TAMIL NADU AGRICULTURE SECTOR

Looking for a win-win-win for farm viability, water use reduction or elimination, + efficient use of clean energy

contents

1.0 agriculture, water, power—interlinkages

1.1 agriculture, water, power— groundwater crisis

89%

Groundwater usage for agriculture in T.N.

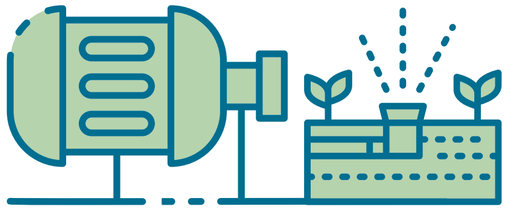
60%

Groundwater is the main source for irrigation

58%

Agricultural land is irrigated in T.N.

1.2 agriculture, water, power—electricity's role



Electricity is used to pump up groundwater for irrigation. Currently, that electricity predominantly comes from grid-based unmetered supply or stand alone diesel pumps and a small of number of solar pumps.

Electricity supplied by TANGEDCO to cover agricultural tariffs, is being subsidised by the state. Farmers are supplied free of cost electricity that is intermittent, of poor quality and at inconvenient times.

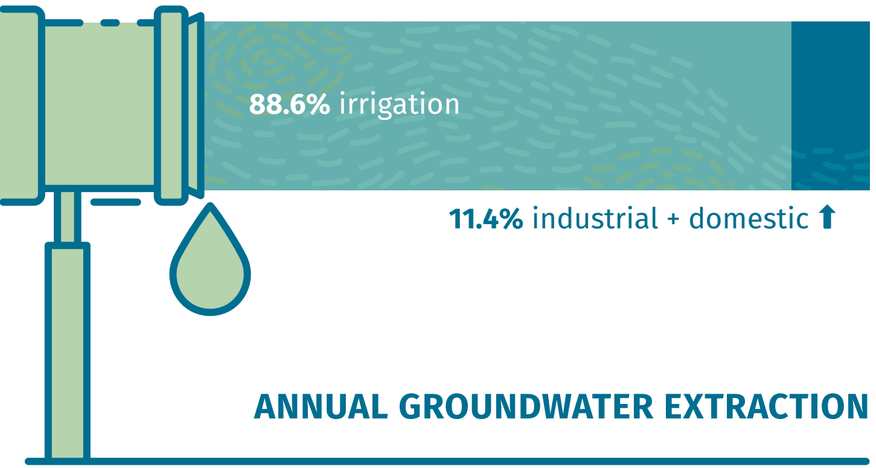
1.3 agriculture, water, power—inextricably linked

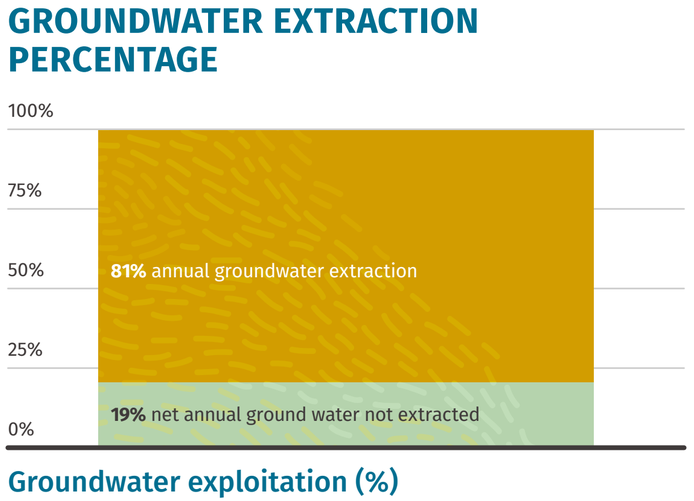
1) Agriculture, aided by electricity, is failing to respond to the mounting environmental challenges. Groundwater is being dangerously depleted by overdrawal due to increased water demand for (certain) food crops. The situation is worsened by climate change, its consequent erratic rainfall, and increased rainfall deficits, which results in inadequate replenishment of groundwater.

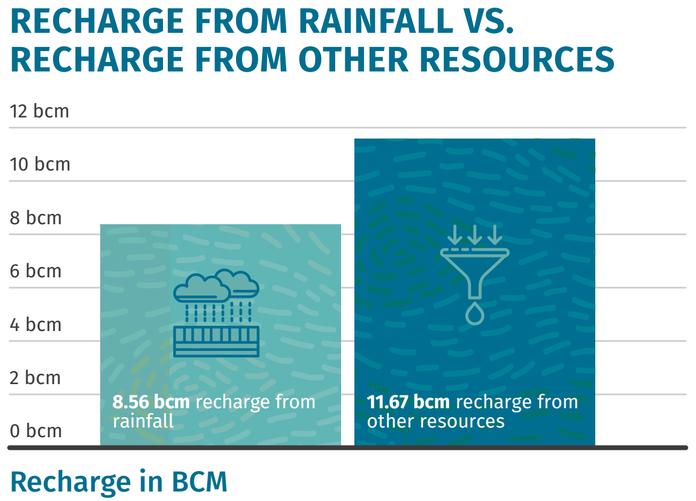
2) Agriculture, water and electricity sectors all need to holistically respond to the changing and unpredictable external circumstances, and the demands of the future, in order to balance the (sometimes) conflicting demands of ecological wellbeing, food security and farm viability.

2.0 tamil nadu's groundwater crisis

2.1 groundwater consumption by irrigation: 89%







Groundwater resources are replenished through rainfall and other sources like return flow from irrigation, canal seepage, recharge from water bodies, water conservation structures, etc.

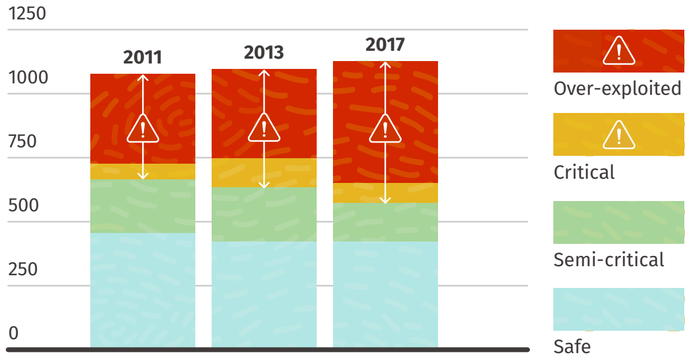
T.N.'s conventional irrigation system's water use efficiency is only 35% (surface water) to 55% (groundwater).*

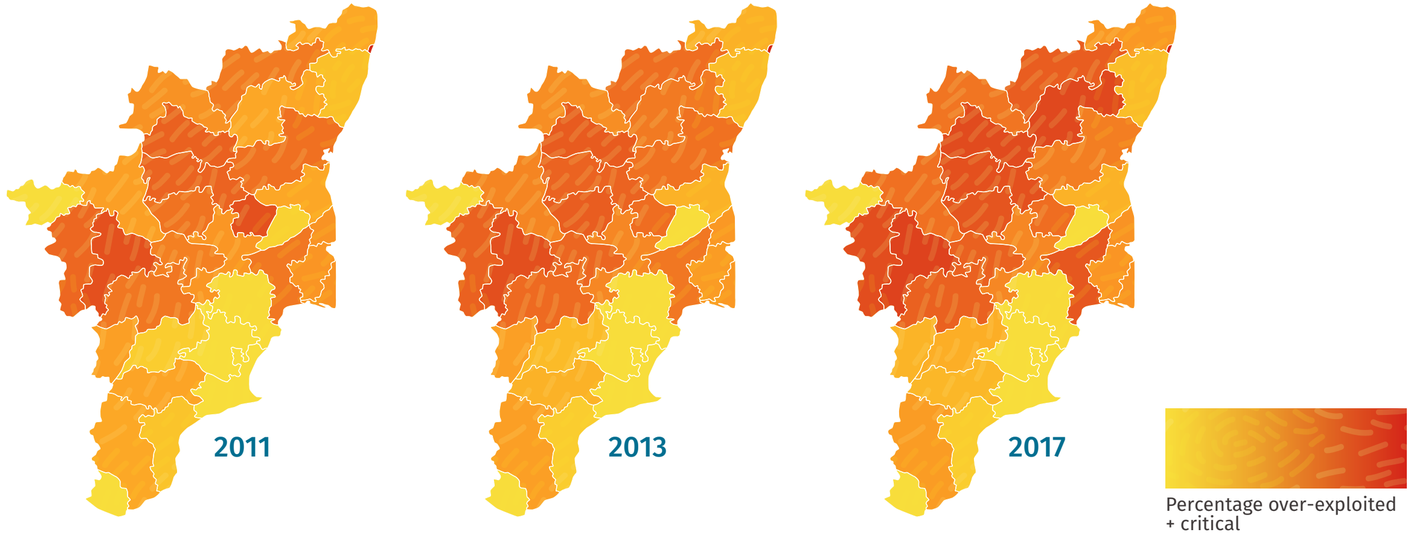
Source: CGWB, Dynamic Groundwater Resources Assessment of India—2017 | * State of Irrigation in Tamil Nadu—Investments and Returns, www.core.ac.uk/download/pdf/6764868.pdf

2.2 tamil nadu's groundwater situation in the red

In 2017, ~50% of assessed units were over-exploited or critical

TAMIL NADU GROUNDWATER EXPLOITATION TREND





High number of overexploited areas due to the presence of low-potential hard rock aquifers in Tamil Nadu. In 2017, Tamil Nadu's stage of groundwater development* was ~81%.

In 2013, T.N. repealed the Tamil Nadu Groundwater (Development & Management) Act, 2003, meant to ration, regulate groundwater extraction. It has not been replaced by another law.

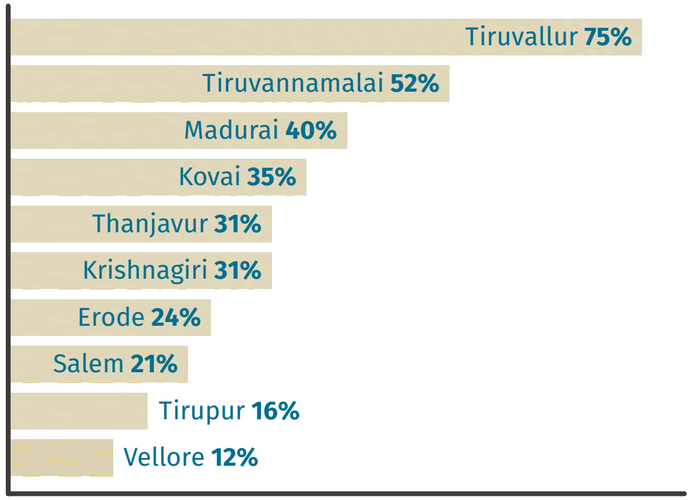
TN has not so far implemented revised guidelines released by CGWA which came into effect from June 1, 2019.

Source: CGWB, Dynamic Groundwater Resources Assessment of India—2017, 2013, 2011 | * Ratio of the annual ground water extraction to the net annual ground water availability | ** Central Ground Water Authority

2.3 northern, western districts saw highest percentage of groundwater deterioration between 2013–17

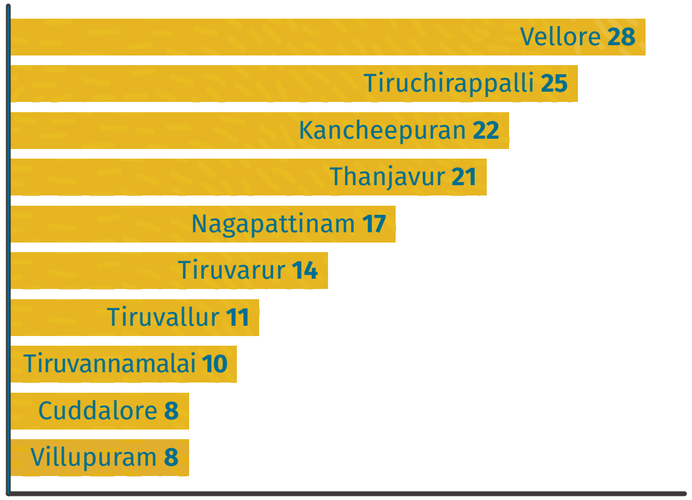
Decadal mean assessments show long-term decline in groundwater levels

DISTRICTS WITH HIGHEST GROUNDWATER DETERIORATION BETWEEN 2013 AND 2017



Percentage of change in number of over-exploited and critical units

DISTRICTS WITH MOST LONG TERM DECLINE (POST MONSOON)



Number of wells

1) Post Monsoon: 11% of wells recorded an ↑ in water levels during Jan 2017 with respect to its preceding decadal mean while 89% recorded a ↓.

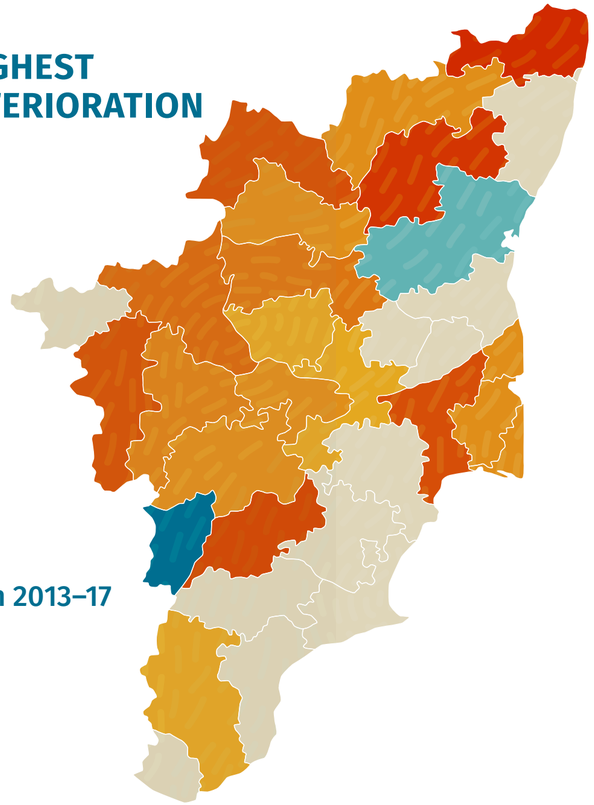
2) Steepest post monsoon decadal declines in 2017 were seen in Tamil Nadu, along with states like Haryana, Punjab, UP, MP and Bihar.

Source: CGWB, Dynamic Groundwater Resources Assessment of India—2017, 2013, 2011 | Groundwater Year Book of Tamil Nadu and U. T. of Puducherry (2016–2017)

2.4 districts with greatest groundwater deterioration between 2013 and 2017

Greatest decadal post monsoon decline in northern, coastal, cauvery delta districts

DISTRICTS WITH HIGHEST GROUNDWATER DETERIORATION BETWEEN 2013-17



GW percentage change in 2013–17

-33 75

DISTRICTS WITH MOST LONG TERM POST-MONSOON GROUNDWATER DECLINE

Wells with fall in GW level

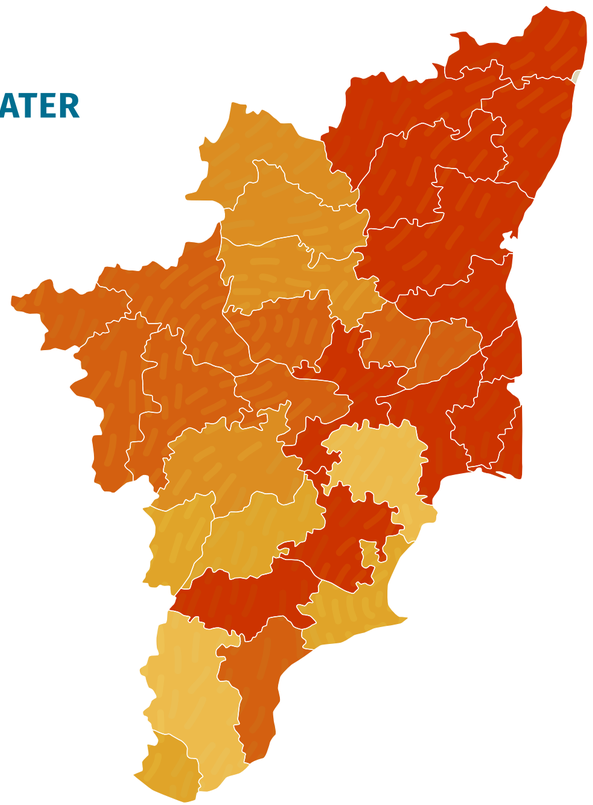
100% Chennai, Cuddalore, Kanchipuram, Nagapatinam, Sivaganga, Thanjavur, Tiruchirapalli, Tiruvallur, Tiruvannamalai, Tiruvarur, Vellore, Villupuram, Virudhunagar

90–99% Ariyalur, Coimbatore, Erode, Karur, Namakkal, Nilgiris, Perambalur, Thoothukudi, Tiruppur

80–89% Dharmapuri, Dindigul, Krishnagiri, Salem

70–79% Kanyakumari, Madurai, Ramanathapuram, Theni

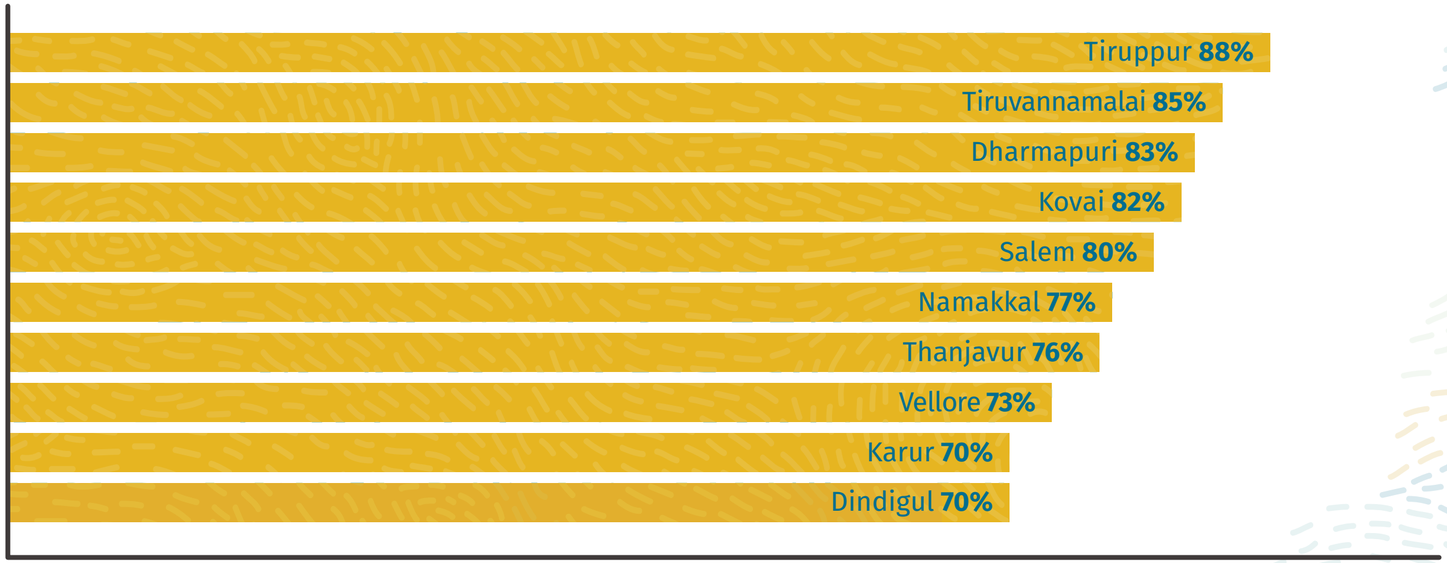
60–69% Podukkottai, Tirunelveli

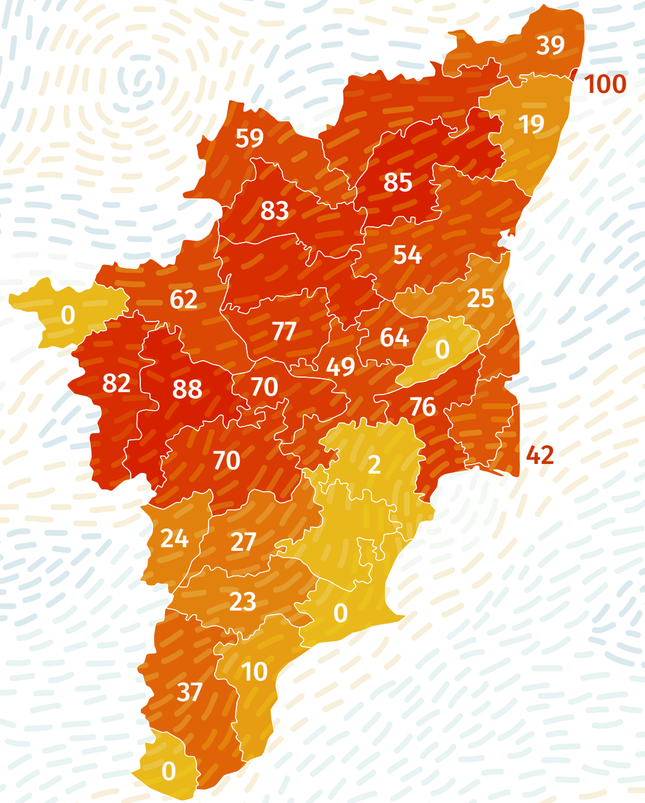


Source: CGWB, Dynamic Groundwater Resources Assessment of India—2017, 2013, 2011 | Groundwater Year Book of Tamil Nadu and U. T. of Puducherry (2016–2017)

2.5 northern & western districts had the poorest groundwater status in 2017

DISTRICTS WITH POOREST GROUNDWATER CONDITIONS IN 2017





Source: CGWB, Dynamic Groundwater Resources Assessment of India—2017

3.0 what is drinking up the water?

3.1 factors contributing to groundwater deterioration

1) Increased use for agriculture:

- » Cropping patterns/ policies/incentives lead to expanded acreage of water intensive crops
- » Increased use of tubewells/borewells/ other wells for irrigation of same acreage as before or for increased acreage of water intensive crops

2) Rainfall deficits—higher, continuous years of deficits from normal

3) Higher incidence of climate change induced extreme rainfall events—shorter, more intense bursts of rain resulting in runoff rather than groundwater recharge

4) Shifting irrigation patterns: lack of maintenance of surface water infrastructure—canals and tanks

5) Inefficiencies in water use (flood or surface irrigation versus drip irrigation)

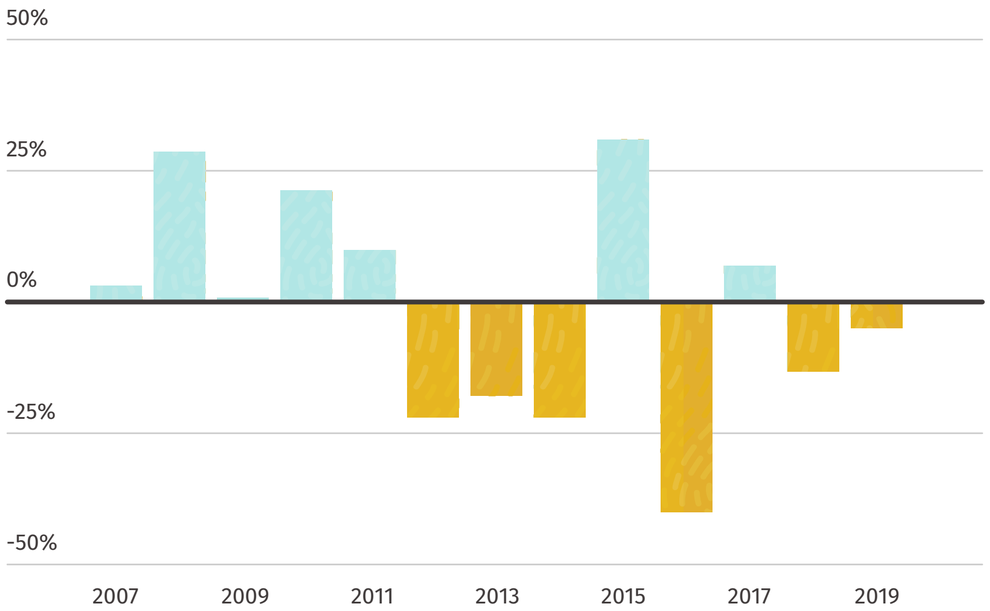
6) Lack of emphasis on groundwater recharge and conservation

7) Electric pump proliferation in highly water stressed districts

3.2 recent frequent rainfall deficits have worsened groundwater crisis

replenishment not keeping pace with extraction

DEPARTURE FROM ANNUAL NORMAL RAINFALL



1) T.N. experienced its worst Northeast Monsoon in 140 years in 2016–17.

2) It experienced 3 continuous years of very severe departures from normal rainfall once before—2001 (-48.01%), 2002 (-65.8%), 2003 (-62.62%).

3) 2019 monsoon saw 560 “extreme rainfall events”, 74% more than the number (321) in 2018*.

4) Number of districts declared drought-hit (meteorological/ hydrological/agricultural/socio-economic/political) in recent years:

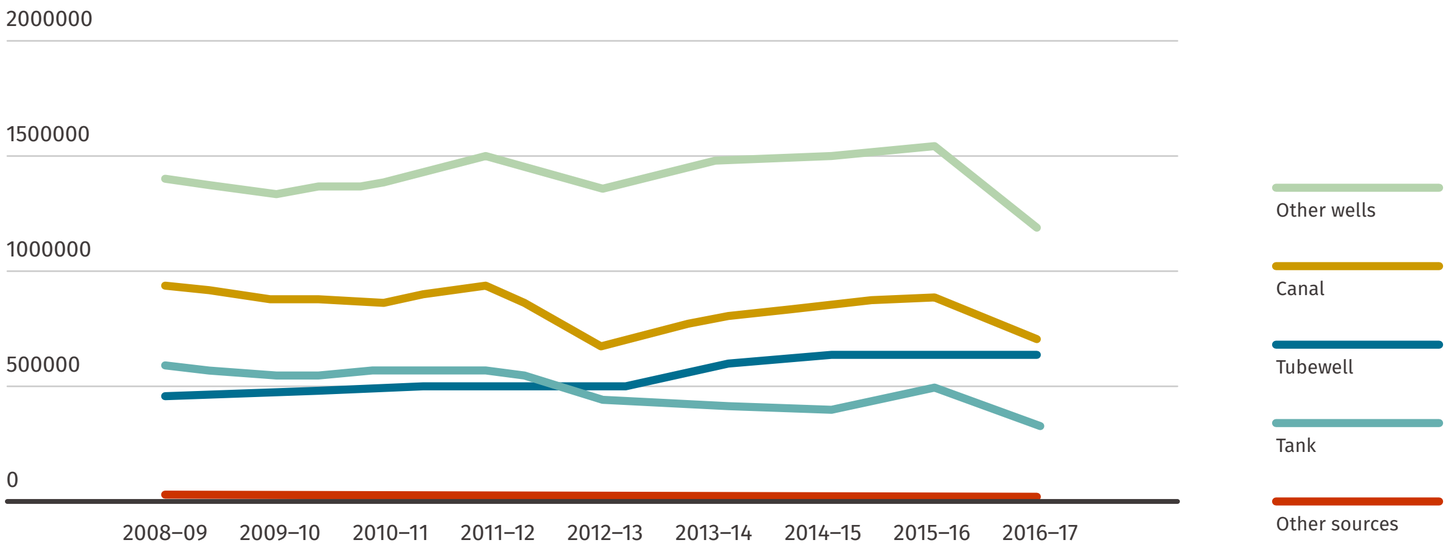
- » Summer 2019: 24 districts
- » 2016–17: all 32 districts
- » 3 consecutive rain-deficit years in 2011, 2012 and 2013

Source: IMD: Rainfall Statistics of India, volumes for 2012 to 2017; IMD: Annual Climate Summary, various volumes | Salient Statistcis on Agriculture, Govt of TN, www.efps.tn.gov.in/agri/salientstatagri/report/02_05.pdf |
* www.indiaspend.com/2019-monsoon-heaviest-in-a-quarter-century/

3.3 tubewell irrigation increased by 40% between 2008–09 & 2016–17

Well irrigation is the top source of irrigation in Tamil Nadu

GROSS IRRIGATED AREA BY SOURCE IN TAMIL NADU



Irrigated area in hectares

1) With minor fluctuations, the share of well irrigation increased from 56% to ~64% in the same period.

2) Tubewell irrigation has steadily increased from ~14% of total irrigation in 2009–10 to ~23% in 2016–17.

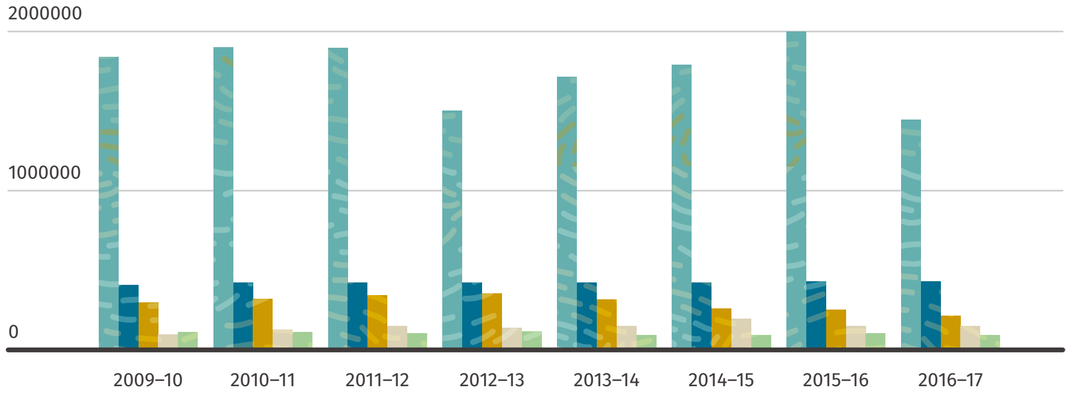
3) Tanks saw an overall declining trend between 2008–09 and 2016–17 barring some minor fluctuations.

Source: www.aps.dac.gov.in/LUS/Public/Reports.aspx

3.4 water-intensive crops accounted for ~50% of all crops between 2009 and 2017

Water intensive crops percentage decreased by ~2–3% since 2013–14

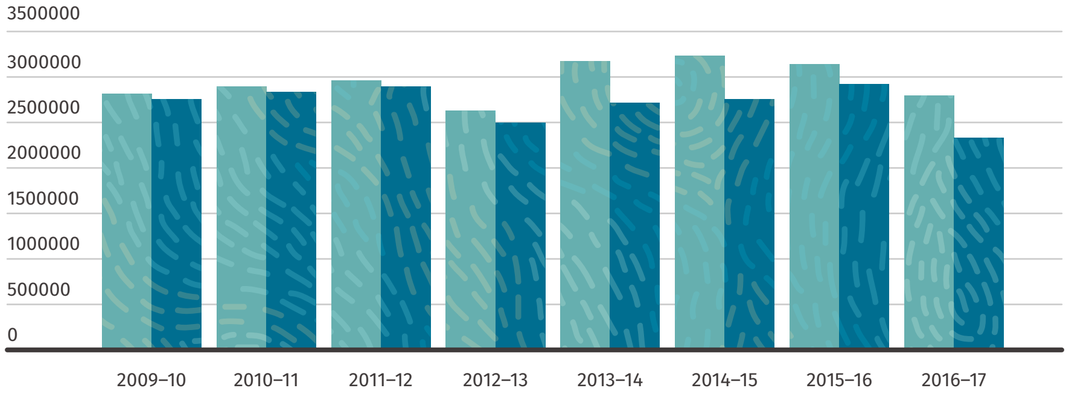
AREA UNDER CULTIVATION OF MAJOR WATER-INNSIVE CROPS



Area under cultivation in hectares

Paddy
Coconut
Sugarcane
Cotton
Banana

TRAJECTORY OF WATER-INTESIVE CROPS VS. OTHER CROPS



Area under cultivation in hectares

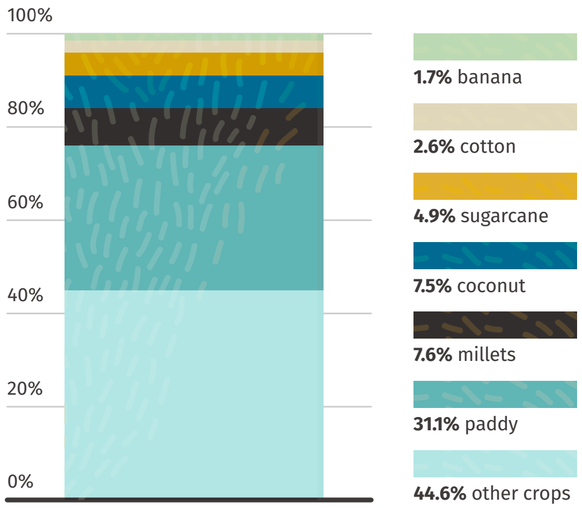
Other crops
Total water-internsive crops

Source: www.aps.dac.gov.in/LUS/Public/Reports.aspx

3.5 paddy forms ~31% of cropped area; millets grown only on 7.6% of the land

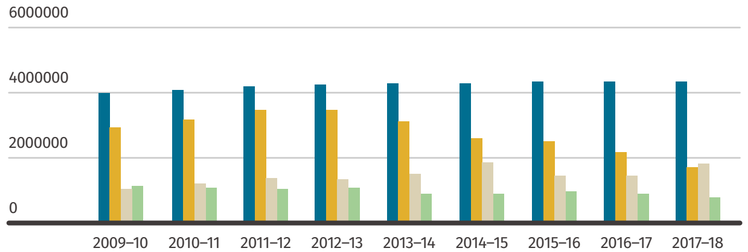
Sugarcane sees a steady decline in recent years

AVERAGE AREA UNDER CULTIVATION (%)

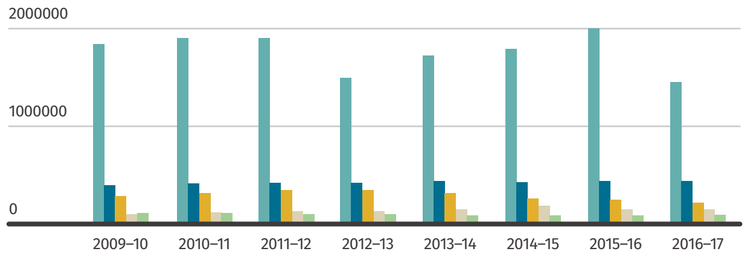


2009–10 and 2017-18

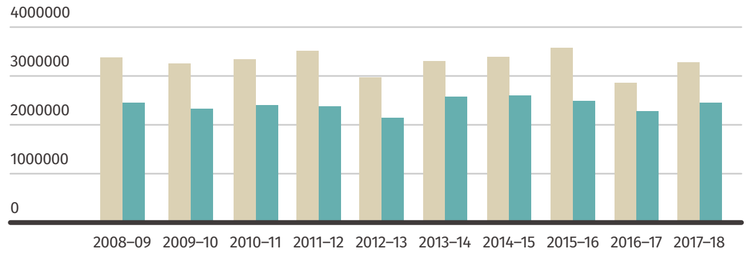
AREA UNDER CULTIVATION OF MAJOR WATER-INTENSIVE CROPS (EXCLUDING PADDY)

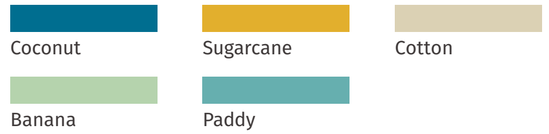


AREA UNDER CULTIVATION OF MAJOR WATER-INTENSIVE CROPS



IRRIGATED VS. UNIRRIGATED AREA IN H.A.





Source: www.aps.dac.gov.in/LUS/Public/Reports.aspx

4.0 electricity in agriculture

4.1 pump-powered well irrigation is facilitating cultivation of water-intensive crops

Ignores regular/increasing rainfall deficits, depleting groundwater

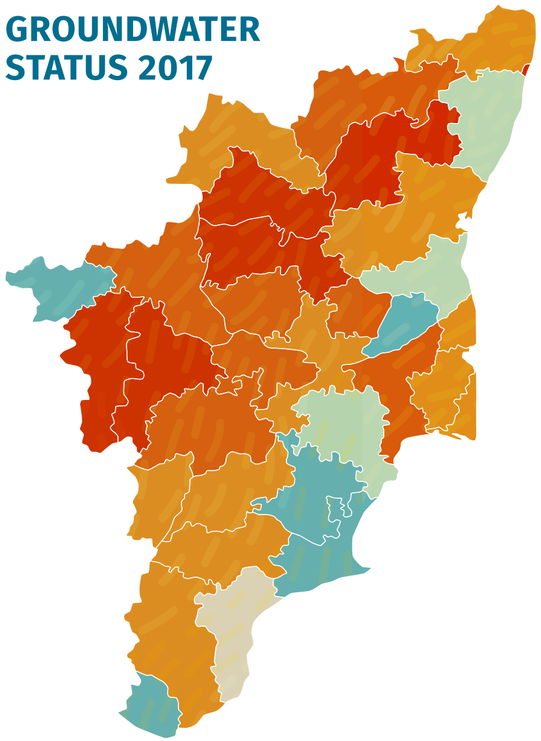
districts	% groundwater exploitation (over-exploited + critical)	average % of water intensive crops (2012–17)	wells as a source of irrigation (%) (2008–17)	wells as a source of irrigation (%) (2012–17)	load (hp)	№ of pending applications	№ of electric pumps	№ of diesel pumps	№ of solar pumps
Tiruvannamalai	85	55	87	91	1,057,204	25,624	353,735	10,149	102
Vellore	73	43	98	99	921,919	18,553	172,811	2,191	101
Salem	80	19	99	99	740,312	17,050	133,778	1,242	104
Tiruppur	88	40	73	79	657,979	27,567	0	0	243
Thanjavur	76	N.A.	25	26	500,329	20,095	17,898	3,146	201
Kovai	82	55	82	85	559,074	18,360	122,918	3,936	179
Dharmapuri	83	24	97	98	343,268	31,432	27,285	60,410	99

Source: TANGEDCO Statistics 2019, Solarillion Foundation Report, 2016

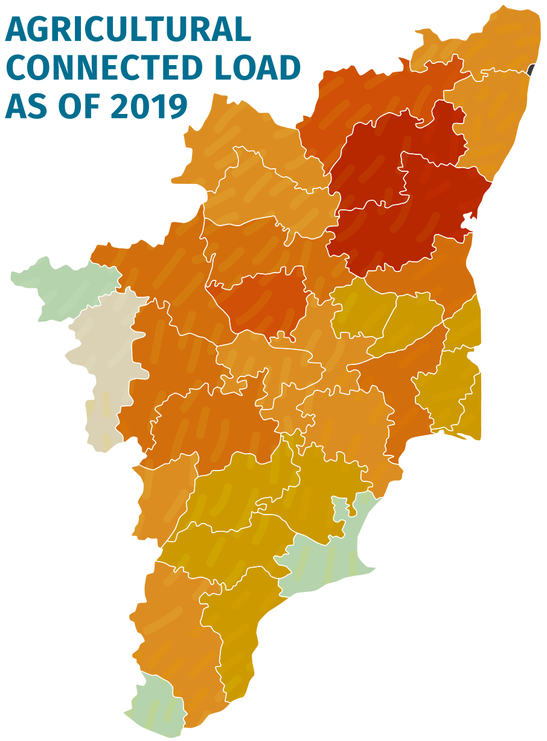
4.2 8 districts account for ~54% of agricultural connection load in state

6 of these districts are among the top 10 groundwater-stressed districts

GROUNDWATER STATUS 2017



AGRICULTURAL CONNECTED LOAD AS OF 2019



1) TN has 20 lakh active agricultural connections, a total connected load of 1.2 cr HP. It has 4.73 lakh pending connection applications. Agriculture was allotted ~52% of T.N.'s Power Subsidy for 2019–20.

2) Maximum connected load (HP) comes from 3 northern districts (25%), 5 western districts (28.7%). Average water intensive crops % in the northern districts is 48% and western districts* is 29.5%.

3) Villupuram (9.57%), Tiruvannamalai (9.12%) and Vellore (6.97%) top the list with the maximum number of agricultural connections and number of electric pumps.

4) Diesel pumps formed ~18% of total pumps in 2016. 4368 solar pumps were installed between 2012–19.

Source: TANGEDCO; Central Groundwater Board (CGWB) assessment | www.cgwb.gov.in/GW-Assessment/Categorization%20of%20AU.pdf | Tamil Nadu Electricity Regulatory Commission (TNERC). Tariff Subsidy Details 2019–20
* Salem and Tiruppur only.

4.3 electricity issues faced by farmers

1) The existing ~20 lakh active agricultural connections are fraught with issues:

» Intermittent, irregular, low quality daytime power supply

› Anecdotal evidence suggests daytime power is available either 6 a.m. to noon, or noon to 6 p.m.

› High voltage fluctuations lead to damage of motors

› 11 a.m. to 4 p.m., when temperatures are highest, is not optimal for irrigation. Everybody attempts to use the 6 a.m. to 11 a.m. or 4 p.m. to 6 p.m. window leading to high voltage fluctuations. Results in blowing of transformer fuse which takes a long time to get fixed

» Steady but inconvenient night time power supply. Because it is a difficult time to irrigate it becomes a key contributor to inefficient irrigation

2) Large number of pending grid electricity connection applications

3) While electricity is free for farmers in T.N., bribes are involved in getting a connection and expenses amounting to ~Rs. 40,000 involved in acquiring pump, motor, line to farm, etc.

4) Issues in getting awarded a connection if there are problems with title deeds, lack of papers to prove ownership of land, etc.

5) Small and marginal farmers more likely to use diesel pumps

thank you for you joining us today

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