercropping, due to greater risks involved in cultivating larger area under a particular crop.
2. Due to prevailing socio-economic situations (such as; dependency of large population on agriculture, small land-holding size, very high population pressure on land resource etc.), improving household food security has been an issue of supreme importance to many million farmers of India, who constitute 56.15 million marginal (<1.0 hectare), 17.92 million small (1.0-2.0

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hectare) and 13.25 million semi-medium (2.0-4.0 hectare) farm holdings, making together 90 percent of 97.15 million operational holdings.

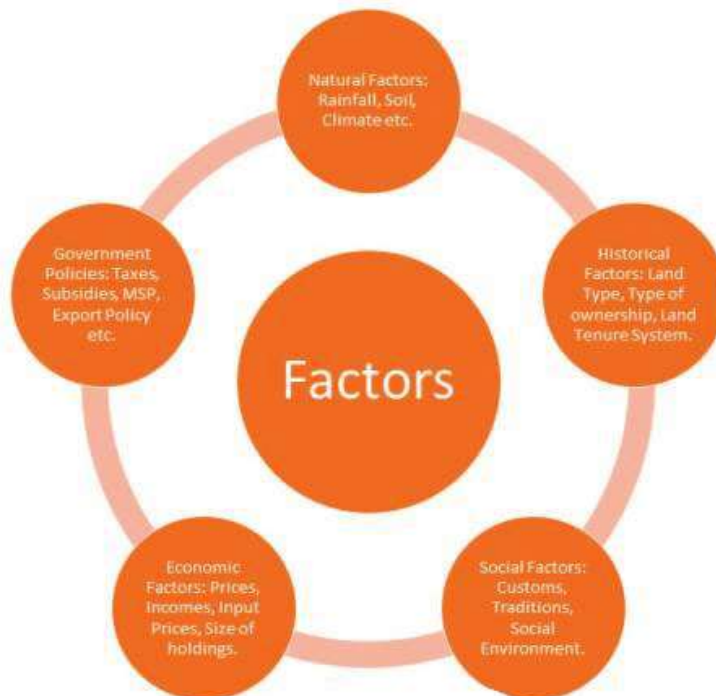
3. An important consequence of this has been that crop production in India remained to be considered, by and large, a subsistence rather than commercial activity.

Factors Determining Cropping Pattern in India



Cropping Pattern in India

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30 most important cropping patterns in India

Specific Issues Related to the Cropping Pattern

Crop Pattern	Region/State	Issues Related to Crop Pattern
Rice-Wheat	UP, Punjab, Haryana, Bihar, West Bengal, Madhya Pradesh.	Over the years there is stagnation in the production and productivity loses. The main reasons for stagnation are:

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		Over Mining of Nutrients from the soil. Declining Ground Water Table. Increase Pest Attacks and Diseases. Shortages of Labour. Inappropriate use of Fertilizers.
		The major issues in sustaining the productivity of rice-rice system are: Deterioration in soil physical conditions. Micronutrient deficiency. Poor efficiency of nitrogen use. Imbalance in use of nutrients. Non-availability of appropriate trans planter to mitigate labour shortage during the critical period of transplanting.
Rice-Rice	Irrigated and Humid coastal system of Orrisa, Tamil Nadu, Andhra Pradesh, Karnataka and Kerala.	
Rice-Groundnut	Tamil Nadu, Andhra Pradesh, Karnataka, Orrisa and Maharashtra.	The major issues in the pattern are: Excessive Rainfall and Water Logging. Non-availability of quality seeds. Limited expansion of Rabi Groundnut in Rice grown areas.
Rice-Pulses	Chhattisgarh, Orrisa and Bihar.	Factors limiting Productivity are: Droughts and Erratic Rainfall distribution.

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		Lack of Irrigation.
		Low coverage under HYV Seeds.
		Weed Attacks.
		Little attention to pest attacks and diseases.
		Marginalisation of land and Removal of Tribal from their own land.
		The Reason for Poor Yields are:
		Sowing Timing.
		Poor Weed Management.
		Poor Plant Varieties.
		Poor use of organic and inorganic fertilizers.
		Large area under Rain Fed Agriculture.
		Problems in Sugarcane-Wheat system are:
		Late Planting.
		Imbalance and inadequate use of nutrients.
		Poor nitrogen use efficiency in sugarcane.
Maize-Wheat	UP, Rajasthan, MP and Bihar	
Sugarcane-Wheat	UP, Punjab and Haryana accounts for 68% of the area under sugarcane. The other states which cover the crops are; Karnataka and MP.	

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Cotton-Wheat	Punjab, Haryana, West UP, Andhra Pradesh, Karnataka, Tamil Nadu.	Build-up of <i>Trianthema partu lacastrum</i> and <i>Cyprus rotundus</i> in sugarcane. The stubble of sugarcane pose tillage problem for succeeding crops and need to be managed properly. Problems in Cotton-Wheat system are: Delay Planting. Stubbles of cotton create the problem of tillage operations and poor tilth for wheat. Cotton Pest like Boll Worm and White Fly. Poor nitrogen use efficiency in cotton.
Soya bean-Wheat	Maharashtra, MP and Rajasthan	Constraints limiting the soybean production and productivity are: A relatively recent introduction of soybean as a crop. Limited genetic diversity. Short growing period available in Indian latitudes. Hindered agronomy/availability of inputs at the farm level.

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Rainfed nature of crop and water scarcity at critical stage of plant growth.

Insect pests and diseases, Quality improvement problems.

Inadequate mechanization and partial adoption of technology by farmers have been identified.

The major issues in Legume based system are:

Lack of technological advancement.

Loses due to erratic weather and waterlogging.

Diseases and Pests.

Low harvest index, flower drop, indeterminate growth habit and very poor response to fertilizers and water in most of the grain legumes.

Nutrient needs of the system have to be worked out considering N-fixation capacity of legume crops.

Legume Based

Cropping
Systems
(Pulses-
Oilseeds)

MP, Gujarat,
Maharashtra, Andhra
Pradesh and Karnataka.

Horticulture Crops in India

India has made a good place for itself on the Horticulture Map of the World with a total annual production of horticultural crops touching over 1490 million tones during 1999-00.

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The horticultural crops cover about 9 percent of the total area contributing about 24.5 percent of the gross agricultural output in the country. However, the productivity of fruits and vegetables grown in the country is low as compared to developed countries.

Vegetable Crops

Vegetable crops in India are grown from the sea level to the snowline. The entire country can broadly be divided into six vegetable growing zones:

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1. Temperate Zone : Jammu & Kashmir, Himachal Pradesh, upper Uttranchal and Punjab, Darjeeling hill area of West Bengal, Nilgiri hills areas of Tamil Nadu, Arunachal Pradesh and Sikkim.
 2. Northwestern subtropical zone : Haryana, parts of Punjab, Uttar Pradesh, Madhya Pradesh and Bihar.
 3. Northeastern subtropical zone : Most parts of Bihar, northern parts of West Bengal, Meghalaya, Assam and Nagaland.
 4. Central tropical zone : Gujarat, most parts of Madhya Pradesh, Maharashtra, Western part of West Bengal, Tripura, Manipur and part of Mizoram.
 5. Southern tropical zone : Andhra Pradesh, Karnataka, Tamil Nadu and part of Kerala.
 6. Coastal humid tropical zone : Coastal areas of Kerala, Andhra Pradesh, West Bengal and Orissa.
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Low productivity is the main feature of vegetable cultivation in India as farm yields of most of the vegetables in India are much lower than the average yield of the world and developed countries.

The productivity gap is more conspicuous in tomato, cabbage, onion, chilli and peas. The preponderance of hybrid varieties and protected cultivation are mainly responsible for high productivity in the developed countries.

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Constraints in vegetable production:

1. Lack of planning in Production
2. Non-availability of seeds of improved varieties.
3. High cost of basic production elements
4. Inadequate plant protection measures and non-availability of resistant varieties.
5. Weak marketing facilities
6. Transportation limits
7. Post-harvest losses
8. Abiotic stresses.

The following points highlight the four main factors determining cropping pattern in India. The factors are:

1. Physical Factors
2. Technical Factors.
3. Economic Factors.
4. Government Action.

Factor # 1. Physical Factors:

Cropping pattern of any particular region of the country is depending on its soil content, weather, climate, rainfall etc. As for example, in a wet area having chances of heavy rainfall and water-logging, people will like to cultivate rice whereas in a dry area, farmer can manage to cultivate coarse cereals like bajra, jowar etc.

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Factor # 2. Technical Factors:

The cropping pattern also depend upon the technical factors such as nature and capacity of irrigation facilities available in a region, availability of improved seeds, chemical fertiliser etc. With the development of irrigation facilities, the entire method of cultivation being followed from the traditional period is bound to change.

With this, new and better crop rotation system can be followed and new and superior crops also can be grown.

In India, due to the extension of irrigation facilities, the cultivation of sugarcane, tobacco, oilseeds etc. have increased substantially. Moreover, with the availability of irrigation water, even double or triple cropping is also successfully done. Again, in the absence of irrigation facilities in some other parts of the country, the concept of “dry land farming” is also gaining its importance in recent years.

Factor # 3. Economic Factors:

Economic factors are playing the major role in determining the cropping pattern in a country like India.

The following are some of the economic factors influencing the cropping pattern of our country:

(a) Price and income aspect:

Movement of price of agricultural products is having some correlation with the changes in cropping pattern. A remunerative and steady price of a particular crop will provide a better incentive to the producer to produce that crop and unremunerative price will induce the farmer to change the cropping pattern.

In India, fixed procurement price of wheat and rice and other controls imposed by the Government induced the farmers to shift to cash crops like sugarcane. Again,

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the un-remunerative prices of jute prevailing in Assam and other adjoining states also led to shift in the production of food crops.

Moreover, income maximisation aspect is also playing an important role in influencing the cropping pattern in the country. Relative profitability per acre is also having considerable influence on the cropping pattern of the country.

(b) Farm Size:

A good relationship also exists between farm size and cropping pattern. In a small farm, farmers are very much interested to produce food grains for household consumption. After meeting their own food requirements small farmers may go for cash crops in order to maximise their money income. On the other hand, in a big farm farmers like to follow that cropping pattern which maximise their income.

(c) Tenure:

Land tenure system prevailing in the country also influences the cropping pattern. In a system of crop sharing, it is the landlord who finalizes the cropping pattern guided by profit maximising principle.

(d) Availability of farm inputs:

Cropping pattern is also depending upon the farm inputs available viz., seeds, fertiliser, controlled and assured water supply through irrigation etc. and among these irrigation is the most important. Accordingly, the NCAER observed, "if additional irrigation facilities were provided in Punjab, the cropping pattern on as much as 3.4 million acre could be changed, of which nearly 1.6 million acre now under gram could be put to more paying crops."

Factor # 4. Government Action:

Cropping pattern may also be influenced by government action undertaken in the form of administrative and legislative measure. Supply of inputs by the

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government, intensive scheme for various crops, various government campaign like grow more food or any legislative provision by the government, transportation and marketing provision also help to finalize the cropping pattern in the country.

NCAER suggested certain measures for introducing a better and scientific cropping pattern which include:

(a) Like U.S.A., U.A.E., and other countries, the NCAER suggest to introduce legislative compulsion for structuring a desired cropping pattern in different region of the country.

(b) Government may appoint District Planning Officers who introduce crop planning in every season considering various seasonal changes and changes in other factors such as yields, policies, demand etc. The cultivators also should co-operate with various government departments for implementing their programme.

(c) An agricultural mechanisation corporation may also be set up for supplying various inputs on loans.

(d) The Government should also provide adequate transport and marketing facilities and also make provision for consolidation of holdings.

Thus, in conclusion, it can be said that economic factors are playing a dominant role in determining the cropping pattern in India. Although Indian farmers are very much poverty stricken and conservative still their cropping pattern can be changed through appropriate changes in economic motive.

Whenever farmers in India see a better cropping pattern they try to adjust with it. To adopt a better cropping pattern farmer should possess requisite volume of capital and know-how just for changing the cropping pattern in India.

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Q3) What are the government policies regarding agriculture?

Government of India is giving more priority for welfare of the farmers. In this regard it is implementing several farmers welfare schemes to revitalize agriculture sector and to improve their economic conditions. Therefore, the government has rolled out new initiatives, schemes, programmes and plans to benefit all the farmers.

1. Soil Health Card Scheme

Launched in 2015, the scheme has been introduced to assist State Governments to issue Soil Health Cards to all farmers in the country. The Soil Health Cards provide information to farmers on nutrient status of their soil along with recommendation on appropriate dosage of nutrients to be applied for improving soil health and its fertility.

2. National Mission for Sustainable Agriculture (NMSA)

NMSA is one of the eight Missions under National Action Plan on Climate Change (NAPCC). It aims at promoting Sustainable Agriculture through climate change adaptation measures, enhancing agriculture productivity especially in rainfed areas focusing on integrated farming, soil health management, and synergizing resource conservation.

NMSA as a programmatic intervention caters to Mission Deliverables that focuses mainly on conservation agriculture to make farm sector more productive,

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sustainable, remunerative and climate resilient by promoting location specific integrated/composite farming systems.

Schemes under NMSA

- Rainfed Area Development (RAD): RAD is being implemented by RFS Division.
- Soil Health Management (SHM): SHM is being implemented by INM Division
- Sub Mission on Agro Forestry (SMAF): SMAF is being implemented by NRM Division
- Paramparagat Krishi Vikas Yojana (PKVY): PKVY is being implemented by INM Division
- Soil and Land Use Survey of India (SLUSI): Being implemented by RFS Division
- National Rainfed Area Authority (NRAA): Being implemented by RFS Division
- Mission Organic Value Chain Development in North Eastern Region (MOVCDNER): Being implemented by INM Division
- National Centre of Organic Farming (NCOF): Being implemented by INM Division
- Central Fertilizer Quality Control and Training Institute (CFQC&TI): implemented by INM Division

3. Neem Coated Urea (NCU)

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This scheme is initiated to regulate use of urea, enhance availability of nitrogen to the crop and reduce cost of fertilizer application. NCU slows down the release of fertilizer and makes it available to the crop in an effective manner. The entire quantity of domestically manufactured and imported urea is now neem coated. It reduces the cost of cultivation and improves soil health management.

4. Pradhan Mantri Krishi Sinchai Yojana (PMKSY)

It was launched on 1st July, 2015 with the motto of 'Har Khet Ko Paani' for providing end-to-end solutions in irrigation supply chain, viz. water sources, distribution network and farm level applications.

PMKSY not only focuses on creating sources for assured irrigation, but also creating protective irrigation by harnessing rain water at micro level through 'Jal Sanchay' and 'Jal Sinchan'.

Micro irrigation is to be popularised to ensure 'Per drop-More crop'. PMKSY adopts State level planning and projectised execution that allows States to draw up their own irrigation development based on District Irrigation Plans and State Irrigation Plans.

Components:

- Accelerated Irrigation Benefit Programme(AIBP): implemented by Ministry of Water Resources, RD & GR.
- PMKSY (Har Khet ko Pani): implemented by Ministry of Water Resources, RD & GR
- PMKSY (Watershed): implemented by Department of Land Resources.
- PMKSY(Per Drop More Crop - PDMC)

5. Paramparagat Krishi Vikas Yojana (PKVY)

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It is implemented with a view to promote organic farming in the country. To improve soil health and organic matter content and increase net income of the farmer so as to realise premium prices. Under this scheme, an area of 5 lakh acre is targeted to be covered through 10,000 clusters of 50 acre each, from the year 2015-16 to 2017-18.

6. National Agriculture Market (e-NAM)

It provides e-marketing platform at national level and support creation of infrastructure to enable e-marketing.

This innovative market process is revolutionizing agriculture markets by ensuring better price discovery. It brings in transparency and competition to enable farmers to get improved remuneration for their produce moving towards 'One Nation One Market'.



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7. Micro Irrigation Fund (MIF)

A dedicated MIF created with NABARD has been approved with an initial corpus of Rs. 5000 crore (Rs. 2000 crore for 2018-19 & Rs. 3000 crore for 2019-20) for encouraging public and private investments in Micro irrigation. The main objective of the fund is to facilitate the States in mobilizing the resources for expanding coverage of Micro Irrigation.

MIF would not only facilitate States in incentivizing and mobilizing resources for achieving the target envisaged under PMKSY-PDMC but also in bringing additional coverage through special and innovative initiatives by State Governments.

An Advisory Committee has been set up to provide policy direction and ensure effective planning, coordination and monitoring of the Micro Irrigation Fund.

8. Agriculture Contingency Plan

Central Research Institute for Dryland Agriculture (CRIDA), ICAR has prepared district level Agriculture Contingency Plans in collaboration with state agricultural universities using a standard template to tackle aberrant monsoon situations leading to drought and floods, extreme events (heat waves, cold waves, frost, hailstorms, cyclone) adversely affecting crops, livestock and fisheries (including horticulture).

Total 614 district agriculture contingency plans are placed in the 'farmer portal' of the Ministry of Agriculture and Farmers Welfare, Government of India (<http://www.farmer.gov.in>) and also in the ICAR / CRIDA website (<http://www.crida.in>) for downloading the full plan by stakeholders for operational use.

9. Rainfed Area Development Programme (RADP)

Rainfed Area Development Programme (RADP) was implemented as a sub-scheme under Rashtriya Krishi Vikas Yojana (RKVY).

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Aim

- To improve quality of life of farmers' especially, small and marginal farmers by offering a complete package of activities to maximize farm returns.
- Increasing agricultural productivity of rainfed areas in a sustainable manner by adopting appropriate farming system based approaches.
- To minimise the adverse impact of possible crop failure due to drought, flood or un-even rainfall distribution through diversified and composite farming system.
- Restoration of confidence in rainfed agriculture by creating sustained employment opportunities through improved on-farm technologies and cultivation practices
- Enhancement of farmer's income and livelihood support for reduction of poverty in rainfed areas and

10. National Watershed Development Project for Rainfed Areas (NWDPR)

The scheme of National Watershed Development Project for Rainfed Areas (NWDPR) was launched in 1990-91 based on twin concepts of integrated watershed management and sustainable farming systems.

Aim

- Conservation, development and sustainable management of natural resources.
- Enhancement of agricultural production and productivity in a sustainable manner.
- Restoration of ecological balance in the degraded and fragile rainfed ecosystems by greening these areas through appropriate mix of trees, shrubs and grasses.

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- Reduction in regional disparity between irrigated and rainfed areas and;
- Creation of sustained employment opportunities for the rural community including the landless.

11. Pradhan Mantri Fasal Bima Yojana (PMFBY)

PMFBY is an actuarial premium based scheme under which farmer has to pay maximum premium of 2% for Kharif, 1.5% for Rabi food & oilseed crops and 5% for annual commercial/horticultural crops and remaining part of the actuarial/bidded premium is shared equally by the Centre and State Government. One of the objectives of the scheme is to facilitate prompt claims settlement. The claims must be settled within two months of harvest subject to timely provision of both yield data and share of premium subsidy by the State Government.

12. Livestock insurance Scheme

It aims to provide protection mechanism to the farmers and cattle rearers against any eventual loss of animals due to death. The scheme also demonstrates the benefit of the insurance of livestock to the people and popularizes it with the ultimate goal of attaining qualitative improvement in livestock and their products.

13. National Scheme on Welfare of Fishermen

This scheme was launched to provide financial assistance to fishers for construction of house, community hall for recreation and common working place. It also aims to install tube-wells for drinking water and assistance during lean period through saving cum relief component.

14. Scheme on Fisheries Training and Extension

It was launched to provide training for fishery sector so as to assist in undertaking fisheries extension programmes effectively.

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15. Gramin Bhandaran Yojna

Objective of this Scheme:

- Create scientific storage capacity with allied facilities in rural areas.
- To meet the requirements of farmers for storing farm produce, processed farm produce and agricultural inputs.
- Promotion of grading, standardization and quality control of agricultural produce to improve their marketability.
- Prevent distress sale immediately after harvest by providing the facility of pledge financing and marketing credit by strengthening agricultural marketing infrastructure in the country.

16. National Agricultural Higher Education Project (NAHEP)

• The Indian Council of Agricultural Research (ICAR) has recently launched Rs 1100 crore ambitious National Agricultural Higher Education Project (NAHEP).

• **Key highlights:**

o **Aim:** To attract talent and strengthen higher agricultural education in the country.

o Funded by the World Bank and the Indian Government on a 50:50 basis.

o The objective of the NAHEP for India is to support participating agricultural universities and ICAR in providing more relevant and higher quality education to Agricultural University students.

o In addition, a four-year degree in Agriculture, Horticulture, Fisheries and Forestry has been declared a professional degree.

17. Online Portal "ENSURE"

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- Union Minister of Agriculture and Farmers' Welfare launched a portal ENSURE – National Livestock Mission-EDEG developed by NABARD and operated under the Department of Animal Husbandry, Dairying & Fisheries.
- Entrepreneurship Development and Employment Generation (EDEG):
 - o Under the Mission's component EDEG, subsidy payment for activities related to poultry, small ruminants, pigs etc., through Direct Benefit Transfer (DBT) goes directly to the beneficiary's account.
 - o To make it better, simpler and transparent, the NABARD has developed an online portal "ENSURE" which makes the information related to beneficiary and processing of application readily available.
- Benefits:
 - o The flow of information/funds will be quicker and more accountable.
 - o The burden of extra interest due to delay in the disbursement of the subsidy would now be reduced.
 - o Accessing the portal will be on real-time basis and list of beneficiaries can be easily prepared

18. Pradhan Mantri Annadata Aay Sanrakshana Abhiyan (PM-AASHA)

- The Union Cabinet approved a new Umbrella Scheme "Pradhan Mantri Annadata Aay Sanrakshana Abhiyan" (PM-AASHA). The Scheme is aimed at ensuring remunerative prices to the farmers for their produce as announced in the Union Budget for 2018.
- The umbrella scheme 'PM-AASHA' comprises three sub-schemes:
 - o Price Support Scheme (PSS).
 - o Price Deficiency Payment Scheme (PDPS).
 - o Pilot of Private Procurement & Stockist Scheme (PPPS).
- Price Support Scheme (PSS):
 - o Under the scheme, the physical procurement of pulses, oilseeds and Copra will be done by Central Nodal Agencies with the proactive role of the state governments.
 - o Further, in addition to NAFED, the

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Food Cooperation of India (FCI) will take up PSS operations in states and districts.

o The procurement expenditure and losses due to procurement will be borne by the Union Government as per norms.

- Price Deficiency Payment Scheme (PDPS): o Under the scheme, it is proposed to cover all oilseeds for which minimum support price (MSP) is notified. o In this, direct payment of the difference between the MSP and the selling/modal price will be made to pre-registered farmers selling his produce in the notified market yard through a transparent auction process. o All payments will be done directly into the registered bank account of the farmer. o This scheme does not involve any physical procurement of crops as farmers are paid the difference between the MSP price and sale or modal price on disposal in the notified market.

- Pilot of Private Procurement & Stockist Scheme (PPPS): o For oilseeds, the states will have the option to roll out Private Procurement Stockist Scheme (PPSS) on pilot basis in selected districts and Agricultural Produce Market Committee's (APMC) of district involving the participation of private stockiest. o The pilot district and selected APMC(s) will cover one or more crop of oilseeds for which MSP is notified. o Since this is similar to the PSS scheme, as it involves physical procurement of the notified commodity, the scheme shall substitute PSS/PDPS in the pilot districts. o The selected private agency shall procure the commodity at MSP in the notified markets during the notified period from the registered farmers in accordance with the PPSS Guidelines, whenever the prices in the market fall below the notified MSP and whenever authorised by the state or UT government to enter the market. The maximum service charges up to 15% of the notified MSP will be payable.

19. Pradhan Mantri Kisan Samman Nidhi:

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- Under this programme, **vulnerable landholding farmer families, having cultivable land upto 2 hectares**, will be provided direct income support at the rate of Rs. 6,000 per year.
- This income support will be transferred directly into the bank accounts of beneficiary farmers, in three equal installments of Rs. 2,000 each.
- The complete expenditure of Rs 75000 crore for the scheme will borne by the Union Government in 2019-20.

Definition:

For the purpose of the calculation of the benefit, the Centre has defined

- a small and marginal landholder family as the one comprising of husband, wife and minor children up to 18 years of age,
- who collectively own cultivable land up to two hectare as per the land records of the concerned states.

Significance:

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

Similar programmes by states:

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- **Bhavantar Bhugtan Yojana in Madhya Pradesh** was sought to provide relief to farmers by providing the differential between MSPs and market prices.
- The **Rythu Bandhu scheme** of the Telangana government provides ₹4,000 per acre for every season to all the farmers of the state. Similar initiatives have also be framed in Jharkhand and Odisha.
- In December 2018, Odisha launched the **Krushak Assistance for Livelihood and Income augmentation (KALIA)**. KALIA is more complicated in design and implementation. It commits to give Rs 5,000 per SMF, twice a year, that is Rs 10,000 a year.

ASPIRE IAS