

Suitable MGNREGS Practices and Convergence Opportunities for Regional Development Priorities



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List of Acronyms

ABhY	Atal Bhujal Yojana
ATMA	Agriculture Technology Management Agency
BSKSY	Bihar Saur Kranti Sinchai Yojana
IFS	Integrated Farming System
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
MIDH	Mission for Integrated Development of Horticulture
MJSA	Mukhyamantri Jal Swavlamban Abhiyan
MKAY	Mukhyamantri Krishi Ashirwad Yojana
MUS	Multiple User System
NABARD-RIDF	National Bank for Agriculture and Rural Development-Rural Infrastructure Development Fund
NFSM	National Food Security Mission
NHM	National Horticulture Mission
NMAET	National Mission for Agriculture Extension and Technology
NMSA	National Mission for Sustainable Agriculture
NMSA-RAD	National Mission for Sustainable Agriculture - Rainfed Area Development
PMKSY-AIBP	Pradhan Mantri Krishi Sinchayee Yojana - Accelerated Irrigation Benefit Programme
PMKSY-HKKP	Pradhan Mantri Krishi Sinchayee Yojana - Har Khet Ko Pani
PMKSY-PDMC	Pradhan Mantri Krishi Sinchayee Yojana - Per Drop More Crop
PMKSY-WDC	Pradhan Mantri Krishi Sinchayee Yojana - Watershed Development Component
PM-KUSUSM	Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan
RKVY	Rashtriya Krishi Vikas Yojana
RKVY-BGREI	Rashtriya Krishi Vikas Yojana - Bringing Green Revolution to Eastern India
RKVY-RAFTAAR	Rashtriya Krishi Vikas Yojana- Remunerative Approaches for Agriculture and Allied Sector Rejuvenation
SGSY	Swarnajayanti Gram Swarajgar Yojana
SMAM	Sub-Mission on Agricultural Mechanisation
STW	Shallow Tube Well

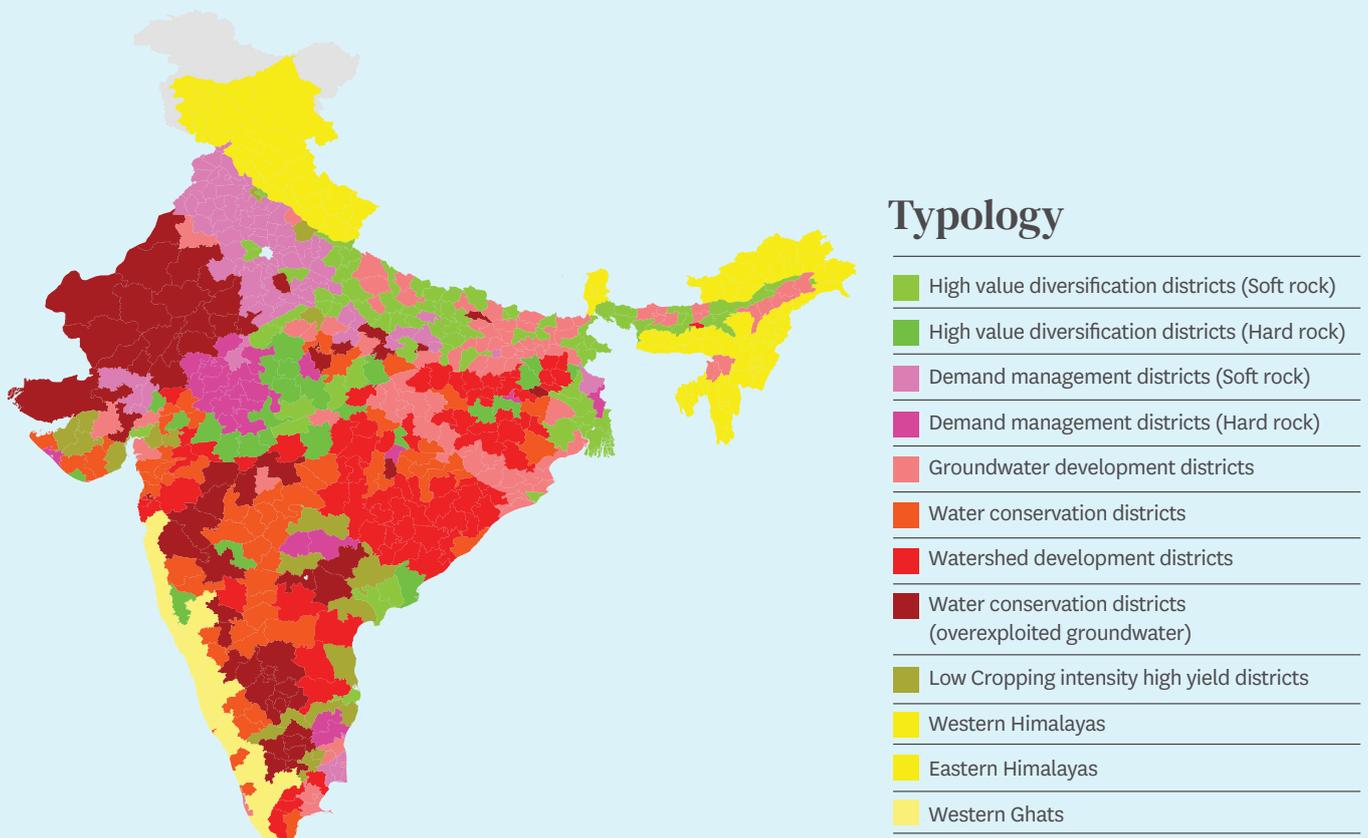
Introduction

India is a diverse country with myriad agro-climatic conditions offering a plethora of opportunities for agriculture development but also posing a number of constraints for effective natural resource management (NRM). Most of the national and state policies in agriculture development and NRM focus on the key outcome indicators for the respective policies, however having the larger subsumed goal of agrarian and rural development. Likewise, MGNREGS (Mahatma Gandhi National Rural Employment Generation Scheme), the flagship rural employment generation policy offers many opportunities for effectively undertaking agriculture development and NRM activities through convergence with different national and state policies to deliver the promise of rural development.

Different agriculture and NRM activities are relevant for different parts of the country owing to different development requirements amidst regional agro-climatic and hydrogeological conditions. In Agricultural Water Management (AWM) Typologies, authors presented a classification of 657 districts into 12 typologies, developed by analysing the district level datasets of groundwater, irrigation access, cropping intensity and crop yields. This classification or these typologies offer a new perspective for planning development activities related to agriculture and NRM. Given the status of the critical parameter and regional agriculture development requirements, a set of development priorities are assigned for each typology.

The selection of suitable (and permissible) activities under MGNREGS for a particular typology is guided by its development priority. Given the focus on convergence with MGNREGS, appropriate opportunities at national and state levels (specific policies) for specific development priorities are also identified. These opportunities can be explored for aligning the MGNREGS activities to achieve enhanced impact on ground. It is to be noted that the activities and convergence opportunities are neither exhaustive nor prescriptive but are only indicative. They are organised along with the necessary data to support in planning water security and climate adaptation activities in rural India.

The development priorities, however broad, provide a focus to align the activities to maximise their impact and contribution towards achievement of the long term regional development goals of water security and climate adaptation.

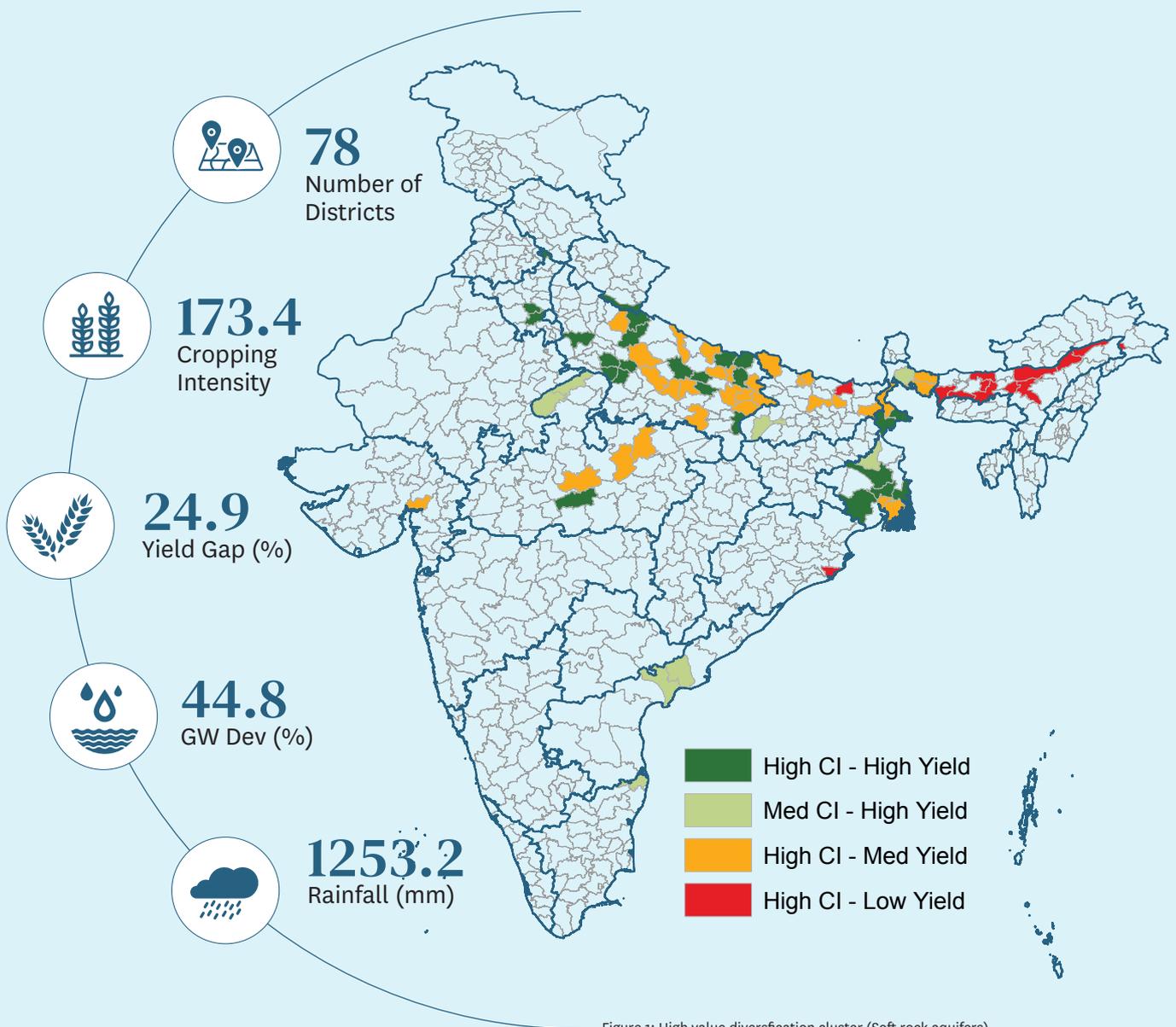




Typology 1 and Typology 2

Typology 1

High Value Diversification Cluster (Soft Rock Aquifers)



Typology 1 is spread across 12 states and one union territory, covering 78 districts, mostly in the Ganga-Brahmaputra- Meghna basin, having soft-rock aquifers.

Characterised by good rainfall and groundwater resources and high potential for significant improvement in agrarian income through increased cropping intensity, diversification to high value cropping and yield improvement.

Despite having the main development priority of increasing high value cultivation, there needs to be an adequate focus on developing and utilising the groundwater resources sustainably and efficiently.

Typology 2

High Value Diversification Cluster (Hard Rock Aquifers)

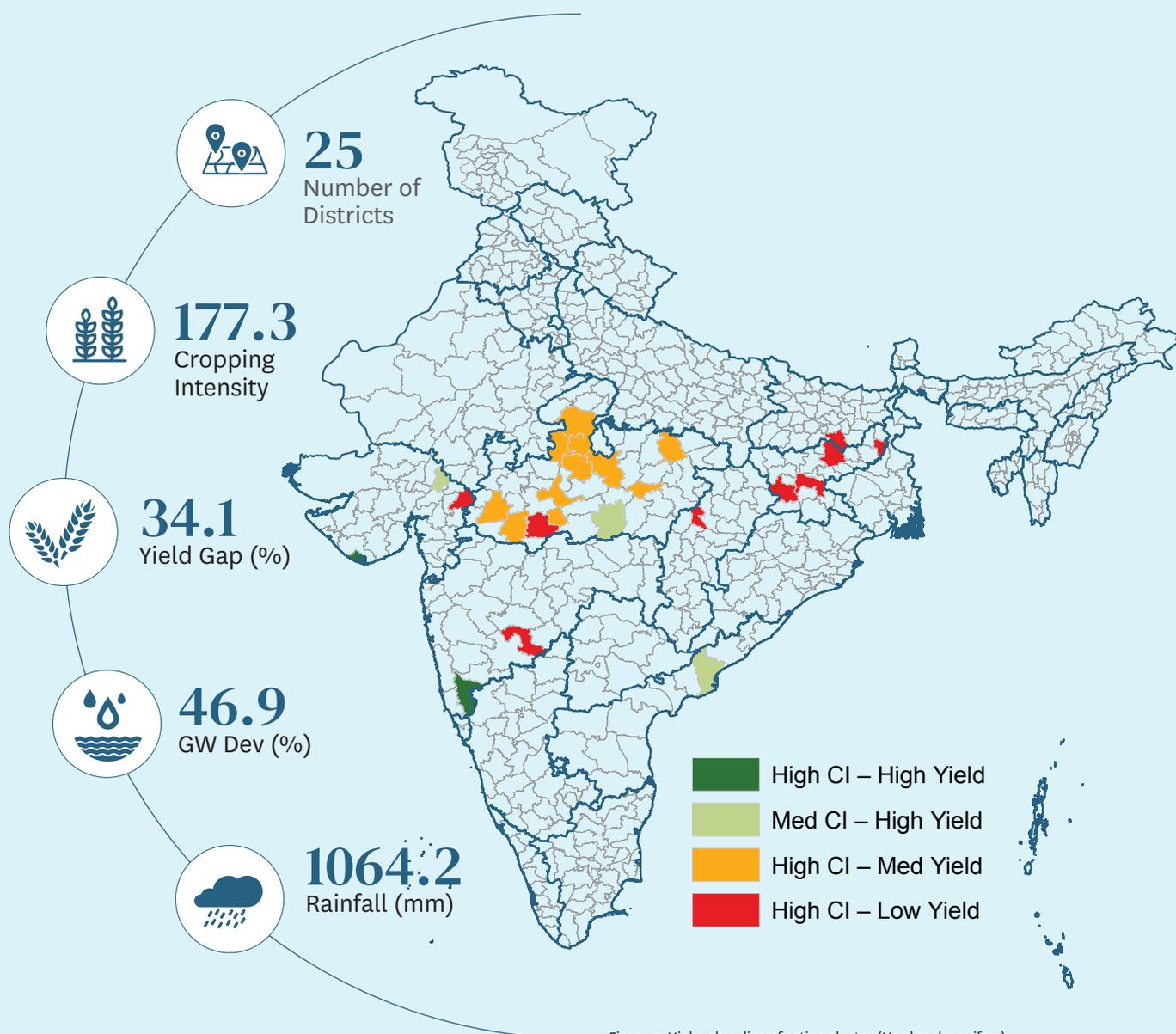


Figure 2: High value diversification cluster (Hard rock aquifers)

Typology 2 is spread across 7 states, covering 25 districts in central India region, having hard rock aquifers.

Characterised by good rainfall and groundwater resources and high potential for significant improvement in agrarian income through increased cropping intensity, diversification to high value cropping and yield improvement.

Despite having the main development priority of increasing high value cultivation, there needs to be an adequate focus on developing and utilising the groundwater resources sustainably and efficiently.

Development Priorities in Typology 1 and Typology 2

 <p>Crop diversification to high value crops</p>	 <p>Irrigation measures to increase yields</p>	 <p>Sustainable groundwater development</p>	 <p>Efficient use of the available and created water resources</p>
Activities (MGNREGS)			
<ul style="list-style-type: none"> ▪ Horticulture ▪ Nursery Raising 	<ul style="list-style-type: none"> ▪ Construction, Repair, Renovation and Maintenance of Irrigation Structures (Dugwells) 	<ul style="list-style-type: none"> ▪ Construction, Repair, Renovation and Maintenance of Recharge Structures 	<ul style="list-style-type: none"> ▪ Improving Soil Moisture
Convergence Opportunities (Hard Rock Aquifers)			
<ul style="list-style-type: none"> ▪ National Horticulture Mission (NHM) ▪ Medicinal and Aromatic Crops Area Expansion Scheme in Madhya Pradesh ▪ Fruit Crop Area Expansion Scheme in Madhya Pradesh ▪ Spice Crops Area Expansion Scheme in Madhya Pradesh ▪ Vegetable Area Expansion Scheme in Madhya Pradesh ▪ Protected/Hi-Tech Agriculture in Madhya Pradesh 	<ul style="list-style-type: none"> ▪ RKVY- National Mission for Sustainable Agriculture (NMSA) ▪ PMKSY (HKKP) 	<ul style="list-style-type: none"> ▪ RKVY- National Mission for Sustainable Agriculture (NMSA) ▪ Tapti Mega Recharge Project 	<ul style="list-style-type: none"> ▪ RKVY- National Mission for Sustainable Agriculture (NMSA) ▪ Micro-irrigation (PMKSY-PDMC)
Convergence Opportunities (Soft Rock Aquifers)			
<ul style="list-style-type: none"> ▪ National Horticulture Mission (NHM) ▪ Schemes of Directorate of Cinchona and other Medicinal Plant in West Bengal 	<ul style="list-style-type: none"> ▪ PMKSY (HKKP) for borewells ▪ RKVY- National Mission for Sustainable Agriculture (NMSA) ▪ RKVY-Bringing Green Revolution to Eastern India (BGREI) 	<ul style="list-style-type: none"> ▪ RKVY- National Mission for Sustainable Agriculture (NMSA) 	<ul style="list-style-type: none"> ▪ RKVY- National Mission for Sustainable Agriculture (NMSA) ▪ Micro-irrigation (PMKSY-PDMC)



1. Crop Diversification to High Value Crops

1.1 Horticulture

Horticulture crops such as fruits, vegetables along with floriculture provide better financial returns and have higher compatibility with micro-irrigation, therefore high value crop diversification can be achieved by adopting horticulture crops that can be selected based on existing market opportunities, availability of storage and post-harvest processing and infrastructure arrangements. Intercropping can be adopted to include shade loving crops to further improve land productivity. Also given the high convergence opportunities with different national schemes of RKVY, especially National Horticulture Mission (NHM) and state schemes (Fruit, Vegetable, Spices, Aromatic and Medicinal Plant Area Expansion Schemes in Madhya Pradesh), developing integrated farming systems by incorporating fisheries and livestock rearing with crop cultivation can be explored.

Selection of Type of Horticulture Crops



Existing market opportunities



Availability of storage



Processing infrastructure & arrangements

Activities (MGNREGS)



Suitable Horticulture Crops (Typology 1)

- ▶ Mango Guava Aonla (small amla) Litchi Ber Pear Banana
- ▶ Potato Green pea Cole Crops Chilli Tomato Cucurbits Brinjal Okra Beans
- ▶ Marigold
- ▶ Turmeric Corriander Cumin Fennel Fenugreek Aniseed Mustard
- ▶ Almonds Fox Nuts
- ▶ Beekeeping
- ▶ Mushroom Cultivation
- ▶ Betel-vine

Suitable Horticulture Crops (Typology 2)

-  ▶ Mango Guava Orange Melon Papaya Banana Lime Custard Apple
-  ▶ Green Peas Cauliflower Okra Tomato Potato Eggplant Onion Gourd
-  ▶ Tube Rose Roses Marigold Gladiolus
-  ▶ Garlic Coriander Ginger Chillies
-  ▶ Almonds Fox Nuts
-  ▶ Beekeeping
-  ▶ Betel-vine

Advanced Opportunities



Intercropping with shade loving crops



Integrated farming systems; incorporating fisheries and livestock with crop cultivation

Challenges

Irrigation availability in community areas

Maintenance and management of horticulture output from community area

1.2 Nursery Raising

For high-value crop diversification, creating quality planting material is very important. Hence, Nursery raising can contribute to horticulture activities while providing additional income generation to the farmers. The plant varieties suitable for the local soil and climate can be selected for raising nurseries. Proper capacity building and training programmes should be imparted to the individuals and groups for imparting the skills for raising good quality nurseries and for maintaining them to have a longer shelf life.



Selection of crops depending on local requirement (vegetables, fruits, flowers, spices, nuts)



Given the current and future needs, gram sabha, panchayat, SHGs can collectively decide the types of crops for which nursery training in consultation with KVKs, State Agriculture Universities.



Appropriate skilling shall be done to execute the required activities



Appropriate information about sunlight/shade, fertiliser and irrigation requirements specific to nurseries shall be provided to individuals/groups/community



Training related to maintenance, storage and transportation of nursery to increase the shelf life of nursery

Activities (MGNREGS)

Raising nursery for Individuals, community and groups

Challenges

Appropriate shading and temperature maintenance for suitable and lucrative crops may need additional resources

Marketing challenges for fetching a good price for nurseries may arise



2. Irrigation Measures to Increase Yields

2.1 Construction, Renovation, Repair and Maintenance of Irrigation Structures

For increasing the access and control of water resources to support diversification to high value crops, more irrigation structures (groundwater and canal irrigation) can be constructed and the existing structures can be renovated, repaired or maintained to restore capacity and ensure a longer life of structures.

National schemes such as PMKSY, NMSA can be explored for convergence with MGNREGA activities given the similar objectives of the schemes. Also region specific schemes such as Bringing Green Revolution to Eastern India also have significant overlaps with the MGNREGS activities and hence can be converged with the same.

Activities (MGNREGS)

Construction of dugwells with sand-filter² and for less than 6m diameter

Construction of lift irrigation

Construction of feeder, distributary and minor and sub-minor canals

Construction of water courses/field channel

Renovation of feeder, distributary, minors, sub-minors, water courses canal for community

Repair and maintenance of parapet & platform of irrigation open well for community

Challenges

Deciding an appropriate location for constructing community irrigation structures may require collective action from all stakeholders

Irrigation capacity created does not necessarily translate into irrigation capacity utilised.

²sand filter applicable only for Typology 1, soft rock region



3. Sustainable Groundwater Development

Sustainable groundwater development entails expansion of irrigation availability and access while ensuring adequate recharge of aquifers. Irrigation expansion can be done by constructing new and maintaining, renovating repairing existing structure as explained in the previous section. This section covers the practices to improve artificial recharge.

Artificial recharge of wells through sand filter:

In alluvial as well as hard rock areas, there are many dug wells, which have either gone dry, or the water levels have declined considerably. These dugwells can be used as structures to recharge the groundwater reservoirs. This involves storing runoff water, filtering and injecting to the underlying shallow aquifer. The stored water is then pumped out at the critical crop time for irrigation.

Recharge Pit:

It can be built to recharge a borewell or help the water infiltration in the area. This helps in improving sustainability of the source of water. The percolation rate of a recharge pit is much less than of an open well. The water percolates slowly because there is no hydrostatic pressure the pit.

Mini Percolation Tank:

They are generally constructed across streams and bigger gullies in order to impound a part of the run-off water to allow it to recharge the groundwater.

Underground dykes:

These are earthen or RCC barrier structures that obstruct sub-surface flow, and the impounded water can be extracted from nearby wells and tube wells. The underground dykes are most suitable in hard rock areas where impermeable strata are found at shallow depths below soil surface. The raised water table due to the underground dykes increase the baseflow in the rivers and streams and thus, make the water available for longer periods.

3.1 Construction, Renovation, Repair and Maintenance of Recharge Structures Suitable for Softrock Region

For ensuring sustainability of groundwater use and development and to avoid future over-exploitation of groundwater, adequate focus on recharging the water resources has to be maintained.

Activities (MGNREGS)



3.2 Construction, Renovation, Repair and Maintenance of Recharge Structures Suitable for Hardrock Region

For ensuring sustainability of groundwater use and development and to avoid future over-exploitation of groundwater, adequate focus on recharging the water resources has to be maintained.

Activities (MGNREGS)

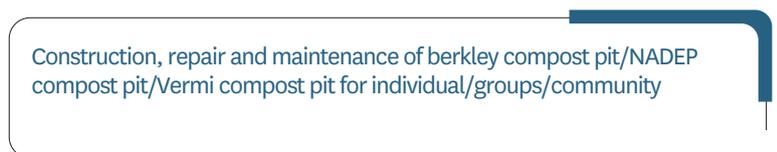


4. Efficient Use of Available and Created Water Resources

4.1 Improving Soil Health and Soil Moisture

Efficient use of water can be achieved by improving the soil health through layering of compost and other carbon-rich supplements. These supplements can be made in the village if required infrastructure is created and maintained in the village. Hence the activities contributing to creation and maintenance of this infrastructure would contribute to efficient utilisation of water resources and would also support diversification to high value crops by improving soil health.

Activities (MGNREGS)



4.2 Micro-irrigation*

Given that most of the horticulture crops are highly compatible with micro-irrigation, efficient use of water through micro-irrigation while achieving high value crop-diversification becomes complementary.

*Not an approved activity under MGNREGS but can be converged well with them"



Typology 3 and Typology 4

Typology 3

Demand Management Districts (Soft Rock Aquifers)

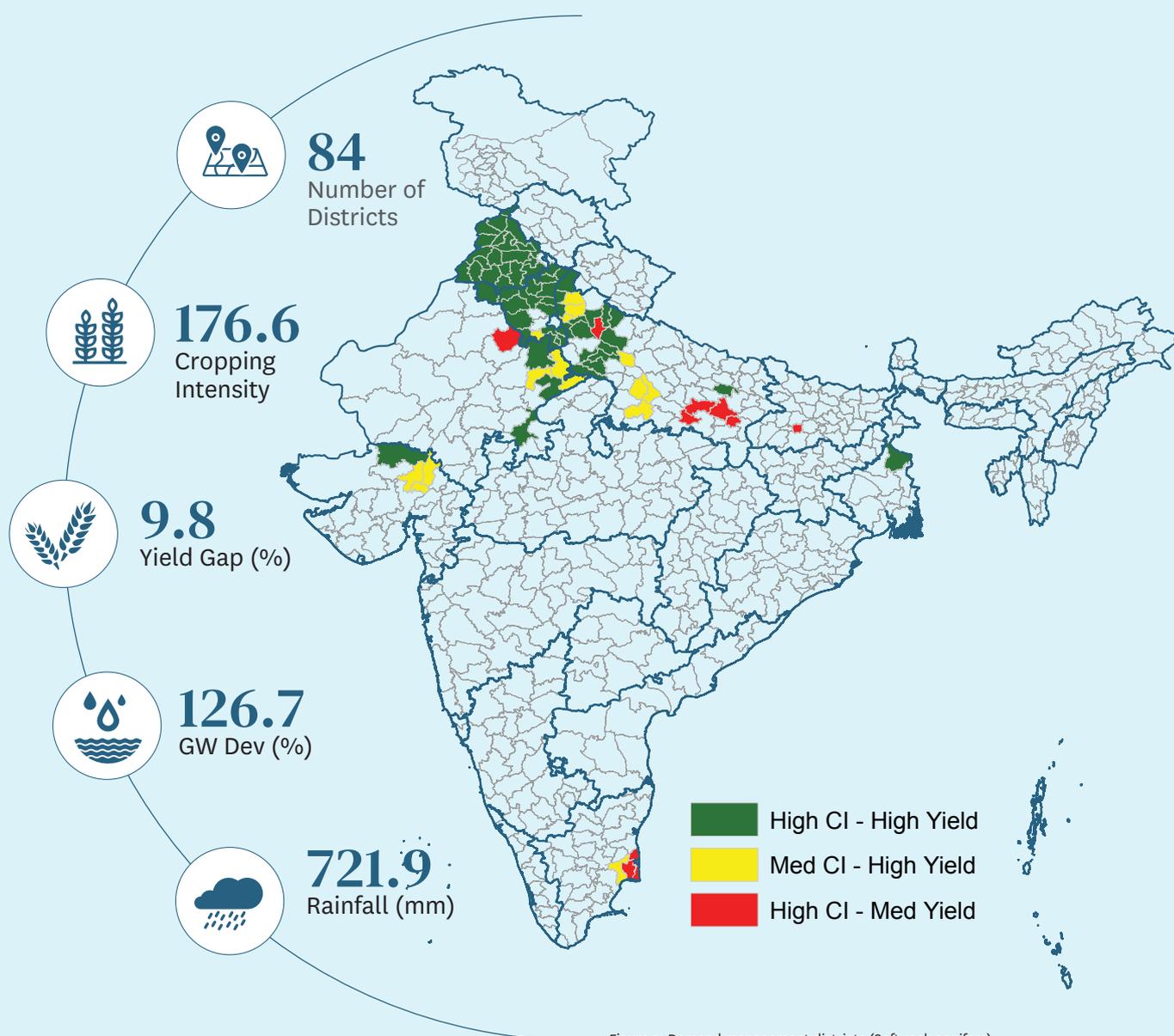


Figure 3: Demand management districts (Soft rock aquifers)

This typology is spread across 8 states and one union territory, covering 84 districts, covering majority of Punjab and Haryana states. All the districts under this typology are characterised by low rainfall, high cropping intensity and high groundwater development. As the groundwater resources of the districts are highly depleted, there is an urgent need of managing the crop water demands by employing efficient irrigation systems and diversifying to less water intensive crops. Additionally, augmentation of the water resources forms an important development priority for this typology.

Typology 4

Demand Management Districts (Hard Rock Aquifers)

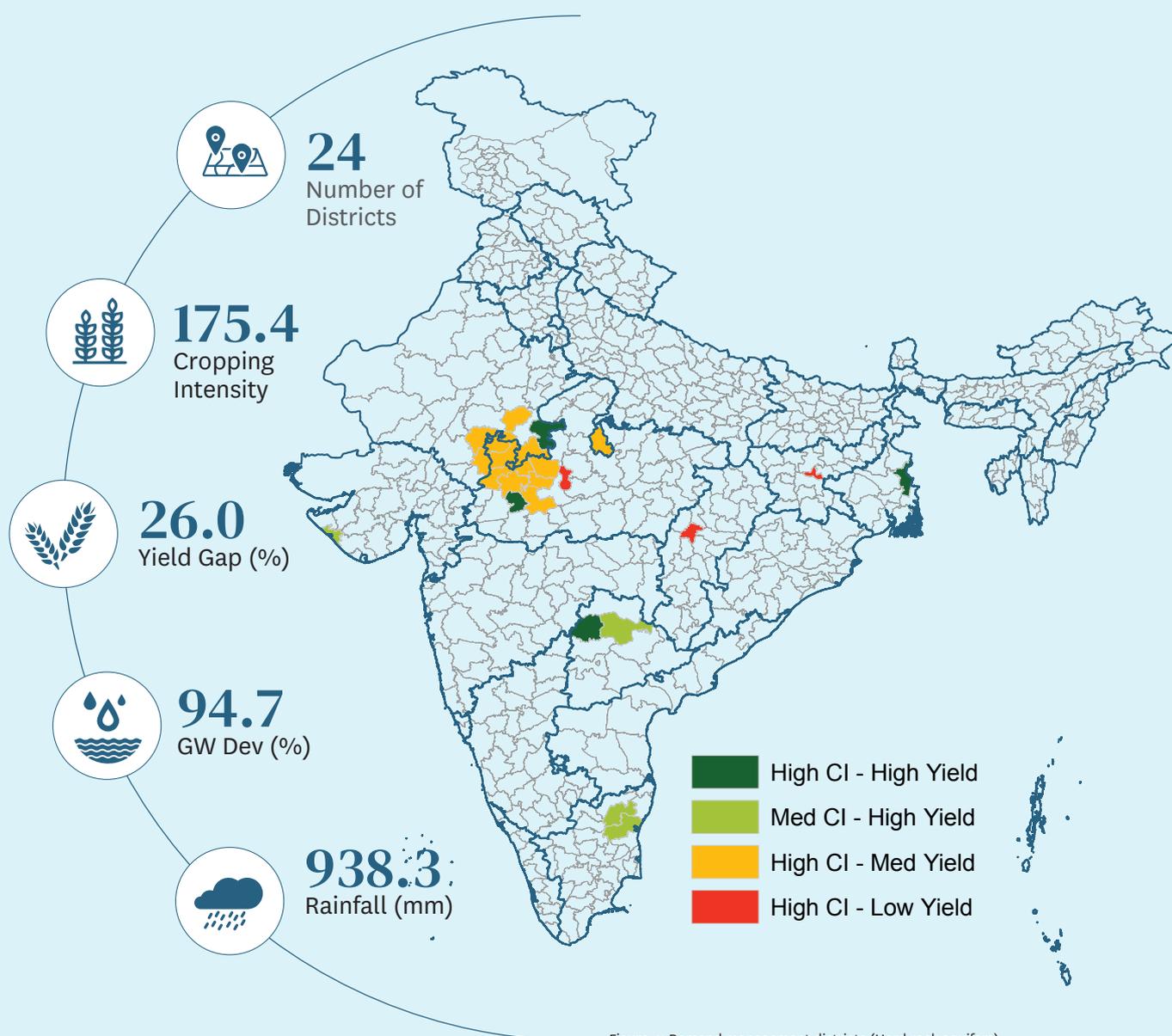


Figure 4: Demand management districts (Hard rock aquifers)

This typology is spread across 9 states, covering 24 districts. These districts are characterised by good rainfall and groundwater resources. Though the cropping intensity is very high and very good development of groundwater, there is still a large gap in crop yield. Therefore, demand-side management is the highest prioritised development activity for sustainable water resources of these districts followed by efficient use of available water resources. Different agronomic practices should also be followed to fill the large crop yield gap in these districts.

Development Priorities in Typology 3 and Typology 4

 <p>Demand management through technological and policy interventions</p>	 <p>Efficient use of available water resources</p>	 <p>Augmenting the available surface and groundwater resources</p>	 <p>Increase yield through agronomic measures</p>
Activities (MGNREGS)			
<ul style="list-style-type: none"> ▪ Land levelling 	<ul style="list-style-type: none"> ▪ Lining of surface irrigation conveyance structures <ul style="list-style-type: none"> • Lining of canal structures, water courses • Land levelling • Efficient rain water use • Construction of bund • Construction, repair and maintenance of compost pit 	<ul style="list-style-type: none"> ▪ Construction, repair and maintenance of surface water irrigation structures and rainwater harvesting <ul style="list-style-type: none"> • construction of canal, anicut/check dam for community • construction of farm pond for individuals • construction, repair and maintenance of community water harvesting pond for community ▪ Augmentation of groundwater through artificial recharge structures <ul style="list-style-type: none"> • construction of Sand filter for borewell/open well recharge • construction of recharge pits, mini percolation tank • construction of graded bund, trench • construction of underground dykes for community (typology 4 only) 	<ul style="list-style-type: none"> ▪ Composting
Convergence Opportunities (Typology 3)			
<ul style="list-style-type: none"> ▪ Land levelling: NMSA (RAD) ▪ Mulching: Mission for Integrated Development of Horticulture, Punjab (MIDH) ▪ DSR, SRI: National Food Security Mission (NFSM) ▪ Crop Shifting: MeraPani Meri Virasat, Haryana ▪ Promotion of Agricultural Diversification, Department of Agriculture, Punjab 	<ul style="list-style-type: none"> ▪ Micro irrigation: PMKSY(PDMC), RKVY (RAFTAR), NHM ▪ In situ moisture conservation, composting: NMSA ▪ Laying Underground Pipeline System (NABARAD-RIDF-18, 22), Punjab ▪ Haryana Preservation of Sub-Soil Water Act- 2009 ▪ Punjab State Preservation of Sub-Soil Water Act 2009 	<ul style="list-style-type: none"> ▪ Surface water irrigation projects, minor irrigation for both surface water and groundwater, groundwater recharge structures: PMKSY Groundwater recharge structures: ABhY (Haryana, Gujarat, Rajasthan, Uttar Pradesh), NMSA (RAD) Scheme for Renovation of Village Ponds, Punjab 	

Convergence Opportunities (Typology 4)

- Land levelling: NMSA (RAD)
- DSR, SRI: National Food Security Mission (NFSM)

- Micro irrigation: PMKSY(PDMC), RKVY (RAFTAR), NHM
- In situ moisture conservation, composting: NMSA

- Surface water irrigation projects, minor irrigation for both surface water and groundwater, groundwater recharge structures: PMKSY
- Groundwater recharge structures: ABhY (Madhya Pradesh, Rajasthan, Uttar Pradesh), NMSA (RAD)
- Rajiv Gandhi Mission for Watershed Management, Madhya Pradesh
- Groundwater level improvement: Mission Kakatiya, Telengana

- Integrated manure and pest management, bio fertilizer: RKVY (RAFTAR)
- Soil health management: NMSA (RAD)
- Farm machinery support: SMAM
- Improved crop cultivar, seed, crop management practices: NFSM



1. Demand Management through Technology & Policy Interventions

Targeting the reduction of the non-beneficial part of water use can reduce the total crop water demand without affecting the yield. Such on-farm non-beneficial water losses can be reduced by several technical interventions such as shifting the crop plantation date to less evaporative demand period, mulching, precise land levelling, direct seeded rice, opting for shorter duration crops and weed management. Following are the activities those are being taken up by MGNREGS and other central or state schemes.

1.1 Land Levelling

Land levelling is mainly done with a main objective of modifying the land surface to a desirable plane for easy cultivation and farm operations. Precise land levelling for the uneven terrain gives an advantage of uniform water application in the field and reduction in unnecessary water wastage, and thus, results in increased irrigation efficiency and crop water productivity. RAD component of NMSA support for land levelling in the states coming under both typology 3 and 4.

Activities (MGNREGS)

Land levelling/ shaping of wasteland/ fallow land for individuals community

1.2 Mulching*

This is the technique of covering the bare soil surfaces in the planted fields either with the trash/ organic residues or plastic films or through interculture to create a top layer of dry soil covering. The main objective is to create a layer of resistance to solar radiation and thus reduce the evaporative losses. Mulching activities under the national scheme, NMSA (RAD) can be converged with MGNREGS. Other schemes like Mission for Integrated Development of Horticulture (MIDH) in Punjab promote mulching.

1.3 Alternative Crop and Cultivation Practices*

Rice is the most important cereal crop cultivated in India and has larger water consumption. Excessive cultivation of rice in northwest India has caused over-exploitation of groundwater and depletion of the environment. In conventional method of cultivating, transplanting after repeated puddling is practiced generally which is water and energy intensive. Puddling is done to reduce the porosity of the soil to ensure a continuous standing water in the field. Direct Seeded Rice (DSR), process of establishing a rice crop from seeds sown in the field directly in the field rather than by transplanting the seedlings, is one of the options to reduce this non-productive water use/loses. Similarly, System Rice Intensification (SRI) provides an option to improve yields while reducing other inputs. SRI promotes development of fast and dense root growth leading to better nutrient and water accessibility for producing tillers and grains. More number of tillers can be developed from a single plant by adopting planting single seedling with wider spacing, early transplanting, alternate wetting and drying irrigation method, use of organic manure etc. National schemes like NFSM promoting direct seeded rice, system rice intensification can also be converged with the complimentary activities undertaken under MGNREGS. Some of the state schemes such as Mera Pani Meri Virasat of Haryana incentivize farmers for cultivating alternative low water requiring crops such as maize, pearl millet, pulses and vegetables. Likewise, the department of agriculture, Punjab promoting agricultural crop diversification have suitable opportunities for convergence.

*Not an approved activity under MGNREGS but can be converged well with them"



2. Efficient Use of Available Water Resources

As the districts coming under this typology are mainly characterised by high cropping intensity, efficient application of available and created water resources can further increase the area under crop and thus, reduce yield gaps. The suitable activities for efficient application of irrigation activities are briefly discussed below:

2.1 Lining of Surface Irrigation Conveyance Structures

Surface water conveyance structures such as canals generally have a very low irrigation efficiency if they are unlined and create a huge gap in irrigation potential created and utilized at the end user. Lining of the parts or whole length of canal can reduce this heavy seepage loss and increase the irrigation efficiency of the system. However, lining of canal needs proper design, supervision and implementation. Cement concrete lining is the preferred solution for longer term for controlling seepage and making water available to the tail-end user. Nevertheless, the lining type should be selected based on the type of soil, sub-grade, water table position, material availability, climatic condition, stability and repair-maintenance cost etc.

Activities (MGNREGS)

Lining of feeder, distributary, minor, sub-minor canal, water courses for community

2.2 Efficient Rain-Water Use

Efficient use of rainwater in the rainfed areas can be achieved if soil moisture is improved by improving the soil health through layering of compost and other carbon-rich supplements, in-situ moisture conservation through soil and water conservation measures. These supplements can be made in the village if required infrastructure is created and maintained in the village. Hence, the activities contributing to creation and maintenance of this infrastructure would contribute to efficient utilisation of water resources and would also support diversification to high value crops by improving soil health. Also, raising bunds height around the plots to retain the rainwater are the activities for using the rainwater efficiently for crop production. Central schemes such as Rainfed Area Development programme under National Mission for Sustainable Agriculture (NMSA-RAD) that supports water harvesting, insitu soil moisture conservation, mulching, construction of vermi compost structures and green manuring for effective rainwater utilisation can form a potential convergence opportunity for MGNREGS. Mission for Integrated Development of Horticulture (MIDH) in Punjab has provision for mulching activity in the state.

Activities (MGNREGS)

Construction, repair and maintenance of recharge pits for community/individuals

Construction of sand-filter for openwell recharge for community/groups/individual

De-siltation, renovation and repair of farm ponds/mini percolation tank/sunken pond for individual/community/group

2.3 Micro-irrigation*

Water saving technologies like micro-irrigation (drip and sprinklers) are the appropriate interventions for achieving efficiency in irrigation application and increasing crop yield. Additionally, crops cultivated under controlled environment of polyhouses and net houses are best irrigated with micro-irrigation techniques. Micro-irrigation also helps in improving the micro-climate and thus offset the impacts of climate variability. Depending upon the crop and skill of the farmer in managing the system, a water saving of 30-50% as compared to surface flood irrigation can be achieved. MGNREGS can co-finance and converge to Per Drop More Crop component of Pradhan Mantri Krishi Sinchayi Yojana (PDMC-PMKSY), RKVY-RAFTAR which aim for promoting micro irrigation for agricultural and horticultural crops across the country have high potential of convergence with MGNREGS.



3. Augmenting Available Surface Water and Groundwater

Augmentation of water resources can be done wherever applicable through rejuvenation of the existing water infrastructure and tapping the additional water resources through utilisation of rain and/or canal water.

3.1 Construction, Repair and Maintenance of Surface Water Irrigation Structures and Rainwater Harvesting

Construction of the canal structures and their repair, renovation and maintenance will improve the rural water security, provide resilience against the droughts and long dry spells, support intensification through cultivation of rice-fallows during the rabi/summer season in rice fallow areas of this typology, assure farmers to invest in improved seeds and agri-inputs for higher productivity and farm incomes. Other structures such as farm pond, check dams, tanks also store water and aids in improving the irrigation supply during critical stages of crops and recharge groundwater. The related centrally sponsored schemes such as RKVY-RAFTAR, RAD-NMSA can be converged with MGNREGS for augmenting the surface water availability for irrigation and other uses. State schemes such as Mission Kakatiya of Telengana also beautifully converge in MGNREGS.

Activities (MGNREGS)

Construction, repair and maintenance of minor, sub-minor, distributary, water course and feeder canal for community

Construction, repair and maintenance of check dam for community

Construction of farm pond for individuals

Construction, repair and maintenance of water harvesting pond for community

3.2 Augmentation of Groundwater through Artificial Recharge

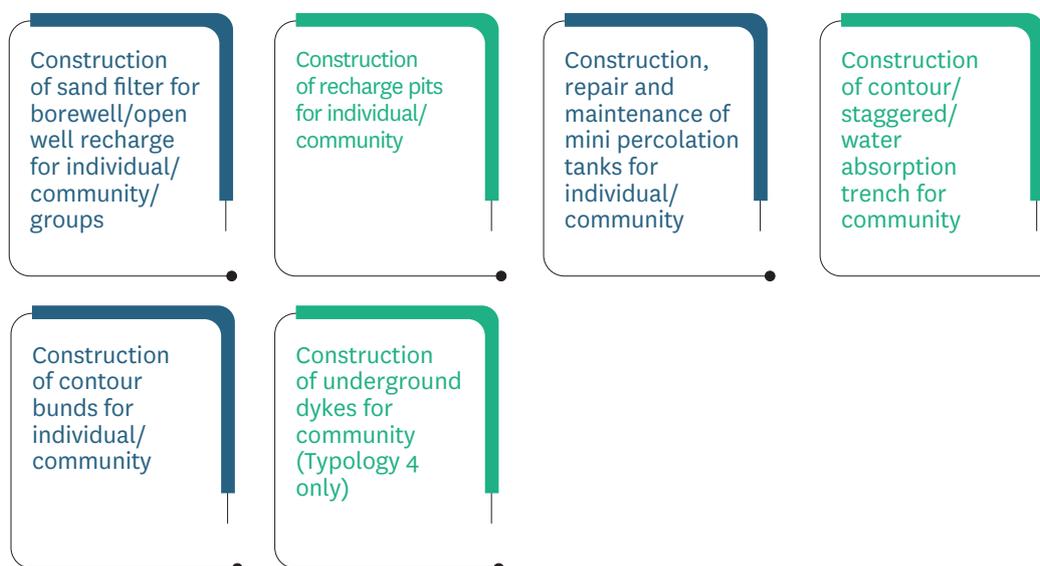
Enhancing the natural recharge to the dug-wells and aquifers provide safe and assured groundwater storage to meet the irrigation needs and successfully combat droughts, long dry spells and heat and cold waves.

In alluvial as well as hard rock areas, there are many dug wells, which have either gone dry, or their water levels have declined considerably. These abandoned dugwells can be used as structures to recharge the groundwater reservoirs. This involves storing runoff water, filtering and injecting to the underlying shallow aquifer. The stored water is then pumped out at the critical time for irrigation. Similarly recharge pits can be built to recharge a borewell or improve the water infiltration in the area. The percolation rate of a recharge pit is much less than of an open well. Mini percolation tank can be constructed across streams and bigger gullies in order to impound a part of the run-off water to allow it to recharge the groundwater.

For Hardrock regions (typology 4) underground dykes, that are RCC barrier structures that obstruct sub-surface flow, can be created for improving the aquifer storage, baseflow in the rivers and streams and thus, make the water available for longer periods.

The centrally sponsored scheme, RAD-NMSA has all the activities related to artificial groundwater recharge similar to MGNREGS, but with lesser budget providing an opportunity for convergence. Similarly, other centrally-sponsored schemes like WDC-PMKSY, ABhY also focus on groundwater resource augmentation.

Activities (MGNREGS)



4. Increase Yield through Agronomic Measures (Typology 4 only)

Viable sustainable agronomic practices such as introducing high yielding crop cultivars, improved product qualities, increased biotic and abiotic tolerance, conservation agriculture such as zero tillage as well as application or/and encouragement of beneficial microorganisms (e.g., bacteria, algae, fungi) with the potential to increase nutrient and water uptake without compromising environment functions can be adopted to improve crop yield.

4.1 Composting

Composting aims at increasing the nutrient content of soil thus, aiding in increasing the yield in a sustainable manner. Composting is the process of decomposing the organic materials by providing ideal environments for microbial activities. There are many types of compost structures which are popular such as Berkley compost pit (for fast composting), traditional compost pit, NADEP compost pit (capacity: 1 tonne), vermi compost (using earthworms; suitable for small vegetable plots up to 0.25 ha). Central schemes like NMSA-RAD having similar activities for preparing vermi compost, organic input, green manuring can be converged with MGNREGS for improving soil health.

Activities (MGNREGS)

Construction, repair and maintenance of berkley compost pit/NADEP compost pit/vermi compost pit for individual/groups/community

4.2 Improved Crop Cultivars/Seeds/ Stress-tolerant Crop Varieties*

Using improved crop varieties with high yielding capability, flood-drought resistant and pest-diseases resistant crops can lead to increased crop yield. Centrally sponsored scheme such as NFSM promotes use of improved crop varieties and disease resistant crop through establishing tissue culture-analysis labs, seed treatment units, bio-control labs. The activities under this scheme can be converged with MGNREGS.

4.3 Crop Management Practices*

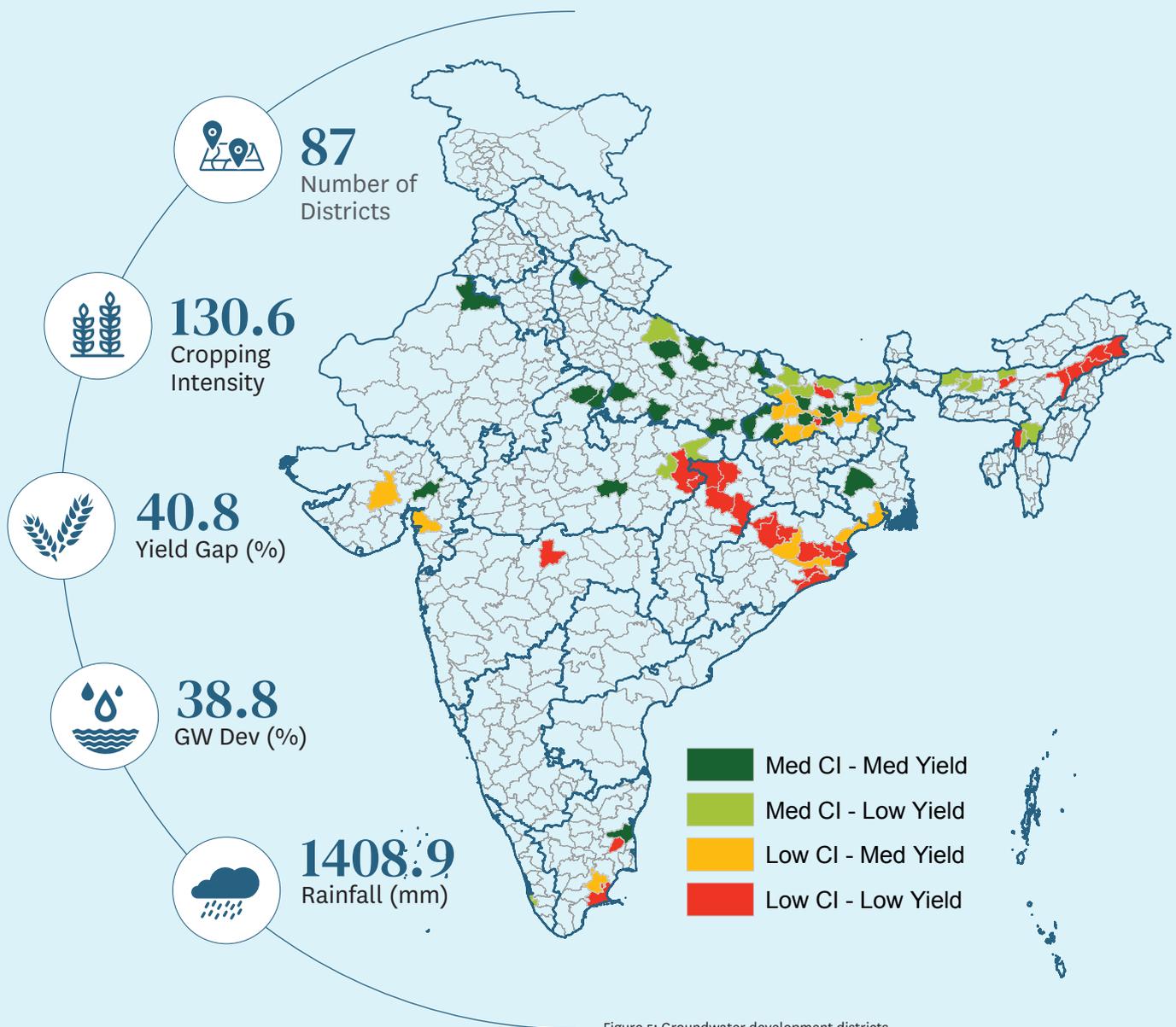
Adopting consistent and best crop management practices at farm level will develop a more resilient crop production system and improve crop yields. Crop management is the set of agricultural practices performed to improve the growth, development and yield of crops. Crop management practices includes preparing uniform seedbed having adequate surface soil moisture, weed-free system, appropriate sowing density, reduced or no-tillage practices, improved pest management, crop rotation or inter-cropping etc. Several national schemes such as SMAM which supports farm mechanization through establishment of village level or the farmer cooperative machine banks, or custom hiring centers, NFSM that supports integrated nutrient management and integrated pest management infrastructures can be converged with MGNREGS for increasing yield of the selected districts.



Typology 5

Typology 5

Groundwater Development Districts



This typology is spread across 14 states and one union territory, covering 87 districts, mostly in the eastern region. Characterised by good rainfall and abundant availability of groundwater resources, the region holds high potential for agrarian income enhancement through increased irrigation access and intensity, yield improvement and incorporation of innovative farming models.

Development Priorities in Typology 5

 <p>Rainwater Management and Irrigation Expansion</p>	 <p>Increase yields through agronomy measures</p>	 <p>Improving availability of affordable farm energy for groundwater lifting and other farm operations</p>	 <p>Development of Innovative Farming System Models</p>
<p>Appropriate Activities (MGNREGS)</p>			
<ul style="list-style-type: none"> ▪ Construction, Repair, Renovation and Maintenance of Irrigation Structures (Dugwells), Drains, Flood/Diversion Channels 	<ul style="list-style-type: none"> ▪ Composting 		<ul style="list-style-type: none"> ▪ Construction and renovation of fisheries ponds, livestock sheds for individuals, community, nursery raising
<p>Convergence Opportunities</p>			
<ul style="list-style-type: none"> ▪ PMKSY (HKKP) for borewells ▪ RKVY- National Mission for Sustainable Agriculture (NMSA) ▪ RKVY-Bringing Green Revolution to Eastern India (BGREI) ▪ Minor Irrigation and Tube Well Scheme of Bihar ▪ Rural Infrastructure Development Fund (RIDF)- Shallow Tube Well Scheme (STW), Assam 	<ul style="list-style-type: none"> ▪ Soil health management: NMSA (RAD) ▪ National Mission for Agriculture Extension and Technology (NMAET & ATMA) SMAM NFSM 	<ul style="list-style-type: none"> ▪ PM-KUSUM (Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan) ▪ Bihar Saur Kranti Sinchai Yojana (BSKSY) 	<ul style="list-style-type: none"> ▪ RKVY- National Mission for Sustainable Agriculture (NMSA) PMKSY(PDMC)

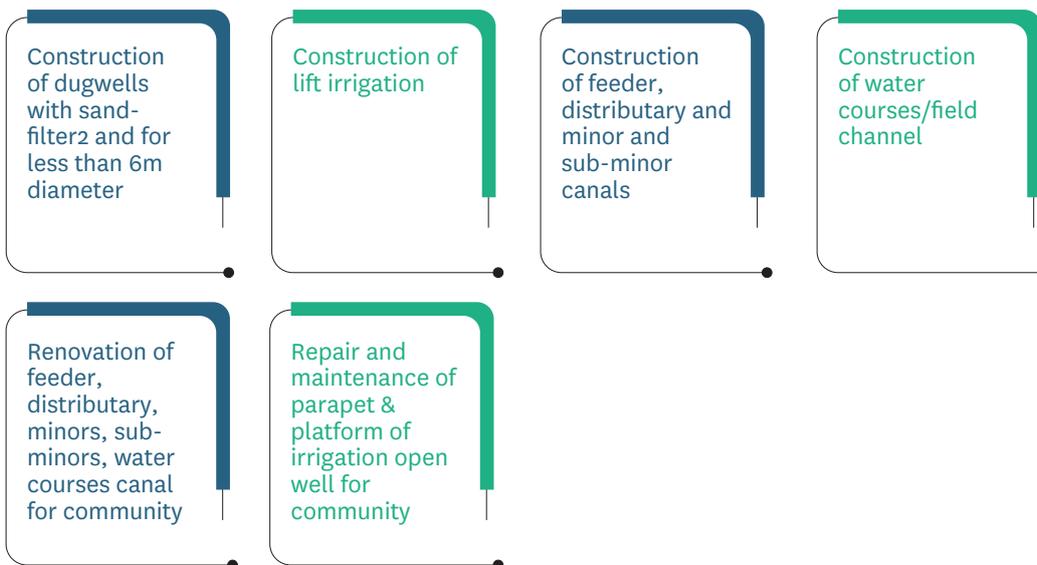


1. Irrigation Expansion and Rainwater Management

1.1 Irrigation Expansion

For increasing the access and control of water resources to expand irrigation, more irrigation structures (Groundwater and Canal irrigation) can be constructed, and the existing structures can be renovated, repaired or maintained to ensure a longer life of structures. Many schemes are supported by national and state governments to expand irrigation access by increasing the number of irrigation structures such as Minor Irrigation and Tube Well Scheme in Bihar and Shallow Tubewell Scheme in Assam. Apart from irrigation structures, schemes are in place to improve affordable energy access to farmers for irrigation such as national flagship scheme PM-KUSUM (Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan) and BSKSY (Bihar Saur Kranti Sinchai Yojana).

Activities (MGNREGS)



Challenges

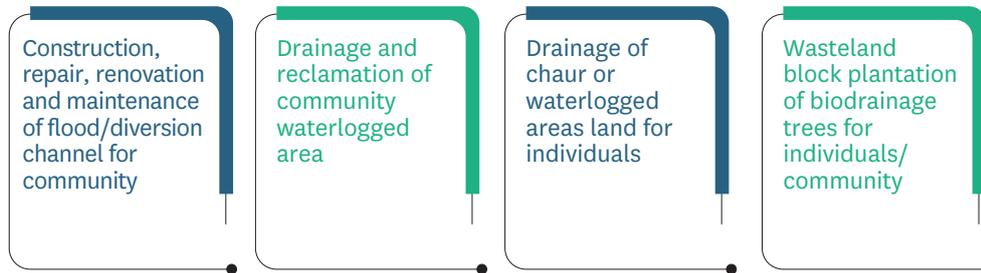
Deciding an appropriate location for constructing community irrigation structures may require collective action from all stakeholders

Irrigation capacity created does not necessarily translate into irrigation capacity utilised.

1.2 Rainwater Management

Given that the region falls in the plains with high rainfall therefore measure have to be taken to effectively manage the rainwater to support expansion in irrigation and avoid flooding and water logging.

Activities (MGNREGS)



2. Increase Yields Through Agronomy Measures

Agronomic practices such as using high yielding crop varieties, improved stress tolerance, conservation agriculture such as zero tillage as well as improving soil health and structure without compromising environment functions can be adopted to improve crop yield.

2.1 Composting

Composting helps in increasing the nutrient content of soil thus, aiding in increasing the yield in a sustainable manner. For details, refer to pg. 24. Central schemes like NMSA (RAD), soil health management component of NMSA having similar activities for preparing vermi compost, organic input, green manuring can be converged with MGNREGS for improving soil health.

Activities (MGNREGS)



2.2 Improved Crop Cultivars/ Seeds/ Stress-tolerant Crop Varieties*

The major states under this category like Assam and Bihar are more prone to flooding situation where cultivating the local varieties cause heavy yield reduction due to submergence. Centrally sponsored scheme such as NFSM promotes use of flood-drought resistant and disease resistant crops through establishing tissue culture-analysis labs, seed treatment units, bio-control labs. The activities under this scheme can be converged with MGNREGS for further improving the crop yield.

*Not an approved activity under MGNREGS but can be converged well with them"

2.3 Crop Management Practices*

Crop yield can be increased by adopting several best crop management systems. For details, refer to pg. 25. Several national schemes such as SMAM which supports farm mechanization through establishment of village level or the farmer cooperative machine banks, or custom hiring centers, NFSM that supports integrated nutrient management and integrated pest management infrastructures can be converged with MGNREGS for increasing yield of the selected districts.



3. Development of Innovative Farming System Models

3.1 Integrated Farming Models

Integrated Farming Models are interdependent production systems based on co-management of crops and animals in a way that maximizes the utilization of nutrients of each system and minimizes the waste while significantly improving the income and labour and land and water productivity. Some options are listed below:

Agriculture	Horticulture	Pig culture	Sericulture	Agricultural (rice)	Agricultural	Poultry
livestock	fish culture	fish culture	fish culture	fish	duckery	fish culture
poultry	poultry			mushroom cultivation	poultry	

Activities (MGNREGS)

Construction and renovation of fisheries ponds, livestock sheds for individuals, community

3.2 Nursery Raising

Nursery raising can be a component of innovative farming model and can provide significant additional income generation to the farmers. For more details, refer to pg 11.

Activities (MGNREGS)

Raising nursery for individuals, community and groups

Challenges

Appropriate shading and temperature maintenance for suitable and lucrative crops may need additional resources

Marketing challenges for fetching a good price for nurseries may arise

*Not an approved activity under MGNREGS but can be converged well with them"



Typology 6

Typology 6

Water Conservation Cluster

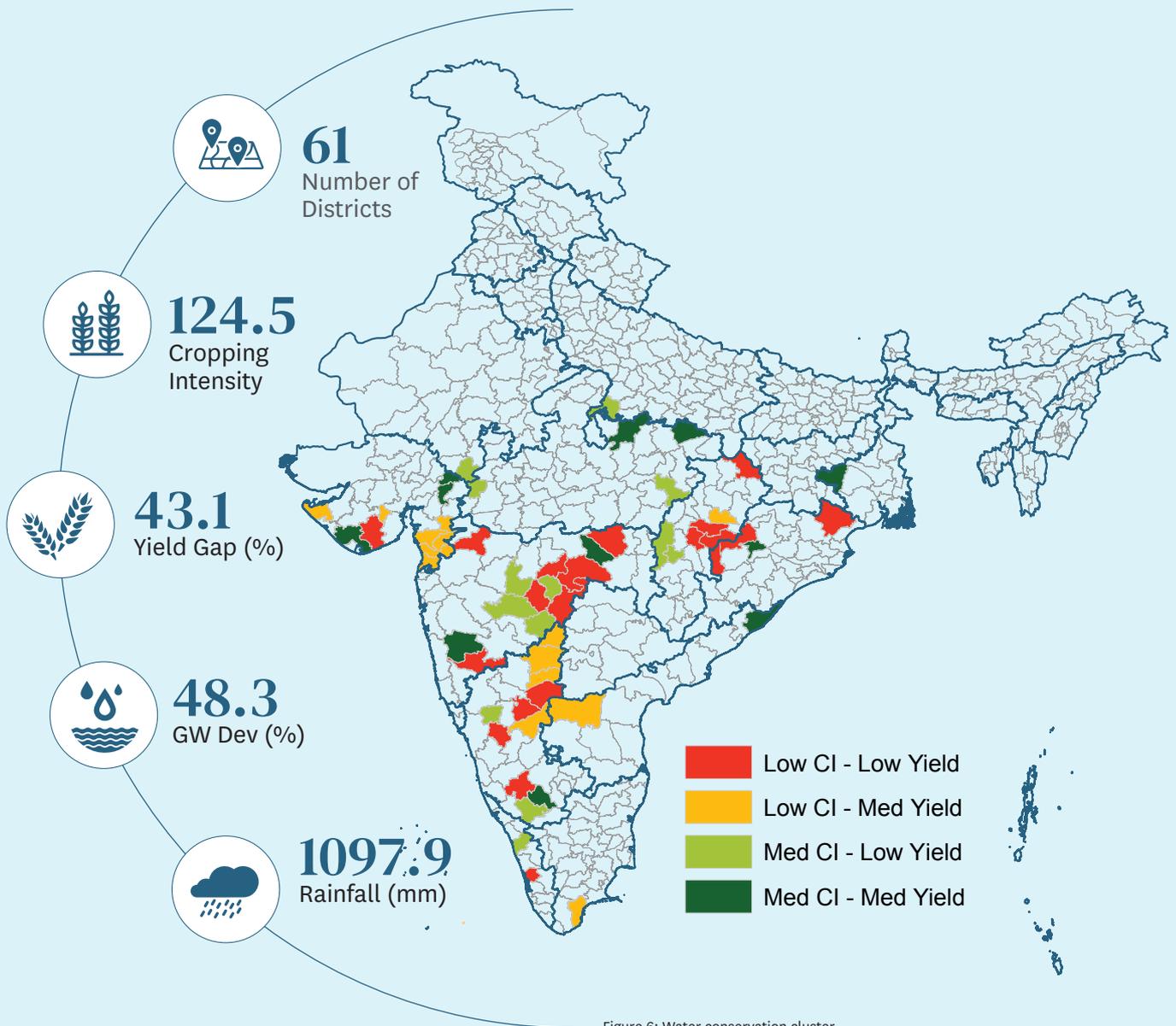


Figure 6: Water conservation cluster

This typology is spread across 13 states and two union territories, covering 61 districts. These districts experience very good rainfall and have moderate cropping intensity. However, the groundwater development is not substantial, and the yield gap is also high. There is a high potential for significant improvement in agrarian income through increased cropping intensity, and yield. Additionally, there needs to be an adequate focus on utilising the water resources efficiently and sustainable development of groundwater.

Development Priorities in Typology 6

 <p>Rainwater management and Irrigation expansion</p>	 <p>Increase yields through agronomy measures</p>	 <p>Efficient use of the available and created water resources</p>	 <p>Sustainable groundwater development</p>
<p>Activities (MGNREGS)</p>			
<ul style="list-style-type: none"> ▪ Rainwater harvesting <ul style="list-style-type: none"> • construction of rainwater harvesting structures: farm pond, check dam, community water harvesting pond • construction of bunds and trenches 	<ul style="list-style-type: none"> ▪ Composting 	<ul style="list-style-type: none"> ▪ Lining of irrigation conveyance structures ▪ Land levelling ▪ Efficient rainwater use <ul style="list-style-type: none"> • Construction of bunds and trenches • Construction, repair and maintenance of compost pits 	<ul style="list-style-type: none"> ▪ Construction of Dugwells
<p>Convergence Opportunities</p>			
<ul style="list-style-type: none"> ▪ Rainwater harvesting: NMSA (RAD), PMKSY (WDC) ▪ Minor irrigation: RKVY(RAFTAR) ▪ Irrigation expansion, rainwater harvesting: Jalamrutha, Karnatak ▪ Rainwater harvesting, Micro irrigation: Krishi Bhagya Scheme, Karnataka ▪ Irrigation: Sagarkhedu Sarvang Vikash Yojana, Gujarat 	<ul style="list-style-type: none"> ▪ Integrated manure and pest management, bio fertilizer: RKVY (RAFTAR) ▪ Soil health management: NMSA (RAD) ▪ Farm machinery support: SMAM ▪ Improved crop cultivar, seed, crop management practices: NFSM ▪ Seed, integrated pest and nutrient management: RKVY (BGREI) ▪ Manure pits: Suvarna Gramodaya Yojana, Karnataka 	<ul style="list-style-type: none"> ▪ Micro irrigation: PMKSY(PDMC), RKVY (RAFTAR), NHM ▪ In situ moisture conservation, composting: NMSA ▪ Financing farm machineries like leveller: AGR2 (Farm Mechanization Scheme), Gujarat ▪ Micro irrigation: Krishi Bhagya Scheme, Karnataka 	<ul style="list-style-type: none"> ▪ Shallow/medium tube wells: NMSA(RAD)



1. Rainwater Management and Irrigation Expansion

This typology covers majority of the districts of Eastern India, experiencing high rainfall and have large rainfed farming systems. Due to topography and lack of assured irrigation, low groundwater development conditions, the agriculture system is mainly dependent on rainfall and thus, have very low cropping intensity, high yield gap, and large fallow lands. A large proportion of rainfall which is flowing out of the region can be arrested through water harvesting structures and in situ interventions such as mulching, composting (to increase the moisture holding capacity of soil) to create assured irrigation availability during critical stages of the crops and can reduce the fallow land proportions. National schemes such as NMSA (RAD), RPKMSY (WDC), RAFTAR-PMKSY (promoting minor irrigation), and state schemes like Jalamrutha of Karnatak, Krishi Bhagya Scheme of Karnatak, and Sagarkhedu Sarvang Vikash Yojana of Gujarat focusing on rainwater harvesting and on farm rain water conservation activities can be converged with MGNREGS.

Activities (MGNREGS)

Construction of earthen peripheral/farm/field/graded bunds for individuals/community

Construction, repair and maintenance of boulder/brushwood/earthen anicut/gabion/masonry cc check dam for community

Construction, repair and maintenance of community water harvesting pond and farm ponds for individuals/community

Construction of contour/staggered/water absorption trench for community



2. Increase Yield through Agronomy Measures

2.1 Composting

Agronomic measure like composting aims at increasing the nutrient content of soil thus, aiding in increasing the yield in a sustainable manner. For details, refer to pg 24. MGNREGS can be converged with central schemes like NMSA (RAD), Soil health management: NMSA, ATMA and state schemes like SuvarnaGramodayaYojana of Karnatak as they support activities related to construction of compost pits and green manuring.

Activities (MGNREGS)

Construction, Repair and Maintenance of Berkley compost pit/NADEP compost pit/Vermi compost pit for individual/groups/community

2.2 Improved Crop Cultivars/Seeds/ Stress-tolerant Crop Varieties*

Centrally sponsored scheme such as NFSM promotes use of improved crop varieties and disease resistant crops through establishing tissue culture-analysis labs, seed treatment units, bio-control labs. The activities under this scheme can be converged with MGNREGS for further improving the crop yield. For details, refer to pg. 24.

2.3 Crop Management Practices*

Crop yield can be increased by adopting several best crop management systems. For details, refer to pg. 24. Several national schemes such as SMAM which supports farm mechanization through establishment of village level or the farmer cooperative machine banks, or custom hiring centers, NFSM, RKVY (RAFTAR) and RKVY (BGREI) that support integrated nutrient management and integrated pest management infrastructures can be converged with MGNREGS for increasing yield of the selected districts.



3. Efficient Use of Available and Created Water Resources

Efficient application of available and created water resources can further increase the area under crop and thus, the reduce the yield gaps. The suitable activities for efficient application of irrigation activities are listed and briefly discussed as follows:

3.1 Lining of Surface Irrigation Conveyance Structures and Land Levelling

Surface water conveyance structures such as canals have low irrigation efficiency if they are unlined and create a huge gap in irrigation potential created and utilized due to heavy loss of water through seepage. Lining of the parts or whole length of canal can reduce this heavy seepage loss and increase the irrigation efficiency of the system. For details, refer to pg 21. Water application efficiency can be increased through uniform water application which can be done through land levelling. In Gujarat, state scheme such as AGR2 (Farm Mechanization) scheme finances for farm machineries like bund former, land leveller, digger etc. can aid in efficient management of irrigation water.

Activities (MGNREGS)

Lining of feeder, distributary, minor, sub-minor canal, water courses for community

Land levelling of waste lands/fallow lands

Not an approved activity under MGNREGS but can be converged well with them

3.2 Efficient Rain-Water Use

Efficient use of water can be achieved if soil moisture is improved by improving the soil health through layering of compost and other carbon-rich supplements. For details, refer to pg 21. Central schemes such as Rainfed Area Development programme under National Mission for Sustainable Agriculture (RAD-NMSA) that supports water harvesting, in-situ soil moisture conservation, mulching, construction of vermi compost structures and green manuring for effective rainwater utilisation can form a potential convergence opportunity for MGNREGS.

Activities (MGNREGS)



3.3 Micro-irrigation*

Water saving technologies like micro-irrigation (drip and sprinklers) are the appropriate interventions for achieving efficiency in irrigation application and increasing crop yield. For details, refer to pg 22. Centrally sponsored scheme such as PDMC-PMKSY, RKVY-RAFTAR which aim for promoting micro irrigation for agricultural and horticultural crops across the country, and other states projects such as Krishi Bhagya Scheme, Karnatak promotes use of drip irrigation through varying range of subsidies.



4. Sustainable Groundwater Development

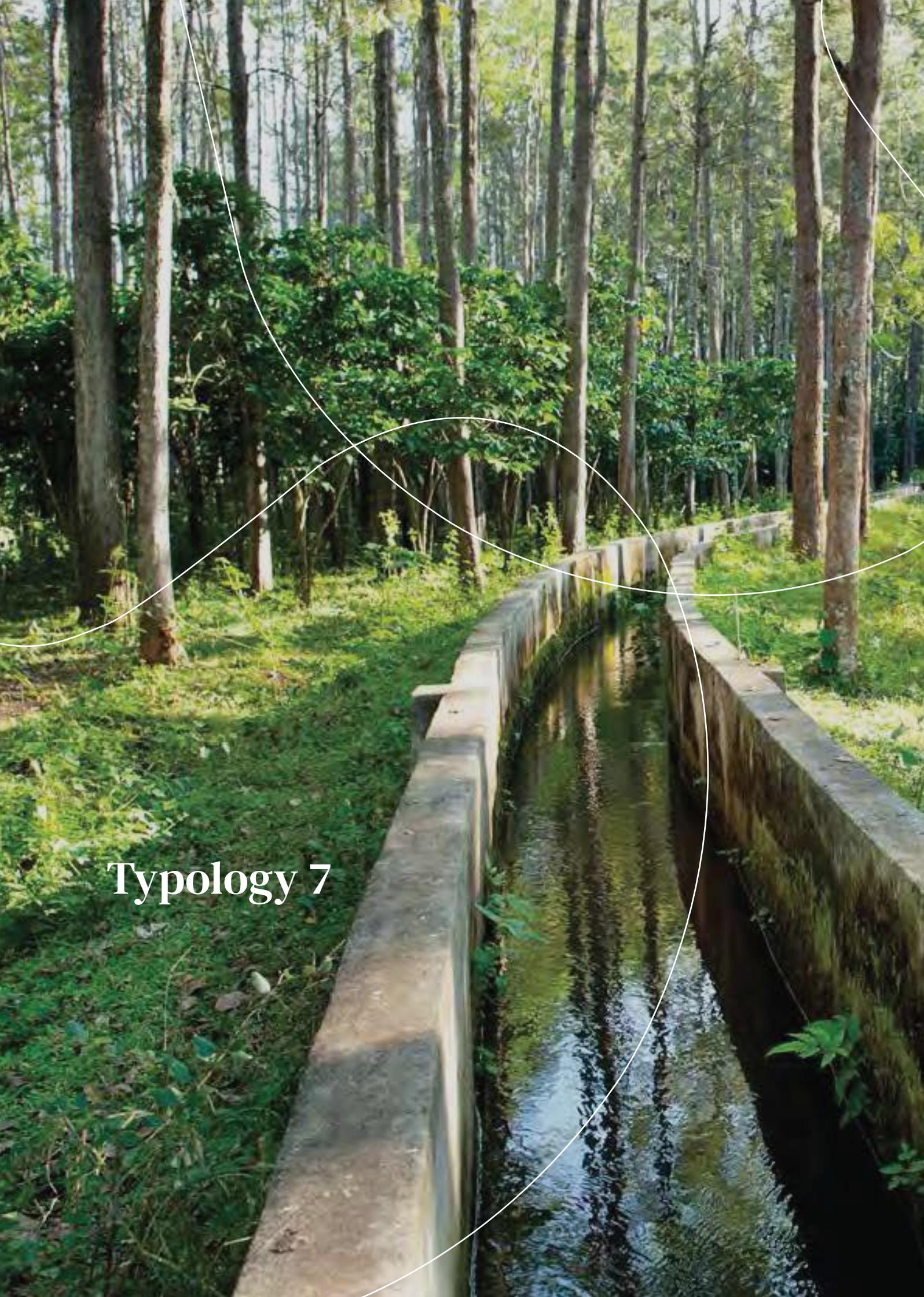
The average groundwater development of the districts is only about 48% and for increased crop production and reducing crop yield gap, groundwater must be developed sustainably. National scheme such as RAD-NMSA focuses on construction of shallow or medium borewells/tube wells in suitable areas of the states.

4.1 Construction of Irrigation Open Wells

Irrigation open wells can be constructed in the districts coming under safe water level category. They can be for individual, or community based. These irrigation wells can provide support to increase the cropping intensity and reduce the fallow area.

Activities (MGNREGS)





Typology 7

Typology 7

Watershed Development Districts

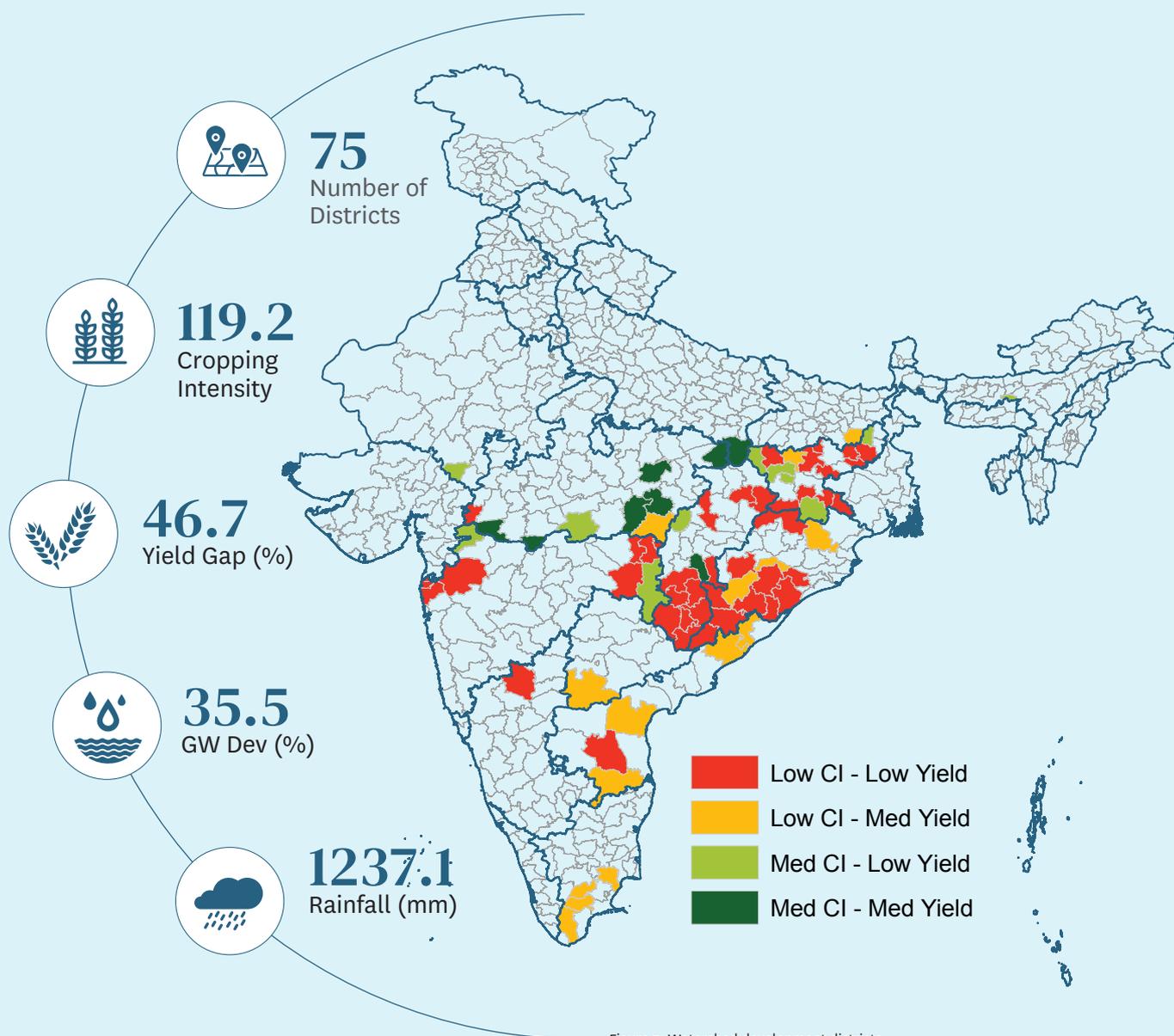


Figure 7: Watershed development districts

This typology is spread across 13 states, covering 75 districts, majority lying in Eastern part of the country. Jharkhand followed by Chattisgarh and Odisha come under this typology. These districts are characterised by high rainfall, but low groundwater development conditions. The cropping intensity is low in these districts with a large yield gap to the national average. For achieving higher water productivity, overall watershed development is prioritized followed by managing the rainwater for achieving assured irrigation during crop cultivation stages. Innovative farming system models such as integrated farming are required for achieving higher productivity.

Development Priorities in Typology 7

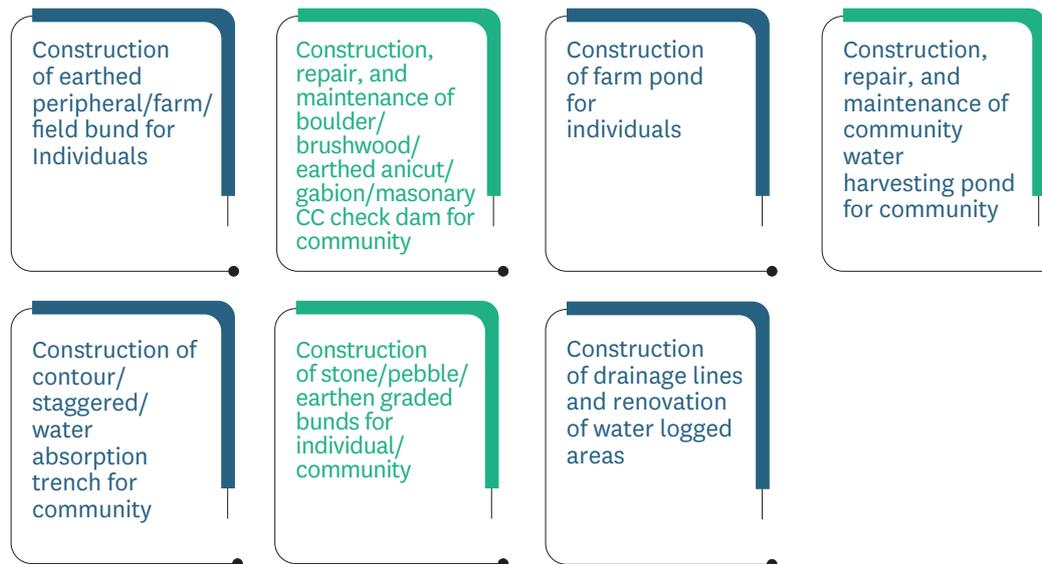
 <p>Development and effective implementation of the watershed management projects</p>	 <p>Rainwater management and Irrigation expansion</p>	 <p>Increase yields through agronomy measures</p>	 <p>Development of Innovative Farming System Models</p>
Activities (MGNREGS)			
<ul style="list-style-type: none"> ▪ Construction of bunds, trenches, recharge and rainwater harvesting structures ▪ Construction, renovation of drainage and waterlogged areas 	<ul style="list-style-type: none"> ▪ Rainwater harvesting <ul style="list-style-type: none"> • construction of rainwater harvesting structures: farm pond, check dam, community water harvesting pond • construction of bunds and trenches 	<ul style="list-style-type: none"> ▪ Composting 	<ul style="list-style-type: none"> ▪ Construction, renovation, repair and maintenance of fisheries pond ▪ Block plantation, boundary line, canal line plantation of horticulture trees ▪ Block plantation of sericulture trees in fields ▪ Boundary line plantation of farm forestry trees, canal line plantation of forestry trees
Convergence Opportunities			
<ul style="list-style-type: none"> ▪ Rain water harvesting: NMSA (RAD) ▪ Rain water harvesting: PMKSY (WDC) ▪ MukhyamantriKrishiAshirwadYojana, Jharkhand 	<ul style="list-style-type: none"> ▪ Rainwater harvesting: NMSA (RAD), PMKSY (WDC) ▪ Irrigation expansion: Narva, Garuva, Guruva, Bari Scheme, Chattishgarh ▪ Irrigation expansion: KisanSamridhiYojana, Chattishgarh ▪ Irrigation expansion: Micro-Irrigation Scheme, Chattishgarh ▪ Irrigation expansion: ShakambhariYojana, Chattishgarh 	<ul style="list-style-type: none"> ▪ Integrated manure and pest management, bio fertilizer:RKVY (RAFTAR) ▪ Soil health management: NMSA (RAD) ▪ Improved crop cultivar, seed, crop management practices: NFSM ▪ Seed, integrated pest and nutrient management: RKVY (BGREI) ▪ Narva, Garuva, Guruva, Bari Scheme, Chattishgarh 	<ul style="list-style-type: none"> ▪ Horticulture: RKVY(NHM) ▪ Horticulture, seeds, agriculture mechanization, fertiliser, agriculture allied activities: RKVY (RAFTAR) ▪ Farm pond: NMSA (RAD), NFSM ▪ Horticulture: MukhyamantriKrishi AshirwadYojana, Jharkhand



1. Development and Effective Implementation of Watershed Management Projects

Well-designed watershed management practices help in in-situ soil moisture conservation through land treatment, trenching, bunding etc., harvesting surplus rainy season runoff, enhance the groundwater recharge, enhance coverage under resilient and high value vegetable and fruit orchards, reduce gender and social inequity, improve cooperation in community operations, alleviate social tensions and rural distress like unemployment and forced seasonal or permanent migration. Central schemes such as NMSA (RAD), RKVY- National Horticulture Mission (NHM), PMKSY (-WDC), and state schemes in Jharkhand like MukhyamantriKrishiAsirwadYoajana can be converged with MGNREGS for promoting the related activities.

Activities (MGNREGS)



2. Rainwater Management and Irrigation Expansion

This typology covers majority of the districts of Eastern India, experiencing high rainfall and have large rainfed farming systems. Due to topography and lack of assured irrigation, low groundwater development conditions, the agriculture system is mainly dependent on rainfall and thus, have very low cropping intensity, high yield gap, and large fallow lands. A large proportion of rainfall which is flowing out of the region can be arrested through water harvesting structures and in situ interventions such as mulching, composting (to increase the moisture holding capacity of soil) to create assured irrigation availability during critical stages of the crops and can reduce the fallow land proportions.

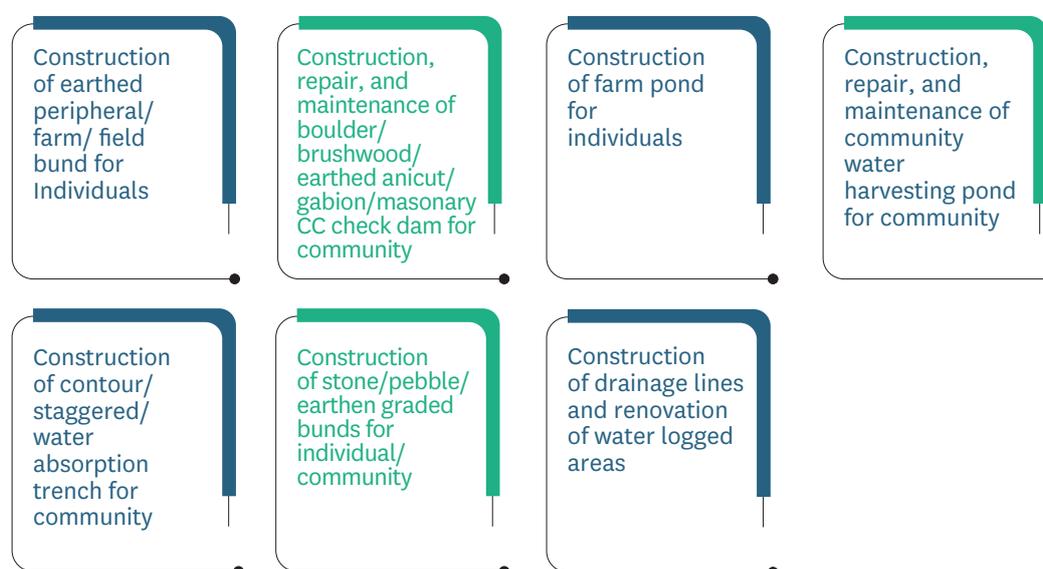
2.1 Rainwater Harvesting

Rainwater harvesting structures such as farm pond, check dams, tanks can be used to store water and aids in improving the irrigation supply during critical stages of crops and recharge groundwater.

Central schemes such as Rainfed Area Development programme under National Mission for Sustainable Agriculture (NMSA-RAD) that supports water harvesting, effective rainwater use through insitu soil moisture conservation, and PMKSY (WDC) can form potential convergence candidates for MGNREGS.

For irrigation expansion, Narva, Garuva, Guruva, Bari Scheme, Kisan Samridhi Yojana, Micro-irrigation scheme, and Shakambhari Yojana of Chattishgarh can be complimented with the related activities under MGNREGS.

Activities (MGNREGS)



3. Increase Yields Through Agronomy Measures

Other than efficient soil and water management, agronomic measures can be adopted for improving the crop yield further.

3.1 Composting

The nutrient content of soil can be increased through composting thus, aiding in sustainable increase in the yield. For details, refer to pg. 24. MGNREGS can be joined with Soil health management-NMSA, RKVY (RAFTAR), NMSA (RAD), and other state scheme of Chattishgarh such as Narva, Garuva, Guruva, Bari Scheme supporting the related activities.

Activities (MGNREGS)



3.2 Improved Crop Cultivars/ Seeds/ Stress-tolerant Crop Varieties*

Centrally sponsored scheme such as NFSM, RKVY-Bringing Green Revolution to Eastern India (BGREI) promotes use of improved crop varieties and disease resistant crops through establishing tissue culture-analysis labs, seed treatment units, bio-control labs. The activities under this scheme can be converged with MGNREGS for further improving the crop yield.

3.3 Crop Management Practices*

Crop yield can be increased by adopting several best crop management systems at farm level. For details, refer to pg. 24. National schemes such as SMAM which supports farm mechanization through establishment of village level or the farmer cooperative machine banks, or custom hiring centers, NFSM that supports integrated nutrient management and integrated pest management infrastructures can be converged with MGNREGS for increasing yield of the selected districts. RKVY (BGREI) scheme also supports the farmers through providing assistance for integrated nutrient and pest management, farm machineries etc.



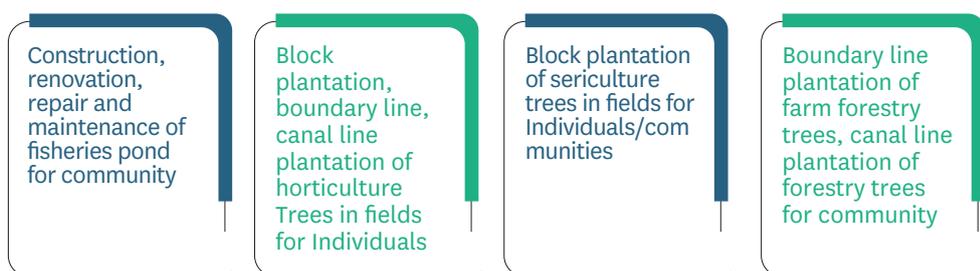
4. Development of Innovative Farming System

High rainfall in the region and a rich biodiversity provides good opportunities for development and adoption of innovative farming systems based on local knowledge and the species, which shall create higher economic value in a sustainable manner. Farmers may be encouraged to adopt:

- i. Integrated Farming Systems (IFS) with a pond and the surrounding farm area with integration of fisheries, livestock, crops, fruits and vegetables, and other plants of economic value.
- ii. Multiple use water systems (MUS) to increase overall land and water productivity and incomes. This will also reduce the damages caused by waterlogging and water congestion.

Different centrally sponsored schemes like RKVY (NHM), RKVY-RAFTAR, NMSA, NFSM support horticultural activities, fisheries for increasing economic condition of the farmers. In Jharkhand, schemes/programmes such as Mukhya mantri Krishi Ashirwad Yojana promote horticultural and supporting activities through financial help and income support. These centrally sponsored and state schemes can be considered for converging with MGNREGS.

Activities (MGNREGS)



Typology 8



Typology 8

Water Conservation Cluster (Overexploited Groundwater)

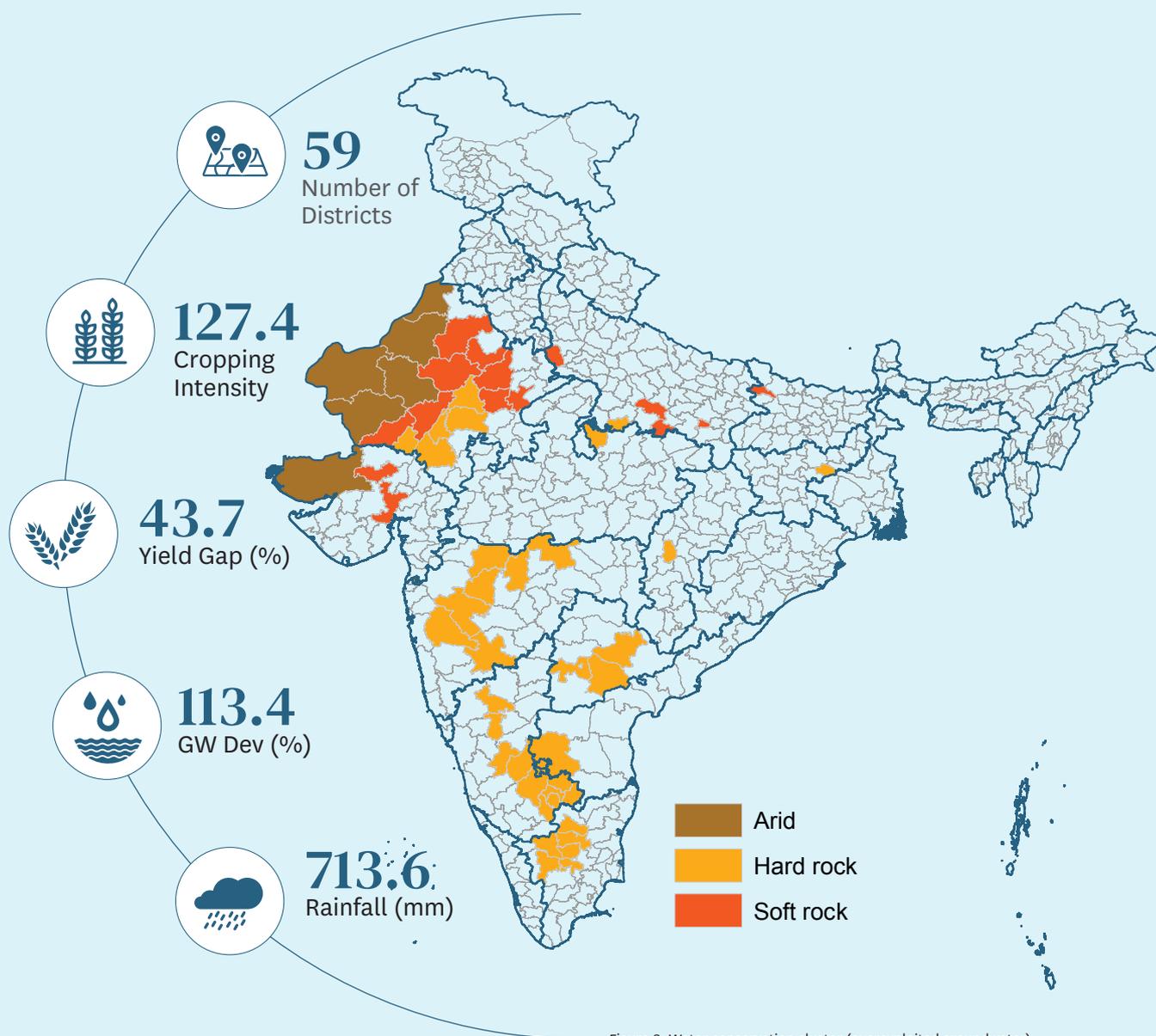


Figure 8: Water conservation cluster (overexploited groundwater)

This typology is spread across 12 states and two union territory, covering 59 districts, across the country. Characterised by over-exploited water resources and less opportunities for increasing agriculture activities, the main development priority in the region is to improve physical and economic water productivity using different soil-water management and agronomic measures. Given less rainfall, the opportunity for recharging groundwater remains less but given the scarcity of water resources in the region, any recharge is useful for supporting existing agricultural practices.

Development Priorities in Typology 8

 <p>Increasing physical and economic water productivity</p>	 <p>Increase yield through agronomy measures</p>	 <p>Augmenting available surface water and groundwater</p>
<p>Activities (MGNREGS)</p>		
<ul style="list-style-type: none"> ▪ Land levelling ▪ Crop diversification <ul style="list-style-type: none"> • plantation of horticultural crops • nursery raising 	<ul style="list-style-type: none"> ▪ Composting 	<ul style="list-style-type: none"> ▪ Construction, repair and maintenance of surface water irrigation structures and rainwater harvesting <ul style="list-style-type: none"> • construction of canal, anicut/check dam for community • construction of farm pond for individuals • construction, repair and maintenance of community water harvesting pond for community ▪ Augmentation of groundwater through artificial recharge <ul style="list-style-type: none"> • construction of sand filter for borewell/open well recharge • construction of recharge pits, mini percolation tank • construction of graded bund, trench • construction of underground dykes for community
<p>Convergence Opportunities</p>		
<ul style="list-style-type: none"> ▪ Land levelling, crop diversification: NMSA (RAD) ▪ Farm machinery support: SMAM-NMAET ▪ Micro irrigation: PMKSY (PDMC), RKVY (RAFTAR) ▪ Micro irrigation, crop diversification: NHM ▪ Micro irrigation: Mukhyamantri Jal Swavlamban Abhiyan (MJSA), Rajasthan ▪ Micro irrigation: Krishi Bhagya Scheme, Karnatak ▪ Horticulture: Suvarna Gramodaya Yojana of Karnatak ▪ Subsidy Seed Distribution schemes, Telengana ▪ Seed, fertilizer support: Rythu Bandhu Scheme, Telengana 	<ul style="list-style-type: none"> ▪ Soil health management: NMSA (RAD) ▪ Farm machinery support: SMAM ▪ Improved crop cultivar, seed, crop management practices: NFSM ▪ Composting: Suvarna Gramodaya Yojana, Karnatak 	<ul style="list-style-type: none"> ▪ Surface water irrigation projects, minor irrigation for both surface water and groundwater, groundwater recharge structures: PMKSY ▪ Recharge structures: ABhY (Gujarat, Karnatak, Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh), NMSA (RAD) ▪ Water conservation and harvesting: Mukhyamantri Jal Swavlamban Abhiyan (MJSA), Rajasthan ▪ Water body restoration, and augmentation: Jalamrutha, Karnatak ▪ Water supply augmentation: Suvarna Gramodaya Yojana, Karnatak



1. Increase Physical and Economic Water Productivity

Water productivity can be improved by increasing the productivity per unit water consumed or withdrawn, reducing non-beneficial water consumption, improving the efficiency of the irrigation systems, choice of crops and reallocating the water among users judiciously.

1.1 Land Levelling

Precise land levelling for the uneven terrain gives an advantage of uniform water application in the field and reduction in unnecessary water losses, and thus, results in increased irrigation efficiency and crop water productivity. For details, refer to pg 20. Centrally sponsored RAD component of NMSA scheme has the provision of land levelling activities. Also, SMAM-NMAET provides financial assistance to this activity across the states which can be converged with MGNREGS for taking up and popularizing land levelling activities.

Activities (MGNREGS)

Land levelling/
shaping of
Wasteland/Fallow
land for
Individuals/
Community

1.2 Crop Diversification

Diversifying to low water consuming crops, remunerative crops such as horticultural crops can increase the economic water productivity. Refer to pg 10 for more details. For this, providing high-yielding variety seeds, improved planting materials and nursery raising are some of the necessary activities. Different central schemes like NMSA (RAD), NHM promote crop diversification through distribution of subsidised high-yielding varieties seeds, planting materials, and support to horticultural crops. Suvarna Gromodaya Yojana of Karnataka, Rythu Bandhu Scheme and Subsidy Seed Distribution schemes of Telengana aim to support horticultural activities, agro-forestry and sericulture, subsidised and high-yielding seed distributions.

Activities (MGNREGS)

Boundary line
plantation of
horticulture
trees for
individual,
communities

Block plantation
of horticulture
trees in fields
for individuals,
communities

Wasteland
block plantation
of horticulture
trees for
individuals,
communities

Canal line
plantation of
horticulture
trees for
community

Block plantation of horticulture trees in government building premises for community

Raising nursery for individuals, community and groups

Suitable Horticulture Crops for the Region



▶ Aonla Banana Ber Guava Kinnow Lime Mango Mosambi Papaya Pomogranate



▶ Brinjal Cole crops Cucirbits Musk melon Okra Onion Pea Potato Water melon



▶ Marogold Rose

1.3 Micro-irrigation*

Micro-irrigation techniques such as drip and sprinklers are the appropriate interventions for achieving efficiency in irrigation application and increasing crop yield. For details, refer to pg 22. Centrally sponsored scheme such as PDMC-PMKSY, RKVY-RAFTAR which aim for promoting micro irrigation for agricultural and horticultural crops across the country can be converged with MGNREGS activities for increasing efficiency of the irrigation systems. Other than these central schemes, state level schemes such as Mukhyamantri Jal Swavlamban Abhiyan (MJSA) of Rajasthan, Krishi Bhagya Scheme of Karnataka also promote use of drip irrigation through varying range of subsidies.



2. Increase Yield through Agronomy Measures

2.1 Composting

Agronomic measure like composting aims at increasing the nutrient content of soil thus, aiding in increasing the yield in a sustainable manner. For details, refer to pg 24. Central schemes like NMSA (RAD), soil health management component of NMSA and state schemes like Suvarna Gramodaya Yojana of Karnataka can be converged with MGNREGS Activities.

Activities (MGNREGS)

Construction, repair and maintenance of berkley compost pit/NADEP compost pit/vermi compost pit for individual/groups/community

*Not an approved activity under MGNREGS but can be converged well with them"

2.2 Improved Crop Cultivars/Seeds/ Stress-tolerant Crop Varieties*

Centrally sponsored scheme such as NFSM promotes use of improved crop varieties and disease resistant crops through establishing tissue culture-analysis labs, seed treatment units, bio-control labs. The activities under this scheme can be converged with MGNREGS for further improving the crop yield.

2.3 Crop Management Practices*

Crop yield can be increased by adopting several best crop management systems. For details, refer to pg. 24. Several national schemes such as SMAM which supports farm mechanization through establishment of village level or the farmer cooperative machine banks, or custom hiring centers, NFSM that supports integrated nutrient management and integrated pest management infrastructures can be converged with MGNREGS for increasing yield of the selected districts.



3. Augmenting Available Surface Water and Groundwater

3.1 Construction, Repair and Maintenance of Surface Water Irrigation Structures and Rainwater Harvesting

Construction of the canal structures and their repair, renovation and maintenance will improve the rural water security, provide resilience against the droughts and long dry spells, support intensification through cultivation of rice-fallows during the rabi/summer season, assure farmers to invest in improved seeds and agri-inputs for higher productivity and farm incomes. Other structures such as farm pond, check dams, tanks also store water and aids in improving the irrigation supply during critical stages of crops and recharge groundwater. The centrally sponsored schemes supporting these types of activities such as. RKVY-RAFTAR, RAD-NMSA can be converged and financed with MGNREGS for augmenting the surface water availability for irrigation and other uses.

Activities (MGNREGS)

Construction, repair and maintenance of minor, sub-minor, distributary, water course and feeder canal for community

Construction, repair and maintenance of boulder/brushwood/earthed anicut/gabion/masonry cc check dam for community

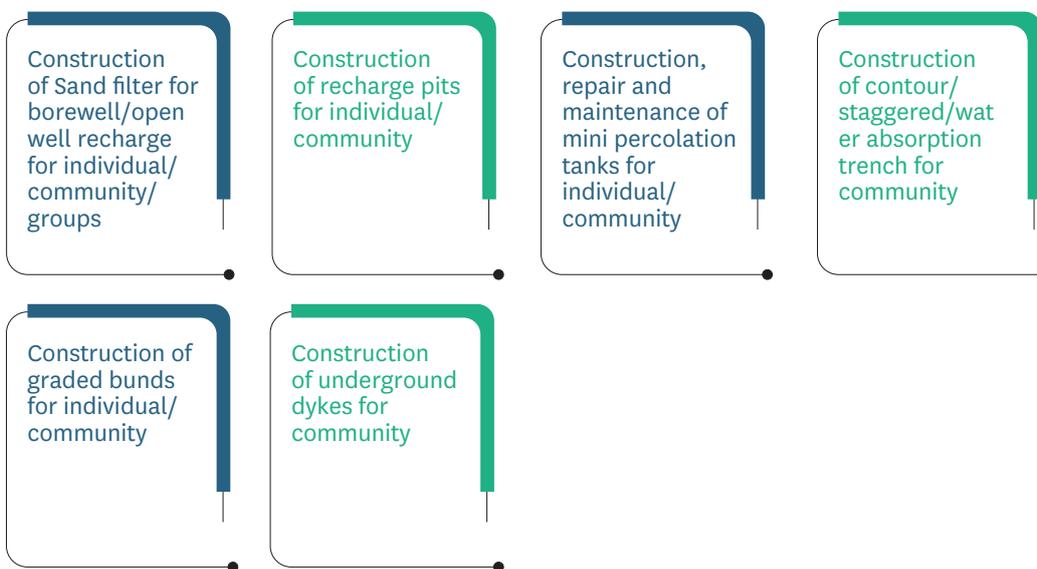
Construction of farm pond for individuals

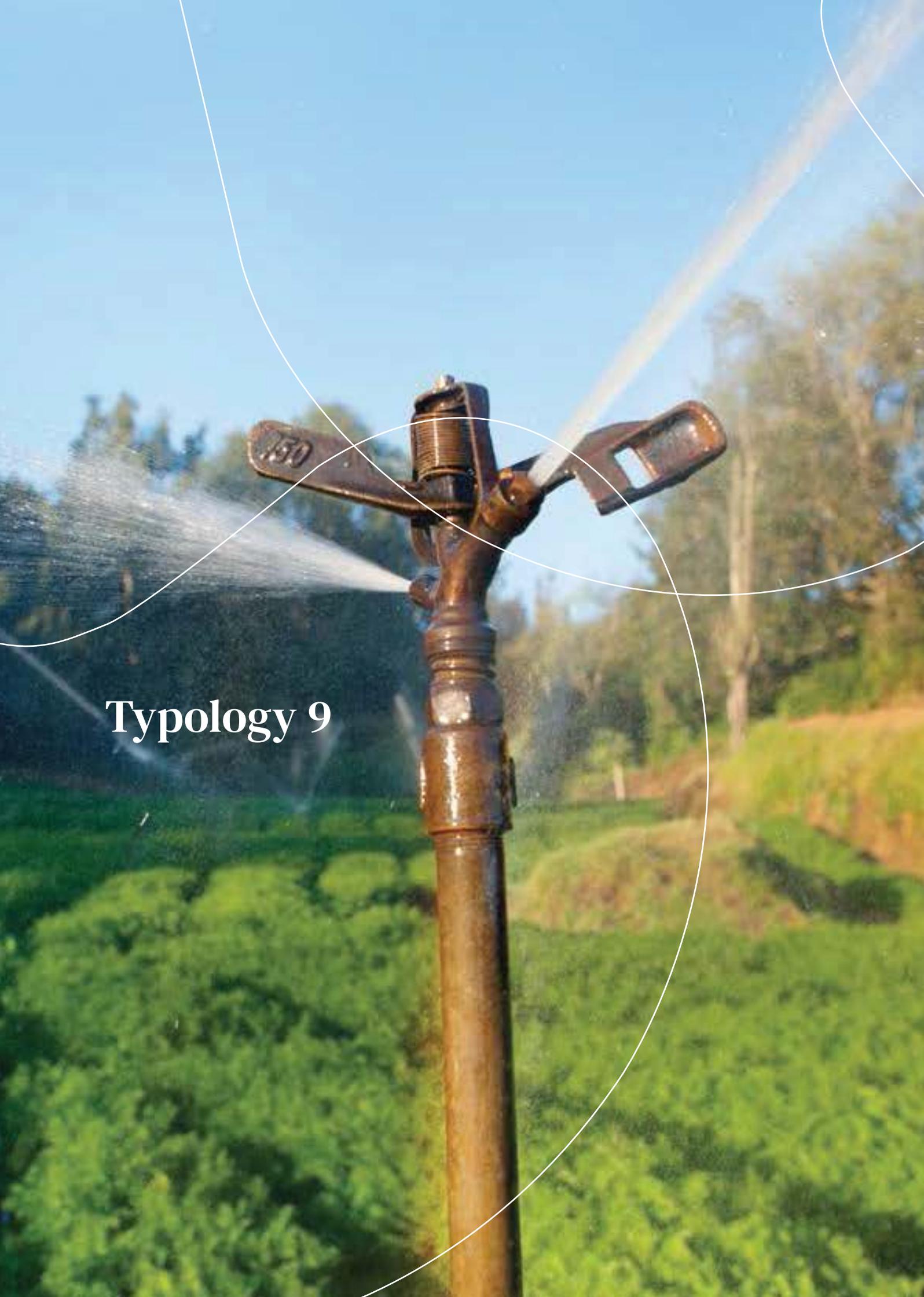
Construction, repair and maintenance of community water harvesting pond for community

3.2 Augmentation of Groundwater through Artificial Recharge

For ensuring sustainability of groundwater use and development and to avoid future over-exploitation of groundwater, adequate focus on recharging the water resources has to be maintained. For more details, refer to pg 13. As the centrally sponsored scheme, NMSA (RAD), ABhY, WDC-PMKSY, and states schemes like Mission Kakatiya of Telengana, Jalamrutha, Karnatak, Suvanrna Gromodaya Yojana, Karnatak, Mukhya mantri Swavalamban Abhiyan, Rajasthan also focus on groundwater resource augmentation, they can be integrated with the MGNREGS activities.

Activities (MGNREGS)





Typology 9

Typology 9

Low Cropping Intensity-High Yield Districts

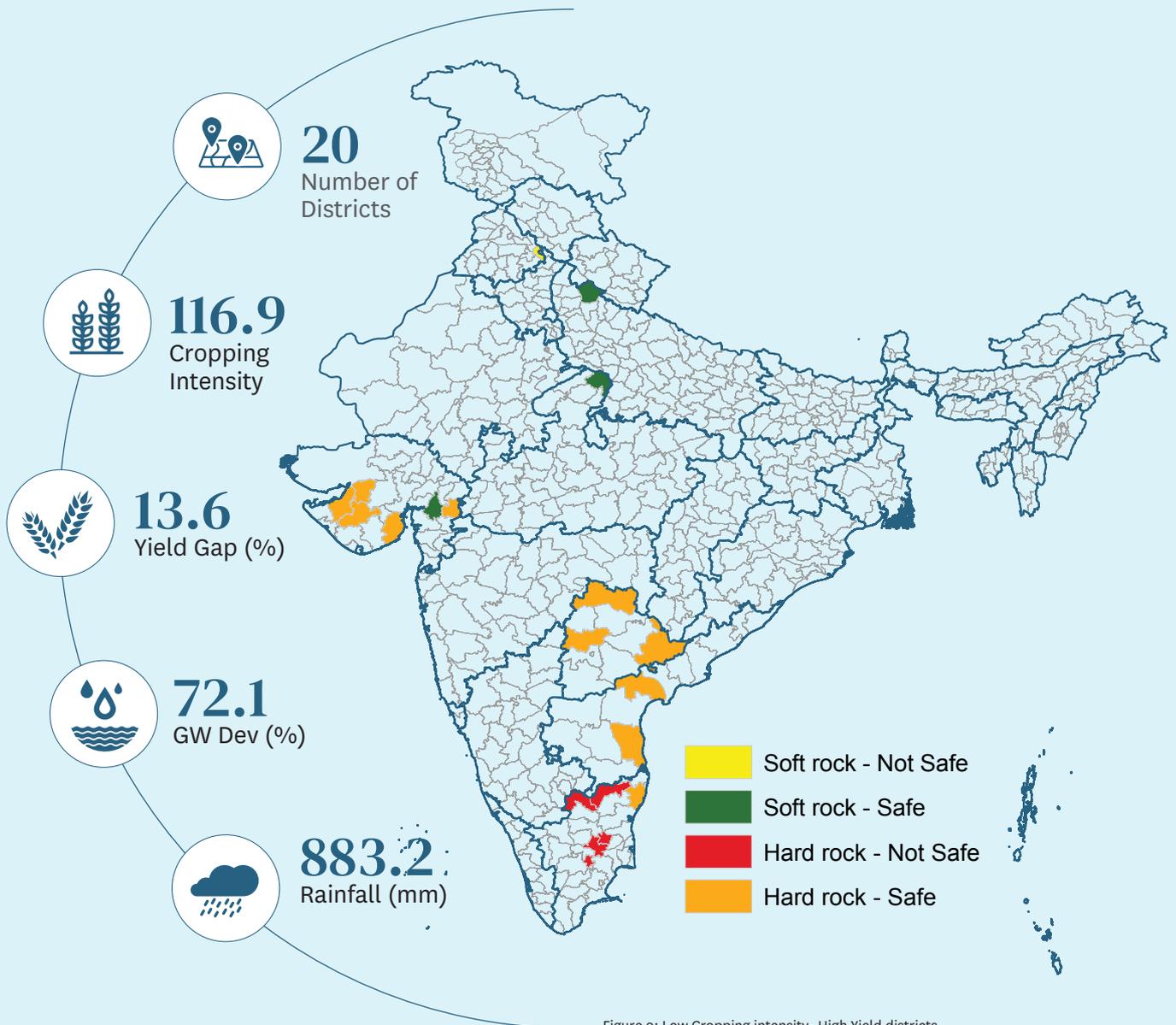


Figure 9: Low Cropping intensity- High Yield districts

This typology is spread across 8 states, covering 20 districts. They are characterised by low rainfall and low cropping intensity. Though the groundwater development is relatively higher, the cropping intensity is low, but with higher yield. Therefore, actions need to be taken for augmenting the available water resources with the highest priority on efficient use of water resources.

Development Priorities in Typology 9

 <p>Efficient use of the available and created water resources</p>	 <p>Augmenting the available surface and groundwater resources</p>
<p>Activities (MGNREGS)</p>	
<ul style="list-style-type: none"> ■ Lining of surface irrigation conveyance structures <ul style="list-style-type: none"> • lining of canal structures, water courses ■ Land levelling ■ Efficient rain water use <ul style="list-style-type: none"> • construction of bund • construction, repair and maintenance of compost pit 	<ul style="list-style-type: none"> ■ Construction, repair and maintenance of surface water irrigation structures and rainwater harvesting <ul style="list-style-type: none"> • construction of canal, anicut/check dam for community • construction of farm pond for individuals • construction, repair and maintenance of community water harvesting pond for community ■ Augmentation of groundwater through artificial recharge <ul style="list-style-type: none"> • construction of sand filter for borewell/open well recharge • construction of recharge pits, mini percolation tank • construction of graded bund, trench • construction of underground dykes for community
<p>Convergence Opportunities</p>	
<ul style="list-style-type: none"> ■ In situ moisture conservation, composting: NMSA (RAD) ■ Micro irrigation: PMKSY(PDMC), RKVY (RAFTAR), NHM ■ Financing farm machineries like leveller: AGR2 (Farm Mechanization Scheme), Gujarat ■ Micro irrigation: TelenganaState Micro Irrigation Project, Andhra Pradesh Micro Irrigation Project 	<ul style="list-style-type: none"> ■ Surface water irrigation projects, minor irrigation for both surface water and groundwater, groundwater recharge structures: PMKSY ■ Groundwater recharge structures: ABhY(Gujarat, Karnatak, Madhya Pradesh, Uttar Pradesh), NMSA (RAD) ■ Irrigation schemes: SagarkheduSarvangiVikasYojna, Gujarat ■ Surface irrigation source creation, improving groundwater: Mission Kakatiya, Telengana ■ Irrigation source creation: VanbandhuKalyanYojana, Gujarat



1. Efficient Use of the Available and Created Water Resources

Efficient application of available and created water resources can further increase the area under crop and thus, reduce the yield gaps. The suitable activities for efficient application of irrigation are listed and briefly discussed as follows:

1.1 Lining of Surface Irrigation Conveyance Structures and Land Levelling

Surface water conveyance structures such as canals cause huge seepage losses if they are unlined and thus, lead to huge gap in irrigation potential created and utilized. Lining of small parts or whole length of canal can reduce this heavy seepage loss and increase the irrigation efficiency of the system. For details, refer to pg 21. Also, precisely levelling the land can save a lot of on-farm water wastage and brings opportunity for uniform water application and increase irrigation efficiency. In Gujarat, state scheme such as AGR2 (Farm Mechanization) scheme finances for farm machineries like bund former, land leveller, digger etc. can aid in efficient management of irrigation water. Following are the activities undertaken by MGNREGS.

Activities (MGNREGS)



1.2 Efficient Rain-Water Use

Efficient use of water can be achieved if the in-situ soil moisture is conserved through bunding or trenching and this green water resource is used by crop. The soil moisture storage capacity is improved by improving the soil health through layering of compost and other carbon-rich supplements. For details, refer to pg 21. Central schemes such as Rainfed Area Development programme under National Mission for Sustainable Agriculture (NMSA-RAD) that supports water harvesting, in-situ soil moisture conservation, mulching, construction of vermi compost structures and green manuring for effective rainwater utilisation can form a potential convergence opportunity for MGNREGS.

Activities (MGNREGS)



1.3 Micro-irrigation*

Water saving technologies like micro-irrigation (drip and sprinklers) are the appropriate interventions for achieving efficiency in irrigation application and increasing crop yield. For details, refer to pg 22. Centrally sponsored scheme such as Per Drop More Crop component of Pradhan Mantri Krishi Sinchayi Yojana (PDMC-PMKSY), RKVY-RAFTAR which aim for promoting micro irrigation for agricultural and horticultural crops across the country form good candidates for convergence with MGNREGS. Other states projects such as Telengana State Micro Irrigation Project (under PDMC-PMKSY), Andhra Pradesh Micro Irrigation Project (APMIP) also promote use of drip irrigation through varying range of subsidies.



2. Augmenting the Available Surface and Groundwater Resources

Augmentation of water resources can be done wherever applicable through rejuvenation of the existing water infrastructure and tapping the additional water resources through utilisation of rain and/or canal water.

2.1 Construction, Repair and Maintenance of Surface Water Irrigation Structures and Rainwater Harvesting

Construction of the canal structures and their repair, renovation and maintenance will improve the rural water security, provide resilience against the droughts and long dry spells, support intensification through cultivation of rice-fallows during the rabi/summer season, assure farmers to invest in improved seeds and agri-inputs for higher productivity and farm incomes. Other structures such as farm pond, check dams, tanks also store water and aids in improving the irrigation supply during critical stages of crops and recharge groundwater. The related centrally sponsored schemes such as RAD-NMSA, HKKP-PMKSY, AIBP-PMKSY can be converged and financed with MGNREGS for augmenting the surface water availability for irrigation and other uses. MGNREGS can also be converged with the state schemes such as Mission Kakatiya of Telengana, Sagar khedu Sarvang Vikash Yojana of Gujarat, Vanbandhu Kalyan Yojana, Gujarat and Sujalam Sufalam Yojana of Gujarat those focus on creation of irrigation sources and rainwater harvesting structures.

Activities (MGNREGS)

Construction, repair and maintenance of minor, sub-minor, distributary, water course and feeder canal for community

Construction, repair and maintenance of boulder/brushwood/earthed anicut/gabion/masonry cc check dam for community

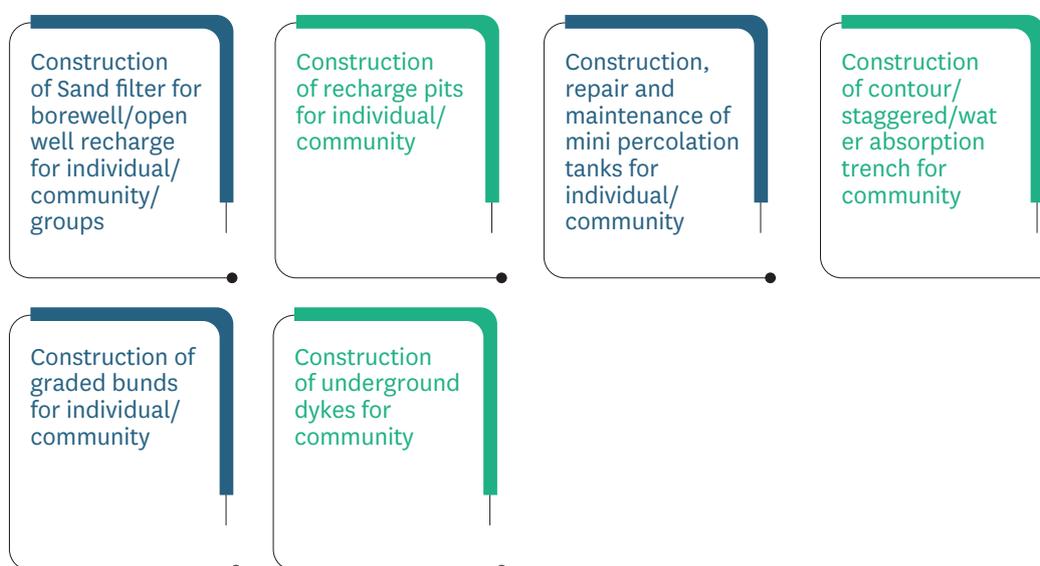
Construction of farm pond for individuals

Construction, repair and maintenance of community water harvesting pond for community

2.2 Augmentation of Groundwater through Artificial Recharge

For ensuring sustainability of groundwater use and development and to avoid future over-exploitation of groundwater, adequate focus on recharging the water resources has to be maintained. For more details, refer to pg 13. The centrally sponsored scheme, RAD-NMSA has all the activities related to artificial groundwater recharge similar to MGNREGS, but with lesser budget providing an opportunity for linking. Similarly, other centrally-sponsored schemes like PMKSY (WDC, HKKP), ABHY (in Gujarat, Karnatak, Madhya Pradesh and Uttar Pradesh) also focus on groundwater resource augmentation. Under the state schemes, Mission Kakatiya of Telengana, Sagar Khedu Sarvang Vikash Yojana of Gujarat, Vanbandhu Kalyan Yojana, Gujarat support groundwater augmentation activities.

Activities (MGNREGS)





Typology 10, 11 and 12

Typology 10

Hilly Regions (Western Himalaya)

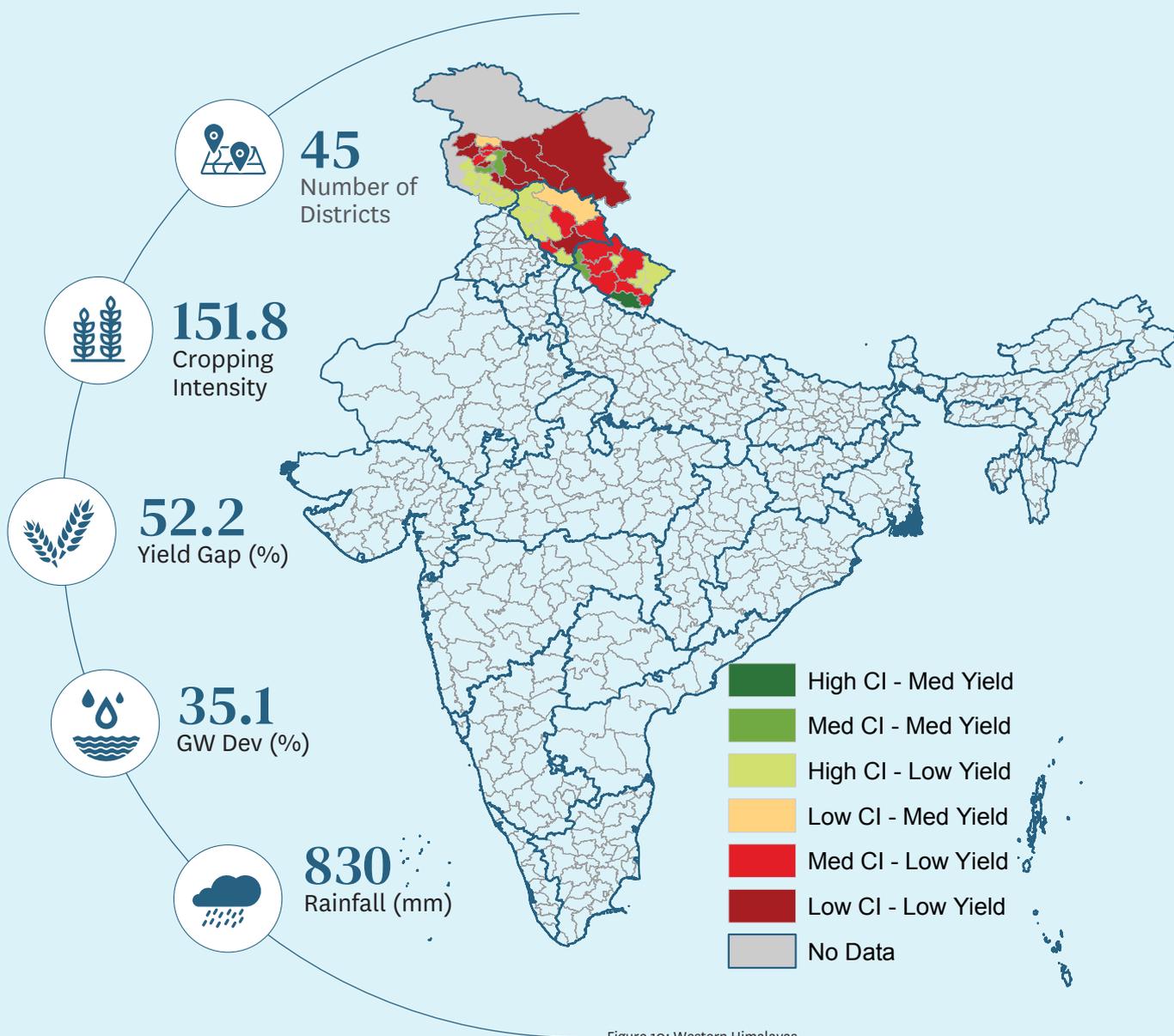
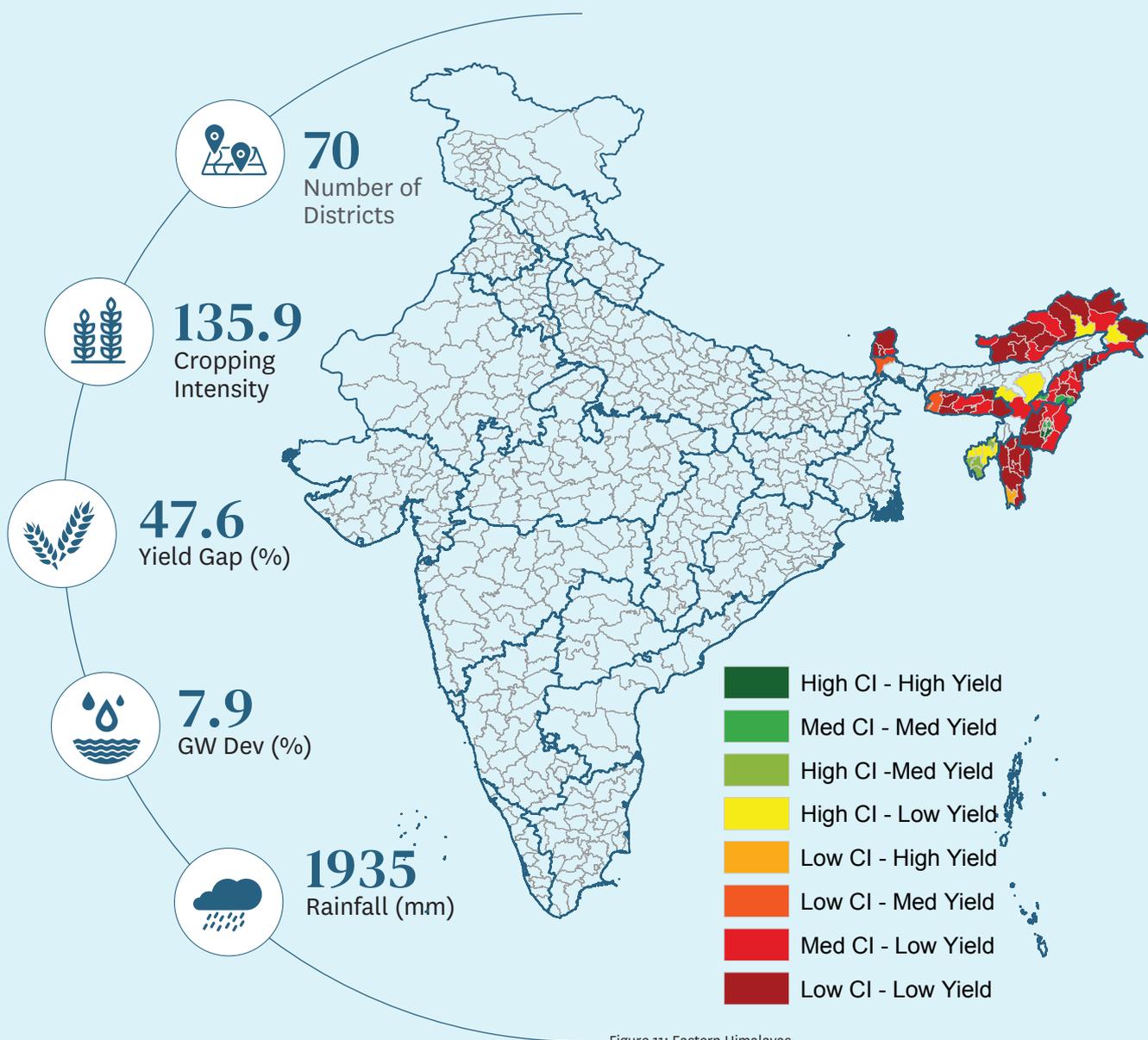


Figure 10: Western Himalayas

There are three hilly regions in the country namely, Western Himalaya, Eastern Himalaya and Western Ghats. The three regions differ in rainfall with Eastern Himalaya and Western Ghats receiving very high rainfall compared to Western Himalaya, which receives less than average rainfall in the country. All three regions, however different, have twin-development priority of restoration and agrarian growth. The regions require effective springshed and watershed management and conservation of the fragile ecosystem to support environment friendly yet lucrative agri-livelihood opportunities.

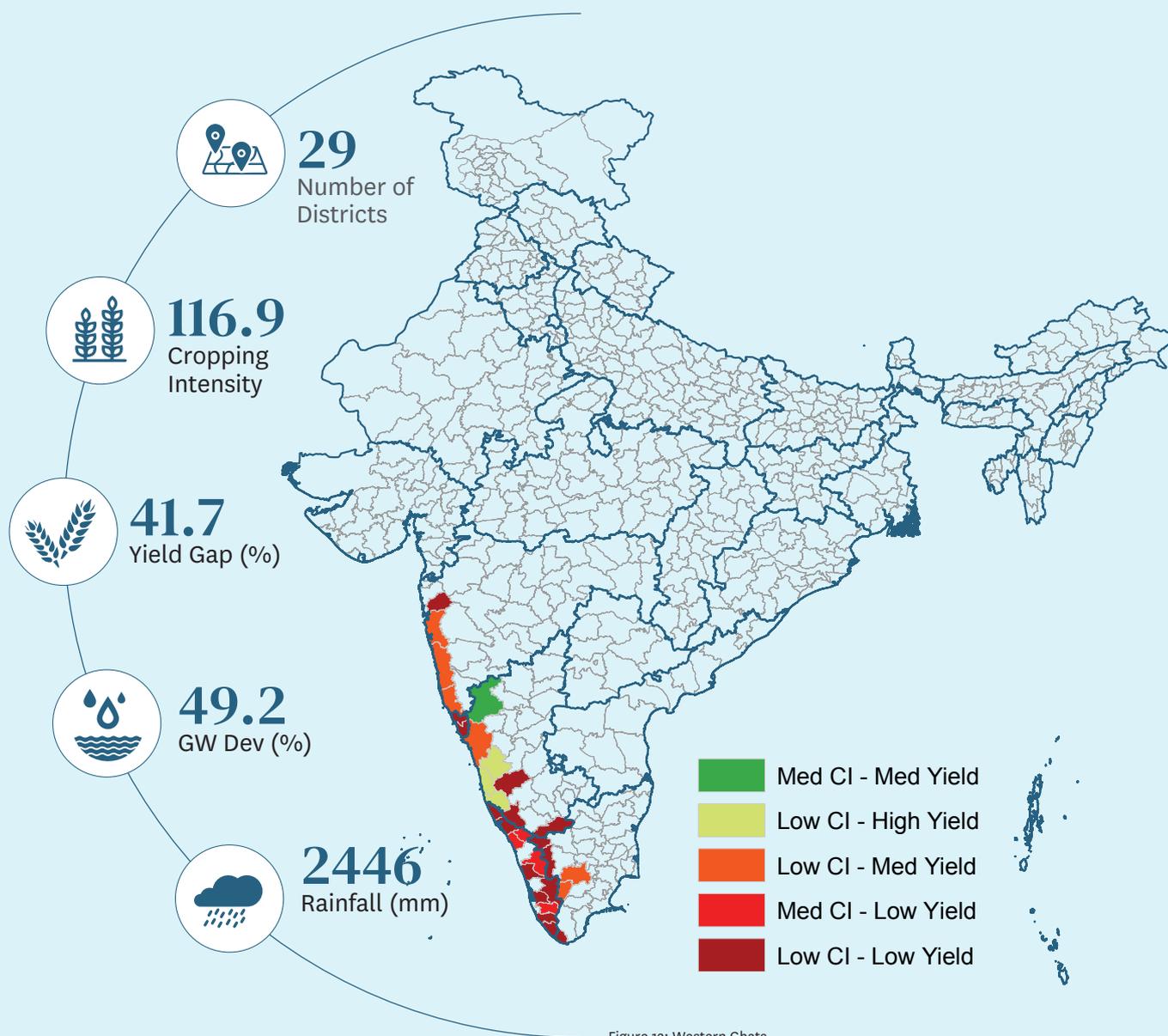
Typology 11

Hilly Regions (Eastern Himalaya)



Typology 12

Hilly Regions (Western Ghats)



Development Priorities in Typology 10, 11 and 12

 Restoration of fragile mountain ecosystem for improved agri- livelihoods	 Springshed management	 Minor irrigation development	 High value crops and value addition
Activities (MGNREGS) Western Himalaya, Eastern Himalaya, Western Ghats			
<ul style="list-style-type: none"> ■ Plantation of Trees/ Afforestation 	<ul style="list-style-type: none"> ■ Construction, Repair, Renovation and Maintenance of Check Dams, Bunds, Drainage 	<ul style="list-style-type: none"> ■ Construction, Repair, Renovation and Maintenance of Lift irrigation Schemes 	<ul style="list-style-type: none"> ■ Plantation of Horticulture Trees ■ Construction of Compost Pits ■ Nursery Raising
Convergence Opportunities Western Himalaya			
<ul style="list-style-type: none"> ■ Chief Minister's Farm Protection Scheme (Himachal Pradesh) ■ Prakritik Kheti Khushal Kisan Yojana (Himachal Pradesh) ■ RKVY- National Mission for Sustainable Agriculture (NMSA) 	<ul style="list-style-type: none"> ■ Spring Rejuvenation Schemes in Himachal Pradesh and Jammu and Kashmir ■ National Mission for Sustaining the Himalayan Ecosystem 	<ul style="list-style-type: none"> ■ Efficient Irrigation Scheme through Micro Irrigation ■ Construction of Lift Irrigation Scheme and Borewell Scheme ■ PMKSY – Har Khet Ko Pani (HKKP) 	<ul style="list-style-type: none"> ■ National Saffron Mission in Jammu and Kashmir ■ Chief Minister Nutan Polyhouse Project (Himachal Pradesh) ■ Tea and Coffee Farming (Himachal Pradesh) ■ RKVY- National Horticulture Mission (NHM) ■ Mission for Integrated Development of Horticulture (MIDH)
Eastern Himalaya			
<ul style="list-style-type: none"> ■ Chief Ministers Special Rural Development Fund (Meghalaya) ■ RKVY- National Mission for Sustainable Agriculture (NMSA) 	<ul style="list-style-type: none"> ■ Chief Minister's Adarsh Gram Yojana (Arunachal Pradesh) ■ Community Fishery Development Project in Manipur, Meghalaya ■ National Mission for Sustaining the Himalayan Ecosystem 	<ul style="list-style-type: none"> ■ Construction of Community Ponds (North Eastern States) ■ PMKSY – Har Khet Ko Pani (HKKP) 	<ul style="list-style-type: none"> ■ Tea and Coffee Plantations (North Eastern States) ■ Floriculture (North Eastern States) ■ RKVY- National Horticulture Mission (NHM) ■ Mission for Integrated Development of Horticulture (MIDH)
Western Ghats			
<ul style="list-style-type: none"> ■ Punarjani- Restoration of Agricultural Sector in Post Flood Scenario (Kerala) ■ RKVY- National Mission for Sustainable Agriculture (NMSA) 	<ul style="list-style-type: none"> ■ Haritha Kerala ■ Modernization of Tanks (Karnataka) ■ National Mission for Sustaining the Himalayan Ecosystem 	<ul style="list-style-type: none"> ■ Haritha Kerala ■ Lift Irrigation Schemes (Kerala) ■ PMKSY – Har Khet Ko Pani (HKKP) 	<ul style="list-style-type: none"> ■ Coconut Development (Kerala) ■ Vegetable Development (Karnataka, Goa) ■ Development of Spices ■ Tea and Coffee Plantations ■ Sericulture ■ RKVY- National Horticulture Mission (NHM) ■ Mission for Integrated Development of Horticulture (MIDH)



1. Restoration of Fragile Mountain Ecosystem for Improved Agri- Livelihoods

The diverse and fragile ecosystem of Himalaya supports over 60 million people practising hill agriculture, which is increasingly becoming more vulnerable to Climate Change. The Himalayan ecosystem is critical for maintaining the ecological balance in the Indian landmass as it provides the essential forest cover and feeds the perennial rivers that provide necessary fresh water in the mainland. Various plantation activities under MGNREGS and schemes supporting organic or natural farming, restoration of environment, special rural development activities can contribute to achieving the development priority of restoration of fragile mountain ecosystem while developing the agri-livelihoods. MGNREGS activities can be converged with activities from different state schemes like Chief Minister's Farm Protection Scheme and Prakritik Kheti Khushal Kisan Yojana in Himachal Pradesh, Chief Minister's special rural development fund in Meghalaya and Punarjani- Restoration of Agricultural Sector in Post Flood Scenario in Kerala.

Selection of Tress for Plantation



Suitable for climate and contributing to ecosystem restoration



May support market development and business opportunities

Activities (MGNREGS)



2. Springshed Management

Springshed management is a holistic approach for co-management of water and land resources in the mountainous and hilly regions. It includes activities which contribute to groundwater recharge and spring rejuvenation resulting in long term water resource sustainability. Activities under National Mission for Sustaining the Himalayan Ecosystem (NMSHE) can be converged with MGNREGS activities for effectively managing the springsheds in the Himalayan region. North eastern states like Nagaland and Sikkim have successfully utilised the MGNREGS activities for spring rejuvenation and revival and other hilly states can learn from their experience. In the Western Ghats, activities from state specific schemes, for example HarithaKeralin Kerala and Modernisation of Tanks can be converged with MGNREGS for effective springshed management.

2.1 Construction, Renovation, Repair and Maintenance of Recharge Structures Suitable for Mountains and Hills

For ensuring adequate supply of fresh water and replenishment of water resources in hilly regions adequate focus on recharging the water resources has to be maintained.

Activities (MGNREGS)

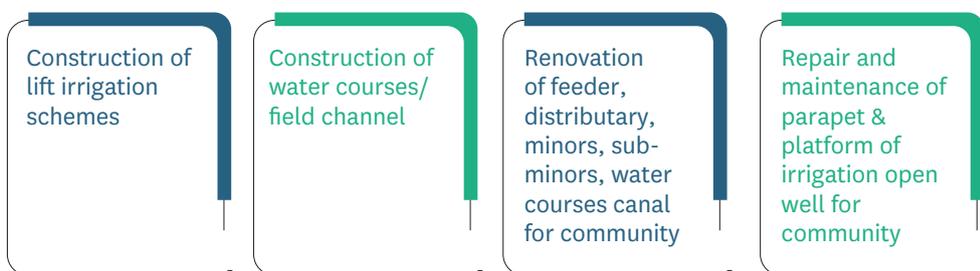


3. Minor Irrigation Development

3.1 Construction, Renovation, Repair and Maintenance of Irrigation Structures

For increasing the access and control of water resources to support high value cropping and plantation, more lift irrigation can be developed, and the existing structures can be renovated, repaired or maintained to ensure a longer life of structures. National schemes like PMKSY- Har Khet Ko Pani and state specific schemes such as construction of community ponds in eastern Himalaya, expansion of micro-irrigation western Himalaya, promotion of lift irrigation in north eastern states can be converged with MGNREGS.

Activities (MGNREGS)



Challenges

Deciding an appropriate location for constructing community irrigation structures may require collective action from all stakeholders

Irrigation capacity created does not necessarily translate into irrigation capacity utilised.



4. High Value Crops and Value Addition

4.1 Horticulture

Horticulture crops such as fruits, vegetables along with floriculture provide better financial returns and have higher compatibility with micro-irrigation. They can be selected based on existing market opportunities, availability of storage and post-harvest processing arrangements, and net returns. Intercropping can be adopted to include shade loving crops to further improve land productivity. Also, there are significant convergence opportunities of MGNREGS with different state level schemes, such as National Saffron Mission in Jammu & Kashmir, Chief Minister Nutan Polyhouse Project in Himachal Pradesh, Tea and Coffee Plantations and Floriculture schemes in Eastern region and Coconut and Vegetable Development, and Sericulture in Western Ghats. Also, development of integrated farming systems by incorporating fisheries and livestock rearing with crop cultivation can be explored.

Selection of Type of Horticulture Crops



Existing market opportunities



Availability of storage



Processing infrastructure & arrangements

Activities (MGNREGS)

Boundary line plantation of horticulture trees for individual, communities

Block plantation of horticulture trees in fields for individuals, communities

Wasteland block plantation of horticulture trees for individuals, communities

Canal line plantation of horticulture trees for community

Block plantation of horticulture trees in government building premises for community

Plantation along the coast line (Only for typology 12)

Suitable Horticulture Crops

	Western Himalaya	Eastern Himalaya	Western Ghats
	Apple, Pear, Peach, Cherry, Fig	Apple, Pineapple, Mandarin Orange, Litchi, Papaya	Banana, Jackfruit, Pineapple, Sugarcane, Jamun, Custard Apple
	Tomato, Cauliflower, Cabbage, Pea, Capsicum	Potato, Tomato, Broccoli, Cauliflower, Cucumber, Pumpkins	Tomato, Capsicum, Green Chilli, Tapioca
	Marigold, Gladiolus, Carnation, Rose, Liliun, Gerbera	Sunflower, Cherry Blossom, Chrysanthemum Gerbera	Water-lilly, Jasmine, Marigold
	Forestry Trees, Walnut, Almond	Areca Nut, Tea, Forestry Trees	Tea, Coconut, Rubber, Coffee
	Aniseed, Asafoetida, Cardamom, Ginger, Coriander, Turmeric	Large Cardamom, Black Pepper, Cinnamon, Turmeric	Black Pepper, Nutmeg Cardamom
	Beekeeping, Mushroom Cultivation, Saffron Cultivation	Beekeeping, Betel Leaf	Beekeeping, Cashew

Activities (MGNREGS)

Intercropping with shade loving crops

Integrated farming systems; incorporating fisheries and livestock with crop cultivation

Challenges

Irrigation availability in community areas

Maintenance and management of horticulture output from community area

4.2 Nursery Raising

For creating quality planting material for high value crops, nursery raising is essential. While giving additional income, nursery raising contributes significantly in high value cropping by providing quality seedlings locally. For more details, refer to pg 11.

Activities (MGNREGS)

Raising nursery for Individuals, community and groups

Challenges

Appropriate shading and temperature maintenance for suitable and lucrative crops may need additional resources

Marketing challenges for fetching a good price for nurseries may arise

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