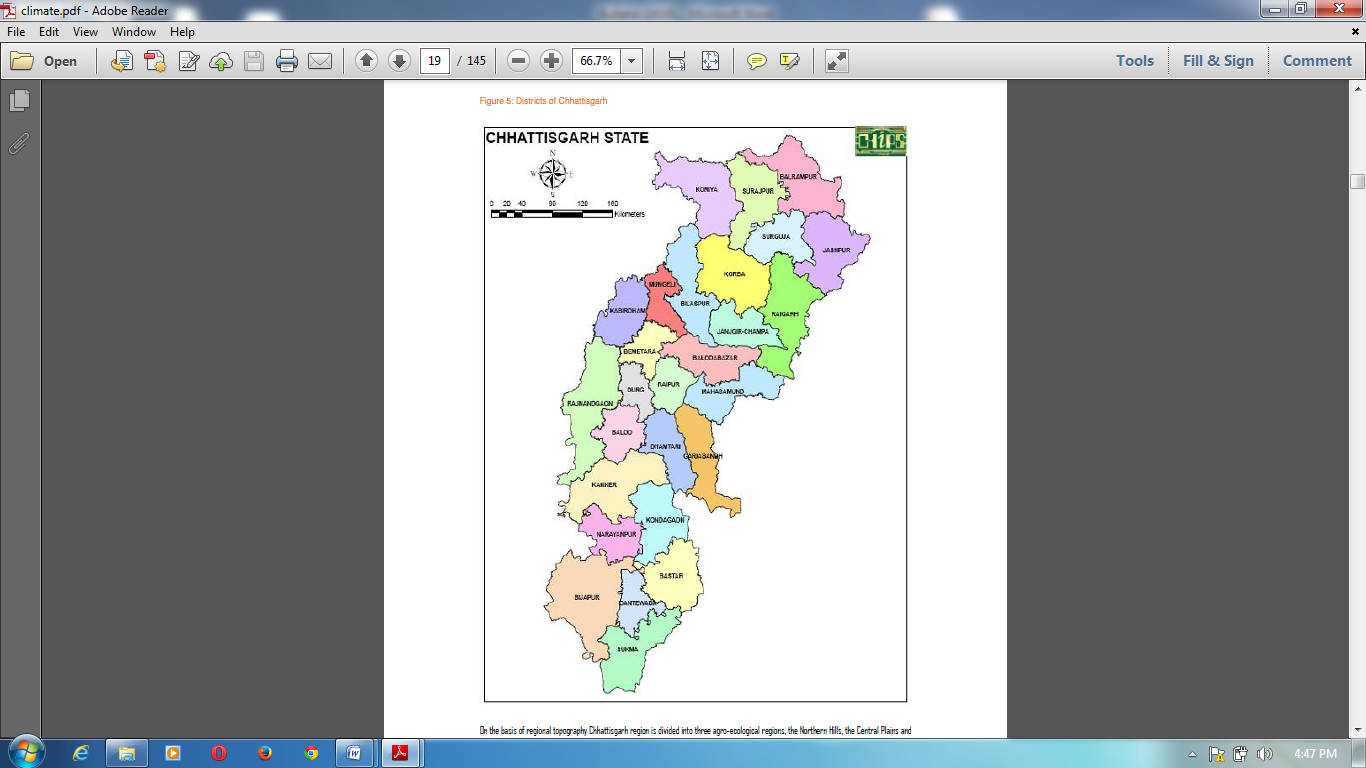
**Sustainable Agriculture Practices in the State**

Chhattisgarh, India’s 26th state carved out of Madhya Pradesh on 1 November 2000 and shares borders with Maharashtra, Madhya Pradesh, Uttar Pradesh, Odisha, Jharkhand, Andhra Pradesh and Telangana. Chhattisgarh state is situated in east-central India stretches between 80˚15′ to 84˚24′ E longitude & 17˚46′ to 24˚ 5′ N latitude. It is spreading over of area of 13.51 million hectares with a gross cropped area of 5.8 million ha. It comprises of 27 districts divided into 3 agro-climatic zones. About 74% area of Chhattisgarh plains, 97% of Bastar plateau and 95% in Northern hills are rainfed, having the paddy as lead crop. Rice is dominated crop in kharif season whereas cropped area of rabi is only about 35 percent. Irrigation facility is also about 36 percent that too is protective in nature.

**Demographic and Human Development Profile**

As per details from Census 2011, Chhattisgarh has population of 2.55 crore, an increase from figure of 2.08 crore in 2001 census. Population growth in this decade was 22.59 percent while in previous decade it was 18.06 percent.

**General Climatology of Chhattisgarh State**

The climate of Chhattisgarh State comes under sub-humid category. The annual average rainfall of the State is about 1200 mm and it is received in 64 rainy days. Almost 85 per cent of annual rainfall is received from southwest monsoon season (June-Sept) and remaining 15 per cent from northeast, summer and winter seasons. July and August are wettest months. During northeast monsoon season (Oct-Dec), southern parts of the State get significant amount of rainfall. The monsoon sets in around 15 June in the tip of the Bastar area and covers the entire State by 25th June. Among the three agroclimatic zones, highest annual rainfall is received in Bastar Plateau zone (1345 mm) followed by Northern Hills zone (1271 mm) and lowest in Chhattisgarh Plains zone (1103 mm). Among the districts, highest annual rainfall is noticed in Bastar (1400 mm) and lowest in Kabirdham (900 mm).

The temperature varies between 30 and 47 °C in summer and between 5 and 25 °C during winter. However, extremes in temperature can also be observed with scales falling to less than 0°C in Mainpat (Surguja district) to 48.3°C at Raigarh in plains. Temperatures shoots up in the State from the month of April to June and then subside with the onset of monsoon. Winter conditions sets in from mid November when the average minimum temperature starts falling below 15°C. The northern districts of the State have more severe and longer winter period as compared to southern parts. The atmospheric humidity is very high (>90%) during monsoon months and starts decreasing from October onwards and reaches as low as 15-20 per cent during peak summer months. Mainly three types of climate like moist sub humid, dry sub humid and semi arid found in the state. Maximum area of state comes under dry sub humid type of climate only Bijapur district comes under moist sub humid climate and Kabirdham, Bemetara, Durg, Balod, Dhamtari, Mahasamund and Kanker district come under semi-arid type of climate

**Agro-Climatic Zone and Districts covered in Chhattisgarh.**

|  |  |  |
| --- | --- | --- |
| **Agro Climatic** | **Districts Covered** | **Total Geo. Area(**lakh ha.) |
| C.G. Plains | Raipur , Gariyaband, Balodabazar, Mahasamund, Dhamtari, Durg, Balod, Bametara, Rajnandgaon, Kabirdham, Bilaspur, Mungeli, Korba, Janjgir, Raigarh and part of Kanker District | 69.49  (50%) |
| Bastar Plateau | Jagdalpur, Narayanpur, Beejapur, Kondagaon, Dantewada, Sukma and the remaining part of Kanker Districts | 39.94 (29%) |
| Northern Hills | Sarguja, Surajpur, Balrampur, Koria, Jashpur & Dharamjaigarh Tehsil of Raigarh Districts | 28.47 (21%) |
|  | **Total** | **137.90 (100%)** |

Source :Govt of Chhattisgarh, March 2012

(National Conference on Agriculture). Figures in parenthesis show percentage to total.

**CHHATTISGARH PLAINS:- Soil types of Chhattisgarh Plains**

The Chhattisgarh Plains is an increase in soildepth, water holding capacity, exchange capacity and preponderance of calcium and magnesium ions. The covered area about 50 per cent in this zone. The soil so developed has been classified in to four soil orders that widely differ in their production potential and physical characteristics. They are locally called, bhata (Entisols), matasi (Inceptisols), dorsa(alfisols)**|** and kanhar (vertisols).

**BASTAR PLATEAU:- Soil types of Bastar Plateau Chhattisgarh**

In Bastar Plateau the land is undulating and hence the soils vary considerably from top of the hillock to the valley. The soil type in Bastar vary from Marhan (Entisols) to Gabhar (Vertisols). Gabhar is the valley portion of the undulating terrain. In between these two Tikra (Inceptisols) and Mal (Alfisols) soil exist.

***NORTHERN* HILLS:- Soil types of Northern Hills of Chhattisgarh**

The Northern Hills most common soils are described locally on account of their occurrence, management and physical properties. This region cover 21 per cent of the total geographical area. These are eroded hilly soils which are covered mostly by forest, Goda/Tikra (light soils), Goda Chawar (Medium), Chawar and Bahra soils. Chawar soils are found in low land bunded fields where rice is grown. In bahra soils (extreme lowlands) water flows continuously till January.

Source: www.agridept.**cg**.gov.in

**Agriculture Overview, Characteristics and Status**

About eighty percent of Chhattisgarh state population is dependent on agriculture and forest for its livelihood. Agriculture in Chhattisgarh is characterized by comparatively low incomes, low productivity and high dependence on rains, large number of small to marginal farmers, low investments, and mono cropping. As per the statistical data 37.56 lakh farmer households recorded in the state out of which 76 percent fall under the small and marginal category. Approximately 36 percent of the area is irrigated from various sources whereas the largest irrigated area i.e. 66 percent is fed by canal irrigation. 55 % cultivated land at the state has poor water holding capacity that's why it is not feasible to take a second crop without irrigation facilities.

**Cropping Pattern**

The main crops of Chhattisgarh are paddy, wheat, maize, groundnut, pulses and oilseeds. Chhattisgarh is also called the "rice bowl of India.” Chhattisgarh is home to more than 23,000 native varieties of rice. Nearly 3.7 million hectare area, which is about 80 percent of net sown area in kharif is under paddy cultivation which contributes about 70 % of total production. The area under double crop is low. That’s why cropping intensity of the state is about 137%. State government has launched various schemes to increase irrigation facilities and thereby tried to increase area under double crop. Though the productivity of food grains in the state is lower-than the national average, the total production of food grains in the state is higher than the state requirement except in oilseeds.

**SWOT ANALYSIS OF C.G WITH REFERANCE TO AGRICUTURE**

State as a whole has its strength weakness, opportunity and threats in the field of agriculture and allied sector, which provides guideline for sound planning and its implementation to fulfill the growing need of growing population. The important features of SWAT analysis are given below.

|  |  |
| --- | --- |
| **Strengths** | **Weakness** |
| 1. Higher average rainfall ( Average annual 1199 mm ) | 1. Dominance of Small and marginal economically weaker families. |
| 1. Varied soil types suitable for various crops | 1. Fragmented land holding. |
| 1. Adequate electricity | 1. Erratic rainfall. |
| 1. Rich in biodiversity | 1. Less irrigation facilities (36%). |
|  | 1. Light soils having low fertility and water holding capacity. |
| **Opportunities** | **Threats** |
| 1. Wide range of crops can be grown . | 1. Erosion of biodiversity. |
| 1. Vast scope for crop diversification. | 1. Drought and erratic rainfall. |
| 1. Area expansion under assured irrigation. | 1. Diversion of Agriculture land to non-agricultural purposes. |
| 1. Enough rain water to harvest and utilise | 1. Depleting ground water. |
| 1. Scope to improve SRR. | 1. Crop menace by stray cattle for double cropping. |
| 1. In general, yield of the crops is low. Enough opportunity to yield improvement in all the crops. | 1. Poor market accessibility to many crop produces as post harvest processing industries is lacking. |

**Water Resources of Chhattisgarh**

Two third of our earth portion is covered by water and one third is considered as solid part. According to the UN estimates, the total amount of water on earth is about 1385.5 million cubic kilometers. Out of total available water 97.3% is salty and cannot be use without treatment. Thus only 2.7 percent of available water is considered as fresh water and out of this fresh water 75.2 percent is in the form of ice in polar region, whereas 22.6 percent is available below the surface of the land as a ground water while only 2.2 percent of fresh water is available in the form of water vapors in atmosphere, soil and living organism lacks and rivers. The main source of water is rains from the hydrological cycles. To fulfill the growing need of growing population of world, country as well as state the need of water management is now focal point of today’s climate change scenarios.

Nature is very kind to Chhattisgarh in terms of rainfall as compared to several other states of the Union. Average rainfall in the state is around 1400 mm. and about 90% of the total rainfall is confined in the Monsoon season i.e. 15th June to September. The rainfall has erratic temporal and spatial distribution in the state. Due to this variation in the rainfall, the agriculture production of the state, which is mainly Paddy, is affected. In fact; every third year, there is always a threat of drought, which is due to uneven occurrence of rainfall rather than deficient rain. It is obvious that irrigation is the prime need of the state. The irrigation percentage in the state is about 36 percent while potential exist to rise the irrigated area up to 75 percent.

The total geographical area of the state is 135,097 Sq. Kms. and nearly 44% of it is covered with forests. The geographical area\* of the state can be divided into five river basins . TheMahanadi River and its tributaries Seonath, Hasdeo, Mand and Arpa drain part ofRaipur, Durg, Rajnandgaon, Bilaspur, Raigarh and Surguja districts. The Indravati River is a tributary to Godavari River and drains the districts of Kanker, Bastar and Dantewada. Most of the Rivers are perennial in nature. The Drainage patterns in the state are dendritic, parallel, angular and radial types. Son is the tributary of GangaRiver and drains parts of Sarguja and Koriya districts.

Most of the rivers in the state have a torrential regime characterized by high flow of water for three to four months during monsoon (June to September) during which around 80% of the annual runoff flows. Floods and droughts are the main characteristics of the annual flow of the rivers in Chhattisgarh requiring storage reservoirs for efficient use of the available surface water resources.

The importance of water as a catalyst for the development of a region or a State cannot be understated. This is particularly true for Chhattisgarh, where almost 80% of the population is dependent on agriculture and allied activities for livelihood. The agriculture sector contributes around 38% to the State’s Net Domestic Product.Besides irrigation, the other key uses of water in the State include: Drinking or domestic purpose , Industry and Power plants.

The State seems to have sufficient water resources and a large untapped potential. Utilizable surface water potential in the State, if properly harnessed, can irrigate an estimated 4.3 m ha area, against the existing irrigation potential of 1.38 m ha.

|  |  |
| --- | --- |
| **Surface Water In Million Cu. Mtr** | |
| Est. Utilizable Potential | 41,720 MCM |
| Potential Irrigable Area | 4.30 m ha |
| Actual Irrigated Area | 1.34 m ha |
| **Ground Water** | |
| Net Utilizable Potential | 11,960 MCM |
| Actual Potential Utilized | NA |

**Potential & Utilization of Water In Chhattisgarh**

***Source*: WRD-GoCG**

The apparent abundance of water resources needs to be efficiently and effectively planned to develop and utilize these resources for the overall benefit of the State. The need for efficiency and effectiveness in the management of water resources can be gauged from the following:

### Potential & Utilization Pattern In Chhattisgarh & India

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Potential | | Utilization in % | |
| Type of Irrigation | Potential  Created [Lac ha] | Potential  Utilized [Lac ha] | Chhattisgarh | India |
| Major3 | 5.94 | 4.53 | 76% | 87% |
| Medium | 2.68 | 2.44 | 91% | 87% |
| Minor | 4.97 | 2.35 | 47% | 89% |
| Total | 13.59 | 9.32 | 69% | 89% |

In the irrigation sector, utilization of irrigation potential is significantly lower than the national figure. For example, as shown in the Table, percentage utilization of created potential for minor schemes and cumulative for the State compares unfavorably with corresponding figures for the country. Currently there are 3 major, 26 medium and 2,892 minor irrigation projects in the State that are managed by the Water Resources Department. Besides these, there are a number of tanks, ponds etc that are managed by the Panchayats. Surface water harnessed by irrigation projects is primarily used for irrigation, but other (dinking / industrial) uses are also involved.

**Ground Water**

The state is underlain by diverse rock types of different geological ages from Pre-Cambrian to Recent. 87% area of the State is underlain by hard rock and the ground water in the area is being tapped mostly by dug wells constructed in the weathered zone and bore wells to tap the deeper aquifers. The yield of open (dug) wells varies from 1 to 2 lps and the yield of the bore wells ranges from < 1 to 5 lps. About 13% area of the State is occupied by Semi-consolidated sedimentary rocks where Dug wells & tube wells have yield range of 1 to 10 lps. The estimation of ground water resources has been carried out block-wise. The annual replenishable ground water resource of the state has been estimated as 12.80 bcm and net annual ground water availability is 11.90 bcm. The annual ground water draft is 4.40 bcm and stage of ground water development is 37%. Out of 146 blocks, 18 have been categorized as ‘Semi-critical’, 2 as ‘Critical’, 1 as ‘Over-exploited’ and remaining 125 as ‘Safe’. In Chhattisgarh, the ground water development concentrates in the central part of the state (Chhattisgarh basin) more as compared to the other parts of the state. Therefore, most of the Semi-critical, critical and over exploited blocks are falling in the central part of the State. As compared to 2011 estimate, there are no significant changes in the annual replenishable ground water resources and ground water draft in 2013. But after 2013 scenario has been change and significant negative impact on ground water status has been observed might be due to unplanned developmental activities leads to over exploitation of available reserve ground water. This problem will again aggravate in changing climate scenario.

* 1. **RAIN** **WATER MANAGEMENT STRATEGIES FOR CHHATTISGARH**

1. Rainwater harvesting at village or panchayat level is the prime need.
2. Sound planning and its effective implementation of rainfed farming in the state.
3. Water harvesting structure should be constructed at appropriate place after verification through latest tool and technology.
4. Aforestation and conservation of existing forest will support the rejuvenation of rivers.
5. Maintenance and conservation of traditional water bodies.
6. Sound planning of Catchment and command area with respect to soil and water conservation.
7. Safe disposal of excess rain water and their smart application.
8. Promotion of new technology of water management in the field of agriculture and allied sector.
9. Location specific minor irrigation works and small scale multipurpose project for augmenting irrigation potential, utilization, drought proofing and balance intra-regional development.
10. Policy for transfer of water from surplus to deficit ar

**Action required**

1. Water is an extremely important resource for Chhattisgarh as almost 80 per cent of its population relies on agriculture for a livelihood. Hence irrigation systems are vital.
2. The State has sufficient water resources and a large untapped potential.
3. Aware of the critical importance of water resources, the Government of Chhattisgarh has accorded high priority to the development of the sector by increasing sizable amount of budget
4. The key issues facing this sector include absence of a State-wide water resources plan; low utilisation of developed water resources; inequitable development of resources; low coverage of urban water supply; low operation and maintenance budget; thin spread of resources, low recovery rate and tariff; poor demand management.
5. In order to address these issues the State needs to undertake wide ranging measures, which can be segregated into 4 distinct stages which are preparatory, run-up, execution and monitoring.
6. The various activities that need to be undertaken during these phases include development of a long term water resource plan, formation of a high level committee, formation of a water regulatory body, regulation of ground water, creation of the conditions for attracting private sector participation, etc.
7. Priorities for water allocation
8. Requirement for information systems
9. Maintenance and modernization of existing schemes
10. Groundwater development and regulation to prevent the excessive use
11. Need for cost recovery through appropriate charges
12. Participation of farmers, NGOs and other agencies in management of water resources
13. Need for appropriate technology in management of water resources
14. Training and capacity building of staff

**State Action Plan on Climate Change:**

Chhattisgarh Government has formulated State Action Plan on Climate Change (SAPCC) consistent with the objectives of NAPCC, focusing on the state specific issues relating to climate change and strategies to tackle them. Under this broader framework climate change action plans have been prepared for Agriculture & allied sectors, forest & biodiversity, water resources, urban development, transport, energy, industry & mining and human health for guiding the short and long-term interventions across the state. Developing agro-climatic zone-wise strategic interventions, natural resource conservation technologies, solar & wind energy for irrigation, strengthening of weather advisory & early warning systems, integrated nutrient & pest management are some of the major approaches outlined in the state action plan to enhance resilience of the local agriculture production base.

**NABARD’s Role in Climate Finance**

NABARD has taken up various initiatives in addressing the challenges posed by Climate Change particularly in the areas of agriculture and rural livelihood sectors.In this direction as a National Implementing Entity for Adaptation Fund (AF) and Green Climate Fund under the United Nations Framework Convention on Climate Change (UNFCCC), NABARD aims to channelize national, international and private finances for adaptation and mitigation activities in India.NABARD as a National Implementing Entity has facilitated sanction of climate change adaptation project “Climate Adaptation in wetlands along the Mahanadi river catchment area in Chhattisgarh with a fund outlay of Rs 21.47 crore from National Adaption Fund for Climate Change (NAFCC). The project aims to promote integrated climate adaptation strategies in the wetlands of Mahanadi catchment in three districts viz. Dhamtari, Mahasamund & Balodabazar. It aims at enhancing the adaptive capabilities of the natives of the project area to the climate change and adopting measures to restore the ecology to the possible extent.

Besides, NABARD is supporting projects many of which can be classified under climate finance. Over 28% of NABARD’s cumulative disbursements have links with climate change adaptation and mitigation. Under Rural Infrastructure Development Fund (RIDF), Tribal Development Fund (TDF), Integrated Watershed Development Fund, Umbrella Programme for Natural Resources Management (UPNRM), NABARD Infrastructure Development Assistance(NIDA) NABARD has supported projects with emission reduction potential including forestry, biogas digesters, rural energy management, renewable energy and improving energy efficiency.

**Revitalizing agriculture sector in the State**

Chhattisgarh has been conferred with the 'Krishi Karman' award for four times (2011, 2013,2015,2016). Three awards for rice production and last for achieving growth in production of pulses.

Chhattisgarh has bagged national ‘Agriculture Leadership Award 2017’ for providing fillip to the cultivation of horticulture based crops. Chhattisgarh Government has prepared a five-year master plan for the period 2017-18 to 2021-22. Horticulture is a sunrise sector in the State. The Horticulture crops cover an acreage of 7.41 lakh hectares and production is about 85.95 lakh metric tonnes. According to the master plan, the target is to increase acerage of horticulture crops by about 4.52 lakh hectares. The increase in acerage will cover fruits, vegetables, masala (spices) crops and flowers. An additional investment of Rs 1,405 crore is likely to be incurred on the project.

A total of fourteen agriculture mandis in Chhattisgarh have been connected to Center’s ‘e-NAM’ platform so far during the first phase of the project Chhattisgarh Government has signed a Memorandum of Understanding (MoU) with Agricultural and Processed Food Products Export Development Authority ( APEDA) to develop clusters for providing a major push to Agri products exports from the State. the Government has chosen three key horticulture producing locations in which papaya, bananas and vegetables are grown. For papaya and bananas, Durg, Bemetara, Raipur, Bilaspur and Rajnandgaon districts have been chosen whereas for vegetables, Durg, Bemetara, Raipur, Bilaspur, Rajnandgaon, Balod, Surguja, Bastar and Raigarh had been identified.

The State has put in place a proactive Agriculture Policy, the success of which is evident from the fact that State has won three “Krishi Karman Awards” in last four years since 2010-11 and also has been selected for Krishi Karman award for the fourth time for enhancement in pulses production during 2014-15. As regards public investment, state government is earmarking a substantial portion of its plan expenditure for agriculture & allied sector, in the form of a separate budget for Agriculture since 2012-13. Major policy initiatiaves of State Government include

* Increase of budget from Rs 7000 crore in 2003 to Rs 13480 crore during 2018-19
* Promotion of production and use of high quality seeds and expansion of Ramtil , Sugarcane , Akti seed and Tivda under overall development of farmer’s scheme.
* 33 permanent soil testing labs and 111 Mini labs established under Soil Health Management Scheme. Approx. 26 lakh Soil health cards were distributed.
* Under Saur Sujala Yojana State Govt. is distributing solar irrigation pumps at a subsidise price of Rs 5000-15000 only. State Govt. has set the target to distribute solar irrigation pumps to 51 thousand farmers by year 2019.
* Promotion of 100 % organic farming in Narayanpur, Gariyaband, Sukuma, Bijapur and Dantewade districts of the state and in the remaining 22 districts one development block in each district.

Institutional support is being provided to agriculture sector through state owned corporations such as CG State Seed & agriculture development corporation (Beej Nigam), Chhattisgarh State Seed Certification Agency, Chhattisgarh State Agriculture Marketing Board, Markfed, Indira Gandhi Krishi Vishwvidyalay (IGKV).

Government of Chhattisgarh is implementing several schemes to promote greater use of certified seeds of high yielding varieties, SRI method of paddy transplantation, double cropping through Rabi demonstration, organic farming, cultivation of pulses, oilseeds & maize in place of summer paddy, etc. These schemes involve frontline demonstrations, distribution of input mini-kits, exposure visits and facilitate adoption of improved package of practices for enhancing cropping intensity & productivity.

Under centrally sponsored schemes National Food Security Mission National Mission on Oilseeds & Oil Palm, Pradhan Mantri Krishi Sinchayee Yojna, Soil Health Card Scheme, Submission on Agriculture Mechanization, Rashtriy Krishi Vikas Yojna, Bringing Green Revolution to Eastern India are some of the major schemes which are instrumental in capacity development of local agri-production system.

For enhancing production and productivity of paddy in the state the State Government is promoting line sowing with weedicide application instead of broadcasting, soil analysis based fertilizer and micro-nutrients application, area expansion under hybrid rice, early/mid duration rice varieties to ensure timely sowing and area expansion under rabi crops, distribution of improved seed and fertilizer kit to forest dweller benefitted under Forest rights act. Similarly, for pulses the state is emphasizing on distribution of quality seed, use of seed drills for sowing of Rabi crops for placement of seed in moisture zone and maintaining adequate plant population, seed treatment with fungicide and bacterial culture, promotion of bio control/biopesticide, promotion of sprinkler irrigation etc. Certified seed production has been recognized as another thrust area in the state’s effort to improve availability of improved seeds through local production and to improve seed replacement rate of major crops grown in the state. **Procurement Support for paddy**

The Chhattisgarh State Cooperative Marketing Federation procures paddy at declared support price through 1333 PACS across the state which has enabled farmers to get reasonable price for their produce. Since Kharif 2007-08, the whole system of paddy procurement has been fully computerized which has facilitated prompt payment to farmers immediately after purchasing of paddy at procurement centers.

**Agriculture Marketing**

Agriculture marketing has been promoted through a network of regulated markets to ensure reasonable return to farmers and consumers by creating a market environment for fair play of supply and demand. Currently, there are 69 mandi and 118 sub mandis operating across the state. These mandis have a storage capacity of 1.78 lakh metric tonnes.

Besides, with a view to encourage development of adequate number of markets equipped with modern infrastructure with greater private sector participation and development of alternate marketing channels, the state has also amended its APMC act to allow establishment of private market yards/ private markets managed by a person other than Market Committee, Direct purchase of agricultural produce from agriculturist by Processor/ Bulk buyer/ Bulk retailer/ exporter, etc, promote and permit  e-trading, contract farming, single point levy of market fee, single registration/ license  for trade/  transaction in more than one market.

Under National Agriculture Market project 14 mandis in 12 districts have been connected to the ‘e-NAM’ platform for online trading across the country.

The Agriculture Policy of the State has been responsible for revitalising the agriculture sector. The Aim of policy is to stimulate the attitude and action, which should result in assessing agricultural progress in terms of improvement in income of farm families not only to meet their consumption requirement but also to enhance their capacity to invest in farm related activities. The policy emphasises five elements: (a) protection of the land health and enhancement; (b) conservation management and utilisation of natural resources with a focus on water and micro irrigation; (c) timely disbursement of agricultural loans; (d) post-harvest management integrated with the development of food processing; and (e) reducing the time lag/gulf in the transfer of knowledge from lab to the land/farm.

As agriculture was traditionally subsistence, with low awareness and poor use of progressive agriculture practices, the State first began work on improved agriculture extension by filling-up vacancies and creating an outreach. Attention given on improving quality of services and making them need-based- especially in remote tribal areas, where improved agriculture practices and diversification can significantly improve incomes. Closer involvement of producer groups in preparation of Extension Plans, farm demonstrations, soil testing andVarietal selection will be encouraged for greater client-orientation and to promote convergence of schemes.

**Priorities for Agriculture**

1. High investments in agriculture infrastructure to improve farm productivity and incomes

2. Particular attention to the needs of small and marginal farmers

3. Improve the quality of extension services

4. Bring average yields of major crops closer to national average while encouraging low input usage

5. Increase irrigation potential and expand coverage

6. Expand warehousing capacity and network in the state

7. Create incentives for non-farm livelihood diversification among agriculture labourer and the landless

8. Use of Information Technology and mass media for generating awareness, better farm & post-harvest management, and monitoring the quality of extension services will be a priority.

9. Knowledge and skills of Agriculture Extension Officers will be continuously upgraded through closer working with Indira Gandhi Agriculture University and Krishi Vigyan Kendras (KVKs) so that they are able to pass on this knowledge to producers.

10.Bio-technology and farm mechanization has become a need of many rural areas facing shortage of agriculture labour due to migration and the state is supporting the establishment of Krishi Yantra Seva Kendras (KYSKs) for leasing farm equipment/machinery to small-medium farmers; awareness about these schemes for linking progressive farmers with new technology will also be increased through the extension services. The MGNREGA programme has contributed to better productivity for marginal farmers through its component on improving private farms.

Chhattisgarh still has the advantage of having relatively low agriculture intensity, though fertilizer consumption has grown two and half time in the period 2000 to 2011 from 0.245 million MT to 0.675 million MT (Kharif and Rabi); areas with no or low chemical input usage will be encouraged to create a niche in organic farming, while taking steps for retaining long-term soil fertility through promotion of bio-fertilizers and organic manures- both of which have seen increased consumption lately. Application of the System of Rice Intensification (SRI) on paddy for productivity improvement is becoming popular. Almost ¾ of area under rice is rain fed which is the main constraint in expansion area under SRI; hence State is promoting line sowing in rain fed area also where traditionally rice is sown by broadcasting method. While rice production increased at a consistent rate due to area expansion and productivity increase in the current plan period, it may plateau in coming years. Rice research will be promoted for gene-conservation and developing newer varieties suited to rain-fed agriculture throughcloser farm-lab collaboration in high productivity as well as tribal areas, with emphasis in tribal areas on promoting aromatic varieties that have huge national and international demand. Area under oilseeds and pulses is rapidly increasing due to better productivity and returns. This is a happy development since Chhattisgarh is deficient in oilseeds, while surplus in cereals and pulses. Traditional staples like niger, kodokutki and maize are still produced and consumed by a significant population but not much research has gone into improving their cultivation .

Agriculture in Chhattisgarh is predominantly rain-fed and timely access to credit, information, and other inputs becomes decisive in the success or failure of a crop. Co-operatives and other entities providing these much-needed finances and inputs (certified seeds, pesticides, fertilizers, implements) will be further strengthened to provide timely and quality services. Steps would be taken for the financial inclusion of marginal farmers through widespread awareness and simplified access.

**Expansion and Management of Irrigation**

Increase in productivity is a function, among other factors, of water availability. The importance of judicious use of available water cannot be over-emphasized. The irrigation potential of the state has increased from 13.3 lakh hectare in 2000 to 18.4 lakh hectare by March 2012, but this is far short of providing water security to the small farmers. As a result, food grain production during Rabi is barely 25 percent of State’s Kharif production. To reduce overdependence on large dams and major projects for irrigation, which face problems in environment and land other clearances, the State will shift attention to developing and utilizing the potential of minor and medium irrigations projects and locally impounding water. Though there is high dependence on surface water for irrigation (76 percent), vast untapped potential still exists.

Scientific management of both ground and surface water will be promoted with priority to repair and maintenance of irrigation canals/pondsand incentives for micro-mini and lift irrigation systems to increase coverage and water use efficiency. Nearly 342 Water User Associations(WUAs) have been managing and maintaining the canal network and command area under them. These experiences will be used to increase thestake and participation of farmer groups in the management of irrigation projects, watersheds, water bodies, and small lift irrigation scheme sin the 12th Plan to improve local water governance, cost recovery and viability of these schemes.

**Strategies**

The State has already outlined its priorities for the agriculture and allied sectors such as horticulture, animal husbandry, and fisheries. The strategies therein are well positioned to build substantive climate resilience, and as such, will form the core of the strategies under the CSAPCC.

1. Analysing the results of sectoral climate risk and vulnerability studies

2. Building institutional linkages under the CSAPCC with and leveraging the National Initiative on Climate Resilient Agriculture (NICRA) of the Indian Council of Agricultural Research (ICAR) and its participating organisations including Central Research Institute for Dryland

**Integrated approach for doubling of farmers income**

In the state road map for doubling farmers’ income by 2022, Government of Chhattisgarh recognizes the importance of an integrated approach spanning multiple sectors to diversify and augment farmers’ income in the state. In this direction, the roadmap delineates the key interventions and goals in sectors such as agriculture, agriculture marketing system, agro-forestry & minor forest produce, sericulture, horticulture, food processing, animal husbandry, dairy development and fisheries. Lowering cost of cultivation, yield improvement of agricultural crops through improved package of practices, expanded irrigation coverage, strengthening storage and marketing infrastructure for better price realization, value addition and processing, integration of agroforestry & sericulture activities for income diversification, area expansion under horticulture, breed improvement in livestock, strengthening and promotion of dairy cooperatives, strengthening of dairy supply chain and processing infrastructure, and fisheries area expansion remains the major goals in this roadmap. The major interventions proposed under this roadmap are as under:

**Reduction in cost of cultivation**

By adopting a variety of proven scientific package of practices, considerable reduction in cost of cultivation can be achieved through input use efficiency in the application of seeds, fertilizer, plant protection chemicals, irrigation and labour. In this direction, the state road map has emphasized the following means for lowering cost of cultivation.

* Promotion of Line Sowing in 5 ha of land & SRI in 1.00 lakh ha of paddy cultivation
* Local production of blue green algae/vermicomposting/NADEP in convergence with MGNREGA
* Distribution of biofertilizers
* Encouraging 100% seed treatment
* Integrated Pest & Nutrient Management
* Water use efficiency through promotion of drip & sprinkler irrigation
* Weather based crop advisory for better preparedness against possible incidence of pests & diseases

**Increasing Gross Income**

Gross income of farmers’ can be enhanced primarily through (a) growth in production, (b) better price realization and (c) diversification of farm and non-farm based income. In a smallholder-based production environment in the state, production growth is vital for generating marketable surplus. To boost production growth, focus has been laid on generating higher marketable surplus high yielding inputs, cropping intensity, intercropping.

* Greater use of hybrid seeds in paddy and maize,
* Improvement in seed replacement rate in pulses and oilseeds,
* Raising cropping intensity
* Intercropping in 2.50 lakh ha of land
* Diversification into horticulture, livestock, fisheries, sericulture, agro forestry
* Better price realization through value addition and processing ( Minor millets, pulses, oilseeds, minor forest produce)
* Mobilization of farmers into Farmers’ Producers Organizations (FPOs)

**Infrastructure Strengthening**

* Linkage of 14 APMC markets with E-NAM for better price discovery
* Warehouse and cold storage, packhouse,ripening chamber capacity creation
* Establishment of fruits & vegetable mandis
* Strengthening of seed processing centers and seed farms
* Construction of check dams, Farm ponds, drip & sprinkler irrigation

**Income Diversification**

* Area expansion under horticulture crops
* Livestock development through cluster approach
* Dairy development through strengthening of dairy cooperatives,processing infrastructure

**Initiatives of NABARD**

NABARD has been instrumental in spearheading a wide range of farm sector interventions to bring about incremental growth in agricultural production & productivity, conservation & management of natural resources, sustainable livelihood support for tribal farm households & collectivization of smallholder farmers.

In Chhattisgarh, NABARD has sanctioned 66 watershed projects in 19 districts with a cumulative treatment area of 78653 hectare. The main objective of these interventions is to restore ecological balance by conserving rain water in-situ, harvesting excess rain water run-off in structures, arresting soil erosion, changing cropping pattern and diversifying livelihood activities in project areas. These projects are benefitting more than 26920 farm households in vulnerable production environment.

NABARD has embarked upon an ambitious programme of replicating the *wadi* models across the country under its Tribal Development Fund. “The core of the programme is “*Wadi*” i.e. development of a small orchard and other development interventions are built around “*Wadi*”. Under Tribal Development Programme, NABARD has sanctioned 81 wadi projects in 18 districts of Chhattisgarh with 54784 tribal families covered under these projects.

 In order to ensure that small holder farmers have cost-effective access to agri-inputs, technology and market through collective bargaining and bulk procurement of inputs and services, NABARD has taken an initiative for nurturing and supporting Producers’ Organizations. In wadi and watershed project areas NABARD is making concerted efforts to mobilize farmers into POs. NABARD has supported formation of 64 FPOs in the state under the PRODUCE fund. In the past few years, several successful FPOs have been documented from such project areas for their remarkable performance in certified seed production, dairy activities, fruits & vegetables cultivation etc.

**Action Points**

* Hassle free access to credit through KCC needs to be recognized as a key instrument in improving farmer’s income.
* Productivity improvement of small agricultural land holdings.
* A nascent trend towards high value commercial crops needs to be secured through sustained efforts at providing need based extension, technology & business support services to small holder producers until the trend gains high enough momentum to sustain on its own. Access to quality inputs, critical farm advisory services and smooth forward linkage with established value chain will be critical.
* Economic association of small and marginal farmers through FPOs, production & marketing cooperatives is known to improve the position of individual member farmers in accessing agri-inputs, technology & market at competitive cost.
* Besides, improving on-farm water use efficiency by adoption of precision-irrigation technologies, diversifying to less water-intensive crops and high yielding varieties, creating protective sources of irrigation; construction of water harvesting structures, secondary & micro storage, groundwater development etc would require additional investment to secure existing production base. The Water User Associations should be trained in water budgeting to ensure optimum use of available water for select crops.
* To expand the outreach of custom hiring facilities to the Gram Panchayat level, institutional set-ups like SHGs (Self Help Groups), PACS, Farmers Producers Organizations (FPOs), need to be explored through departmental support from agriculture department & credit support from banks. Capacity building of locally operating fabrication units with technology & design support from IGKV, Raipur may improve availability small farm implements.
* A graduated shift from predominantly cereals oriented cropping pattern to remunerative horticulture crops can be an effective way to raise farm income of small holder farmers in the state with appropriate safeguard against price-risk factors associated with seasonal gluts and perishability of horticultural crops.
* The immense scope for optimized integration of agro-forestry with crop husbandry, horticulture, fisheries, livestock rearing, wasteland development and soil health management needs to be explored in a holistic manner view of the possible synergies that can be gained through such convergence.
* In the context of doubling of farmers’ income, it is necessary that the extensive support systems available for crop husbandry have to be extended to the livestock component. Employment of common property resources for local raising of green fodder, expansion of livestock health care services through mobile units, greater access to concessional finance for meeting working capital requirement of dairy farming may be strategized to ensure that small scale dairy activity remains a cost-competitive and viable proposition for farmers. Likewise, establishing remunerative forward linkage for marketing of dairy products, strengthening & expansion of dairy co-operatives and milk routes have to be prioritized in the state with active involvement of milk federation or private processing industries.
* Rearing of small animals like sheep, goat & pig in integration with traditional cropping system supplements farm income. In rain fed farming system, such livestock rearing practices also offers significant risk mitigation strategy to smallholder farmers & landless households in the drought situations.
* Integration of freshwater aquaculture with other farm-based production systems such as agriculture, horticulture, agro-forestry & animal husbandry needs to be encouraged in view of the positive complementarities of effects gained through recycling of by-products and consequential cost-cutting.
* Scientific storage infrastructure not only protect against post-harvest wastage & quality deterioration of agri-produce, such facilities help farmers in getting better price for their produce by preventing distress disposal of produce during glut season. Further, accreditation of storage facilities for facilitatingpost-harvest credit by way of pledge finance against Negotiable Warehouse Receipts (NWRs), deployment of scientific storage infrastructure through member driven cooperative institutions, promotion of low cost storage solutions at farm gate level etc have to be recognized as a key agenda for safeguarding commercial interest of farming community.
* Access to marketing infrastructure such as standardization, grading & packaging facilities at production clusters has to be facilitated for realizing better farm-gate price to farmers.
* Establishment of sustainable linkage between smallholder producers and processing industries through a well-structured aggregation mechanism (through FPOs, Cooperatives) could be a key approach in facilitating better price realization to local farmers. Simultaneously, there is a need to promote local entrepreneurship for promotion of processing sector in the state. Other than paddy, there is good scope for processing of oilseeds, pulses, fruits & vegetables in view of the local availability of raw materials. Further, capacity development of small & marginal farmers would be crucial in the initial stages to orient local production base towards crops and varieties suitable for processing industries.
* A robust agriculture production base in the state presents good demand for vermi-compost and farm–yard manure for application in farmland to supplement inorganic fertilizers.
* In view of the existing livestock population in the district and crop residue generated from crop production, adequate raw materials is locally available which can be utilized for local production 0f vermi-compost & farmyard manure.
* Greater availability and adoption of tissue culture planting material with commercially desirable traits can greatly improve productivity and production performance and help in farmer’s income.
* Rural Off-farm sector activities offer considerable scope for augmenting the income of farm households. In this direction, skill and capacity building of women associated with SHGs can be a viable strategy to supplement household income.

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