GOVERNMENT OF INDIA
MINISTRY OF AGRICULTURE AND FARMERS WELFARE
DEPARTMENT OF AGRICULTURAL RESEARCH & EDUCATION

RAJYA SABHA
UNSTARRED QUESTION NO-2259
ANSWERED ON- 19/12/2025

TECHNOLOGIES AND PRACTICES TO INCREASE AGRICULTURAL PRODUCTION

2259. DR. DHARMASTHALA VEERENDRA HEGGADE:

Will the Minister of AGRICULTURE AND FARMERS WELFARE be pleased to state:

(a) latest technologies and practices being promoted by Government to increase agricultural production and productivity in various States of the country;

(b) whether Government is taking any step to encourage diversification in agriculture particularly to promote less water intensive crops and horticulture;

(c) if so, the details thereof for Karnataka; and

(d) the details of plans to promote organic farming in Karnataka?

ANSWER

THE MINISTER OF STATE FOR AGRICULTURE AND FARMERS WELFARE
(SHRI BHAGIRATH CHOUDHARY)

(a): The Government is promoting various modern technologies and good agricultural practices to enhance agricultural production and productivity across States. These include development and dissemination of improved, high-yielding, climate-resilient and pest-tolerant crop varieties by ICAR and State Agricultural Universities. Promotion of precision and resource-efficient farming technologies such as site-specific nutrient management, laser land levelling, use of sensors, drones and decision-support systems is being supported under schemes including the Sub-Mission on Agricultural Mechanisation, National Mission for Sustainable Agriculture, Digital Agriculture initiatives, Rashtriya Krishi Vikas Yojana and the Soil Health Card Scheme. In addition, the Government has approved 'Namo Drone Didi' to promote the use of advanced technologies in agriculture for improving efficiency, enhancing crop productivity and reducing the cost of operations, while also empowering Self Help Groups (SHGs) to function as drone service providers, thereby increasing their income and providing sustainable livelihood opportunities; adoption of efficient water management practices including micro-irrigation, watershed development and water-saving agronomic practices under the Pradhan Mantri Krishi Sinchayee Yojana.

During 2014-25 a total of 3236 field crop varieties have been developed under the aegis of ICAR of which a total of 341 are drought tolerant / less water requiring Varieties, out of which 200 are of Cereals, 25 are of Oilseeds, 43 are of Pulses, 18 are of Fibre, 16 are of Forage, 36 are of Sugarcane and 3 are of other crops.

Further, a total of 749 high-yielding varieties of horticultural crops, of which a total of 51 are of Perennial Spices, 44 are of Seed Spices, 75 are of Potato & Tropical Tuber Crops, 21 are of Plantation Crops, 110 are of Fruit Crops, 393 are of Vegetable Crops, 38 are of Flower & other ornament plants, 17 are of Medicinal and Aromatic Plants, were developed and notified for commercial cultivation.

The latest technologies that are being promoted to increase agricultural production and productivity in various states and technologies for management and restoration of natural resource base are attached as **Annexure-I & II**.

Promoting low-cost feeding technologies like hydroponics, silage formulations, area specific mineral mixtures, different feeding modules for improvement of nutrient utilization, reducing enteric methane emission (for example Harit dhara) and thereby improving livestock productivity in terms of meat and milk.

(b): Yes, the Department of Agriculture & Farmers Welfare (DA&FW) is implementing the Crop Diversification Programme (CDP) under the Pradhan Mantri- Rashtriya Krishi Vikas Yojana (PM-RKVY) in the Original Green Revolution States viz; Haryana, Punjab and western Uttar Pradesh to divert the area of water intensive paddy crop to alternative crops like pulses, oilseeds, coarse cereals, nutri-cereals (shree anna) etc. Under the CDP, assistance is given for alternative crops demonstration, farm mechanization and value addition, site-specific activities, awareness, farmers training etc.

ICAR is promoting less water intensive agri-horti crops for crop diversification and also developed drought-tolerant varieties for commercial cultivation.

(c): In Karnataka, the Government is promoting agricultural diversification through a combination of centrally sponsored schemes. These include promotion of millets, pulses, oilseeds and other less water-intensive crops under the National Food Security Mission (NFSM) and the National Mission on Oilseeds and Oil Palm (NMOOP/National Mission on Edible Oils–Oil Palm). The State is also encouraging expansion of horticulture crops such as fruits, vegetables, spices and plantation crops under the Mission for Integrated Development of Horticulture (MIDH). To improve water-use efficiency, support is being provided for micro-irrigation systems under the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY).

The less water intensive horticultural crops like custard apple, jamun, aonla, dragon fruit, jackfruit and vegetables like drumstick, legumes viz. cluster bean, cowpea and dolichos bean are being popularized through various government schemes in the State of Karnataka. Similarly, for area expansion of cashew in Karnataka, financial assistance was provided by RKVY-RAFTAAR, Govt. of Karnataka and DCCD, Kochi.

Two prototype Integrated Farming Systems models developed for Karnataka having components of diversified cropping systems, fruits, dairy, goat, poultry and boundary plantations and are being popularized among farmers through State and Central schemes. Farmer participatory farming systems with agricultural diversification concept also developed for Uttara Kannada, Dharwad, Gadag and Chikkaballapura districts of Karnataka. Under Pilot Project for Crop diversification, 4 districts of Karnataka namely Belagavi, Uttar Kannada, Kalaburagi and Vijayapura have been covered in which rice is diversified with maize, blackgram, redgram and pigeonpea. In each of the district, 100 ha demonstrations have been made to sensitize the farmers and extension officers. In addition, 16 trainings on crop diversification also conducted in these districts for farmers and extension officials.

(d): During 2014-25 a total of 713 varieties have been released for Karnataka, out of which 78 are Drought tolerant / less water consuming comprising 37 cereals, oil seed (4), pulses (6), Fiber (9), Sugarcane (17) and other crop (1).

All India Network Programme on Natural Farming (previously AINP-Organic Farming) is having one centre at Dharwad working on organic and natural farming in major crops and cropping systems. The centre has developed organic farming packages for soybean-wheat, groundnut-sorghum, chilli-cotton relay intercropping systems suitable for Karnataka. Suitable varieties for organic farming also identified. Need based capacity building programmes are also organized for various stakeholders such as farmers, extension agents and entrepreneurs.

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ANNEXURE-I

[Part (a) of Rajya Sabha USQ No. 2259 dated 19/12/2025]

Latest Technologies that are being Promoted to increase Agricultural Production and Productivity in various States

1. Tractor operated drip lateral and plastic mulch layer cum-planter
2. Tractor drawn garlic dibbler for raised beds
3. Tractor Operated Garlic Harvester for Raised Beds
4. Image Based Variable Rate Fertilizer Applicator
5. Tractor operated Drum Type Pneumatic Planter
6. Side dispensing type Farmyard Manure (FYM) Applicator for Grapes Orchard
7. SPAD Meter 2.0
8. Hand held device for soybean disease identification
9. Abiotic stress detection device
10. Bunch field crop harvester
11. Tractor-drawn coulter-based six-row liquid fertilizer applicator
12. Small tractor operated boom sprayer suitable for field and orchard crops
13. Unmanned track type vehicle for small farms (UMTV) with compatible multiple attachment Rotary tiller, Multi-row planter, Weeder and Air-assisted sprayer
14. Banana Pseudo stem injector
15. Tractor operated raised bed former cum onion bulb planter for multiplier onion
16. Tractor operated cassava harvester cum lifter
17. Tractor operated two row sugarcane settling transplanter for portray seedlings
18. Small tractor operated EPN applicator for sugarcane white grub management
19. 3 IN 1 cashew nut separator, pulp extractor and fibrous material separating machine
20. Continuous feed banana fibre extraction equipment
21. Power operated chaff cutter
22. Bullock drawn Jyoti multi-crop planter
23. Naveen sickle
24. Tubular maize sheller
25. Power operated groundnut decorticator
26. Naveen dibbler
27. Peg type dry land weeder
28. Animal drawn multi-purpose tool frame
29. Tractor front mounted vertical conveyor reaper windrower
30. Tractor operated vertical conveyor reaper windrower
31. High-capacity multi-crop thresher
32. PAU, Ludhiana wheel hand hoe
33. Manual groundnut decorticator
34. Tractor drawn ridge planter for winter maize
35. Manual twin wheel hoe
36. Tractor drawn multi-crop planter
37. Tractor drawn broad bed former cum seeder
38. Power tiller operated seed cum fertilizer drill
39. Self-propelled reaper
40. Multi-crop thresher (3.75 kW)
41. Tractor mounted inclined plate planter

42. Manual seed treating drum
43. Power tiller drawn Jyoti multi-crop planter
44. Tractor front mounted forage harvester
45. Tractor operated pneumatic planter
46. Mat type nursery sowing technique for paddy transplanting
47. IISR tractor operated ridger type sugarcane cutter planter
48. Power weeder
49. Power operated groundnut pod stripper
50. Ridger type sugarcane cutter planter
51. Tractor drawn Jyoti multi-crop planter
52. Groundnut thresher
53. Power operated hold on type paddy thresher
54. Power tiller operated auger digger
55. Tractor mounted rotary weeder
56. Tractor operated multi-purpose sugarcane planter
57. Power operated maize dehusker cum sheller
58. Paddy straw chopper cum spreader
59. Coconut tree climber
60. Tractor operated garlic planter
61. Air sleeve boom sprayer
62. Tractor mounted root crop harvester
63. Thresher for seed spices
64. Seven row tractor operated seed spices planter
65. SRI paddy weeder
66. Tractor operated garlic harvester
67. Tractor operated sugarcane trencher
68. Tractor operated sugarcane trench planter
69. Tractor operated multi-crop planter
70. Tractor operated disc type sugarcane ratoon management device
71. Self-propelled combine harvester for groundnut
72. Tractor operated small seed planter
73. Tractor operated deep furrow sugarcane cutter planter
74. Tractor drawn turmeric rhizome planter
75. Tractor operated check basin former
76. Tractor operated sugarcane cum potato planter
77. Tractor operated auger plough for green manuring and straw incorporation
78. Low hp tractor operated intra row cum inter row weeder for orchards
79. Tractor operated groundnut combine
80. A self-propelled corn cob harvester
81. Tractor operated paddy straw bale shredder cum mulcher
82. Tractor operated hydro-mechanically controlled m.b. plough for orchards
83. Mini groundnut combine
84. Tractor operated automatic reversible mechanical two bottom mould board plough
85. Garlic raised bed weeder
86. Garlic clove planter for raised bed
87. Smart Seeder (strip-Till seeder)
88. Self-propelled mini maize harvester
89. Tractor operated seeder for mat type paddy nursery
90. Tractor operated turbo bund former for mulched fields

91. Tractor operated potato digger-cum-collector
92. Tractor operated sugarcane leaf shredder
93. Tractor operated two row forward – reverse rotavator for sugarcane crop
94. Tractor operated small groundnut combine
95. Hand tool for okra (bhindi) harvesting
96. Collection mechanism for tractor drawn potato digger
97. Non-invasive type Respiration Rate Monitor
98. Sensor based mechanized washing system for cattle before milking
99. Batch type Cattle Washing Unit
100. Cattle Grooming Unit
101. Bullock drawn Multi-crop Precision Dibble Seeder
102. Bullock Drawn Multi-crop Planter cum Slurry Applicator
103. Bullock-drawn Biogas Slurry Applicator
104. Battery Powered Two-Row Root Wash Manual Transplanter
105. Remote Controlled Paddy Seeder
106. Light Weight Multi-crop Thresher
107. Finger Millet Thresher cum Pearler
108. Manual Nursery Cutter for mat type paddy nursery
109. Solar refrigerator with ice bank thermal storage
110. Solar dryer with thermal storage
111. Pilot Scale Torrefaction Unit
112. Fast Decomposition Methodology for Biogas Generation from Paddy Straw
113. Tubular condenser integrated biooil unit
114. Power cum Manual Operated Fruit and Vegetable Grader
115. Automatic Fruit Grader
116. Technology for production of chemical free grape raisins
117. Abrasive peeling machine for medicinal tuber crops

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ANNEXURE-II

[Part (a) of Rajya Sabha USQ No. 2259 dated 19/12/2025]

The Latest Technologies and Practices

ICAR develop and disseminate the technologies for management and restoration of **natural resource base** i.e. soil, water, climate and biodiversity through 16 institutes. The latest and important technologies are as under: -

1. **Integrated Farming Systems (IFS):** 80 IFS models developed across 26 States/UTs to enhance the sustainability in agriculture production; 38 were bankable projects financed by NABARD.
2. **Organic Farming:** 80 organic farming packages developed and disseminated; 100+ crop varieties identified; updated PGS protocol.
3. **Natural Farming Initiatives:** Research initiated in 20 centres in 16 states, potential domains identified NF, Developed generic protocol, delineated and field manual for NF, Launched model farm at 200 location; and CRG under NMNF.
4. **Validation of Natural Farming Practices:** Validation and refinement of Natural farming package of practices in 8 major cropping systems besides characterization of inputs such as Jeevamrit, Ghanjeevamrit, Beejamrit, Neemaster, Agniaster etc.
5. **Climate Risk and Vulnerability Assessment:** Assessed risk and vulnerability of predominantly agricultural districts to climatic hazards as per Intergovernmental Panel on Climate Change (IPCC) protocols in which 109 districts are categorized as 'very highly' and 201 districts as 'highly' vulnerable.
6. **Agricultural Contingency Planning:** Prepared district level Agricultural Contingent Plans for 651 districts and shared with the states/ vulnerable districts besides other stakeholders to cope up with any climatic adversities.
7. **Climate-Resilient Technology Demonstrations:** Demonstrated climate resilient technologies in 151 most vulnerable districts covering 448 villages to cope with various climatic aberrations and enhance farmers income, benefiting 8.5 lakh farmers across crops, livestock, and fisheries. This is being replicated in 10000 villages by DAF&W and 5000 village in POCRA project Maharashtra.
8. **In-situ Moisture Conservation:** In-situ moisture conservation through BBF, ridge and furrow planter. More than 25000 BBF planters sold during the last 5 years in six states.
9. **Climate Change Vulnerability Atlas:** Atlas on vulnerability of Indian agriculture to climate change and prioritization of rainfed areas in the country. Providing micro-level agromet advisory services.
10. **Soil Geo-portal Development:** Developed Soil Geo-portal 'BHOOMI' to host all the data related to soil and water management.
11. **Strengthening Soil Diagnostics:** Strengthened soil diagnostics through the National Soil Spectral Library (>40,000 spectra), improving farmer nutrient decisions.
12. **Portable Soil Testing Technology:** Developed a portable soil test kit/mini lab (Mrida parikshak) to supplement soil testing service and which was used for analyzing and distributing 30 million soil health cards in the country.
13. **Soil Fertility and Degradation Mapping:** Prepared geo-referenced soil fertility maps for 20 states & ready reckoners for soil test-based fertilizer recommendations. Prepared/updated Soil erosion maps, Ravine area map, Coastal erosion map, SLTL maps, Soil erosion control priority maps, Rainwater harvesting potential map (30 m resolution) for 15 states.

14. **Resource Conservation Technologies:** Standardized resource conservation technologies (DSR, zero tillage, laser levelling, bed planting, SRI, LCC etc.) to save water, nutrient, labor and energy.
15. **Agroforestry Development:** 80+ agroforestry models developed; Mapped area under different AF over 28.4 million ha.
16. **Agroforestry Policy Support:** National Agroforestry and state agroforestry policy documents prepared. Accreditation of nursery for quality planting material.
17. **Soil and Water Conservation Technologies:** Developed/standardized soil and water conservation technologies delivering 30–50% reduction in runoff and soil erosion, 20–45% higher groundwater recharge, 20–60% yield increase, and 25–100% farm income improvement, significantly reducing land degradation.
18. **Multipurpose Rubber Dam Technology:** Developed multipurpose rubber dam for water storage, to reduce soil erosion, enhance ground water recharge and safe disposal of sediments. Which was successfully operationalized in 33 locations spread over 8 States in the Country.
19. **Drip-Fertigation Scheduling:** Standardized drip-fertigation schedules for 34 crops which showed promising outcomes with 9-80% higher yield, 11-71% irrigation water saving, 18-25% fertilizer saving and 10-200% higher income from various crops grown under varying soil textural classes across the country.
20. **Alternate Wetting and Drying (AWD) Technology:** Standardized Alternate Wetting and Drying (AWD) for rice saving 17% irrigation water, and drip fertigation for 34 crops boosting yields by 9–80%, FUE by 12–23%, and saving 11–71% water.
21. **Technologies for Problem Soils:** Developed cost-effective liming technology for amelioration of acid soils, reclamation technology for salt affected soils and sub-surface drainage technology for waterlogged saline soils.
22. **Reclamation of Salt-Affected Soils:** Soil reclamation technology developed by ICAR-CSSRI Karnal reclaimed 1.45 mha salt affected soils in 8 states contributing 22 lakh ton food grains to national food busket.
23. **Soil Productivity Improvement in sodic and acidic:** Enhanced productivity of sodic and acid soils (15–35% yield gains) across 25 million ha using gypsum and liming, and developed microbial inoculants, fertilizer prescriptions for 31 crops, Nano Rock Phosphate, and organo-mineral fertilizers to improve nutrient-use efficiency and reduce dependence on mineral fertilizers.
24. **Sub-surface Drainage Adoption:** Cost effective sub-surface drainage technology for waterlogged saline soils has been widely adopted in Haryana, Rajasthan, Gujarat, Punjab, Andhra Pradesh, Maharashtra, Madhya Pradesh and Karnataka. More than 1,10,000 ha waterlogged saline soils have been reclaimed so far.
25. **Salt-Tolerant Crop Varieties:** Developed salt tolerant varieties of rice (CSR 46), wheat (KRL-283), mustard capable of producing about 25% higher seed yield and 29% higher oil yield over national checks. Annually, around 6.5 t breeder seeds of these varieties are being produced to cover 6.45 lakh ha area in nine salt affected states.
26. **CSR-BIO Bio-Growth Enhancer:** Developed CSR-BIO: A potential bio-growth enhancer for higher and sustainable crop productivity of salt affected soils. A cost effective bio-growth enhancer CSR-BIO in both liquid and solid forms comprising of two promising compatible bacterial strains CSR-B-2 (Bacillus pumilus), CSR-B-3 (Bacillus thuringenesis) and one fungal strain CSR-T-1 (Trichoderma harzianum). It acts as soil conditioner and bio-catalyst.

27. **Rapo-Compost Technology:** Rapo-compost technique- The technology has been developed by ICAR-IISS in collaboration with ICAR-CIAE and ICAR-NBAIM, Mau to decompose kitchen waste and vegetable wastes. Using consortium of Ligno-cellulolytic thermophilic organisms, decomposition period has been considerably reduced to 45 days.
28. **Alternative Cropping Systems:** Efficient alternative cropping systems with agronomic management practices have been identified, documented and recommended for different agro-climatic zones having potential productivity ranging from 16 to 35.2 t ha-1 year-1. These alternative systems along with production packages have been included in the Crop Production Guide /package of practices of 19 states.
29. **Land Resource Inventory (LRI):** Completed Land Resource Inventory (LRI) for >100 lakh ha, enabling micro-level land-use planning that can raise productivity by 10–25% and reduce soil degradation by 20–40% under sustainable management practices.
30. **Watershed Management Models:** Developed 75 model watersheds with location specific soil and water conservation measures.
31. **JholaKundi Water Harvesting:** JholaKundi: A low cost water harvesting technique for augmenting production of Jhola lands in Eastern Ghats High Land Region of Odisha.
32. **Soil Resource Mapping:** Prepared soil resource maps of the country (1:1 million scale), states (1:250,000 scale) and 55 districts (1:50,000 scale); soil degradation map of the country (1:4.4 million scale) & state soil erosion maps (1:250,000 scale), Soil resource maps on 1:10,000 scale of selected watersheds (267), villages (173) and research farms (106).
33. **Agro-Ecological Regionalization:** Twenty agro-ecological regions and sixty agro-ecological sub-regions of the country have been delineated and mapped on 1:4.4 million scale.
34. **Agri-Voltaic Systems:** Developed Agri-voltaic system to enhance crop production and electricity generation from a single land use system.
35. **Desertification Assessment:** The desertification status map of Rajasthan state was prepared. The most significant process of desertification in the state is wind erosion.
36. **Wind Erosion and Desertification Control:** Developed sand dune stabilization and shelterbelt plantation technologies to check wind erosion & desertification.
37. **Improved Ber Propagation:** Developed improved Budding technique of ber. The institute sold more than 1.2 lakh elite saplings of ber using this technology.
38. **Gum Exudation Technology:** Gum exudation technology from Acacia Senegal. Technology has been widely adopted in 45 villages in Jodhpur, Barmer, Bikaner, and Nagaur districts of Rajasthan benefiting 5080 farmers.
39. **Solar-Based Farm Technologies:** A total of nine units three each of animal feed solar cooker, inclined solar dryer and solar PV duster were got fabricated and procured for installation in selected villages of Jodhpur and Pali district.
40. **Technologies for North East Region:** Fifty seven crop varieties including rice (34), pulses (7), oilseeds (2), tuber drops (2), tomato (6), brinjal (2), turmeric (1), papaya (1), pineapple (1) and Jatropha (1) had been released by the institute for the North East region. Developed 32 location specific IFS models. Developed technology for utilization of Rice fallow. Developed technology rehabilitation of Jhum land.
41. **Weed Atlas and Management Practices:** Weed- Atlas of weed flora of major cropping system, PoP for 7 major weeds developed.
42. **Precision Planter cum Herbicide Applicator:** A precision planter cum herbicide applicator: The applicator was designed and developed to sow the seed and fertilizer precisely along with application of pre-emergence herbicide. The alternator is backed by the tractor battery power.

43. **Integrated Weed Management Modules:** Integrated weed management modules developed and disseminated to 23 states for adoption.
44. **Biological Weed Control and Bioremediation:** Provided technology backstopping for biological control of Parthenium, water hycynth. Developed Weed Typha sp. - a good candidate for bioremediation of pollutants from drain water.
45. **Vegetable and Pulse Varieties Development for eastern region:** Total 55 varieties/hybrids of Brinjal, tmato, cucumber, cowpea, bottle gourd, bitter gourd, ridge gourd, sponge gourd, pumpkin, chilli, French bean, pea, faba bean, pointed gourd, limabean, soybean, capsicum, snow pea, delicious bean, etc. have been developed by the institute for the cultivation in rainfed and Hill & Plateau region.
46. **Integrated Aquaculture Systems:** Developed and standerdized integrated Fish-Makhana-Water chestnut production.
47. **Coastal Agriculture Research and Varieties:** ICAR-CCARI, Goa focusing research exclusively on coastal agriculture and allied sectors covering both east and west coastal regions of the country. New varieties of Cashew (Goa Cashew - 2, Goa Cashew - 3 and Goa Cashew - 4) of rice (Goa Dhan - 1 and Goa Dhan - 2), Goa cowpea -3 were released.
48. **Sugarcane Ratoon Management Technology:** Multipurpose SORF machine developed by NIASM for sugarcane ratoon and demonstrated successfully in farmer field and has potential in 2.5 million ha.
49. **Introduction of Dragon Fruit:** Demonstrated Dragon Fruit as a new fruit crop. It has potential in 1 lakh ha less fertile barren and rocky lands.

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