Finding a Suitable Niche for Cultivating Cactus Pear (*Opuntia ficus-indica*) as an Integrated Crop in Resilient Dryland Agroecosystems of India

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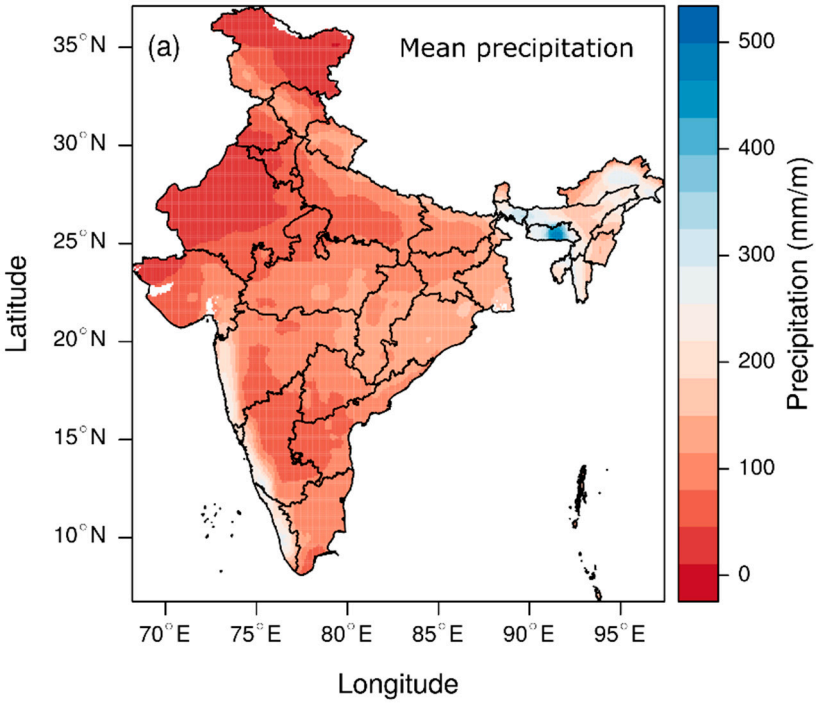
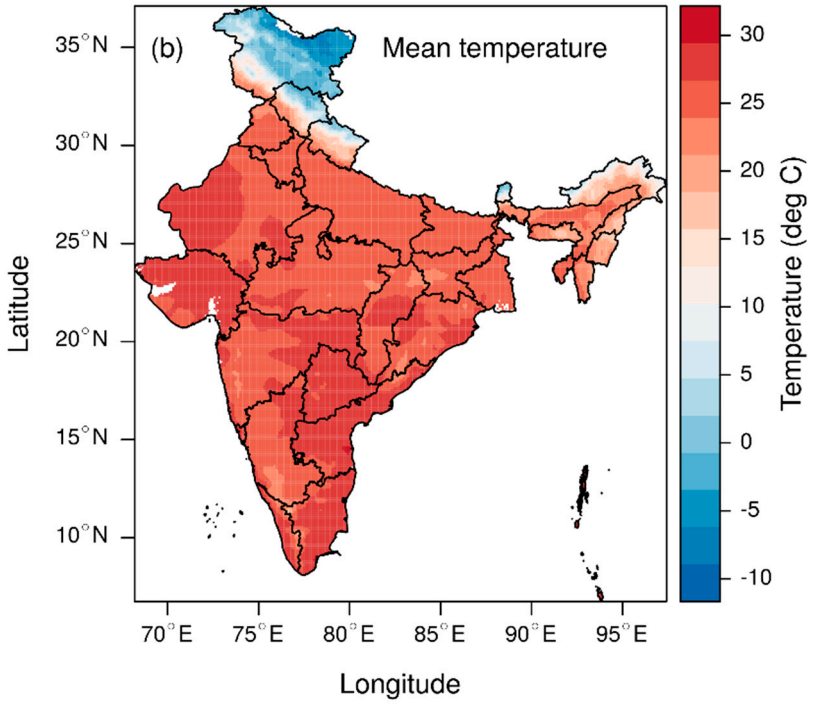
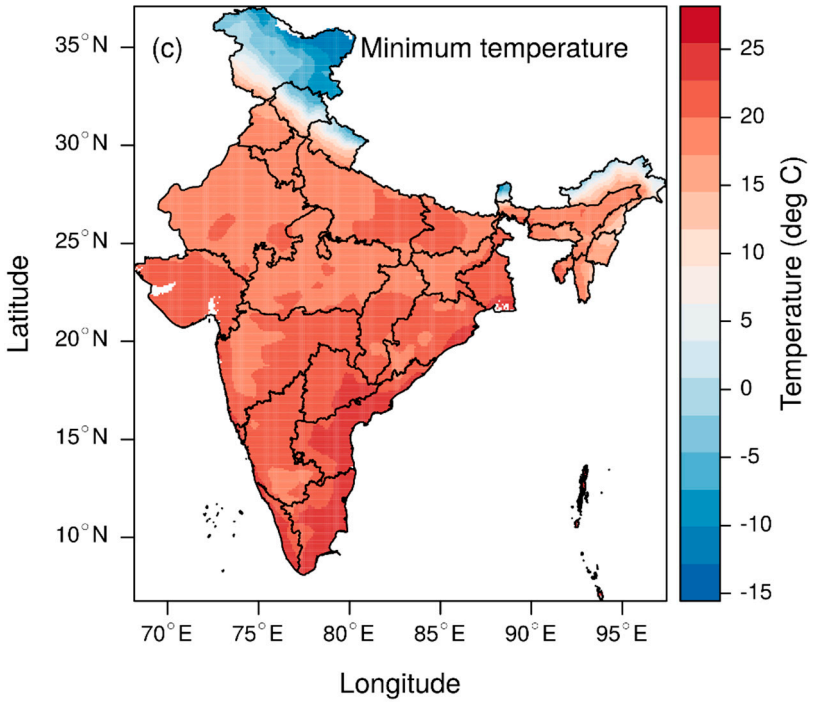
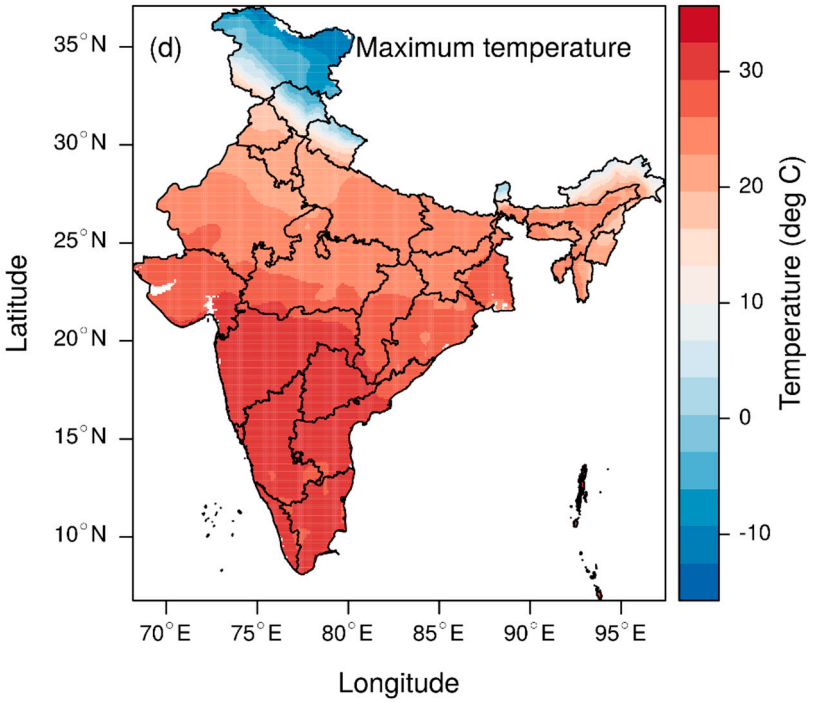
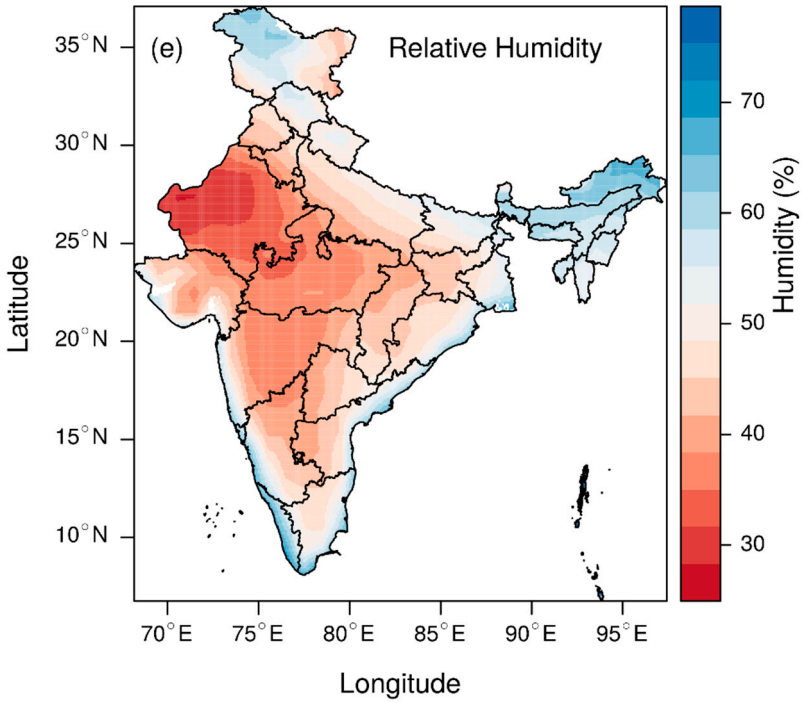
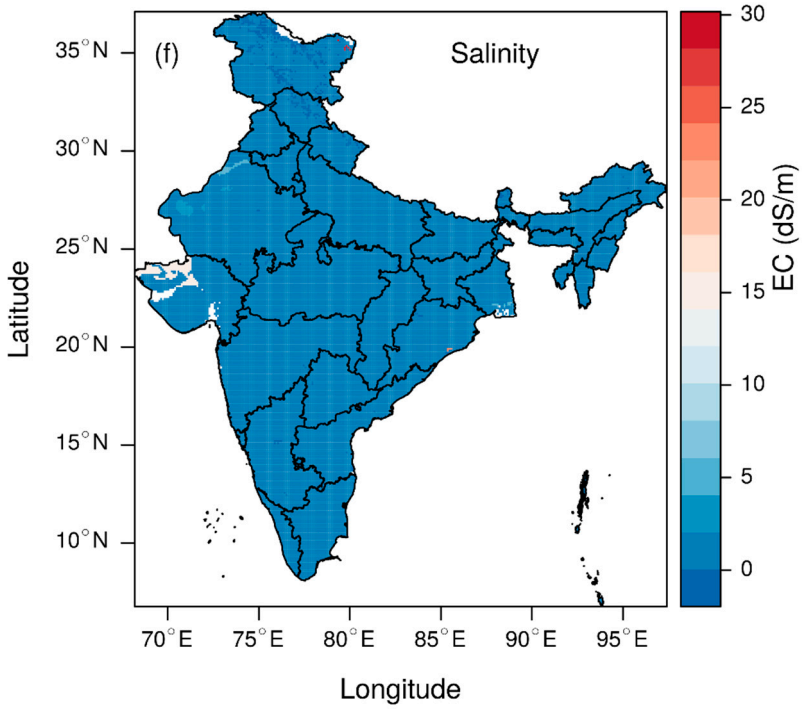


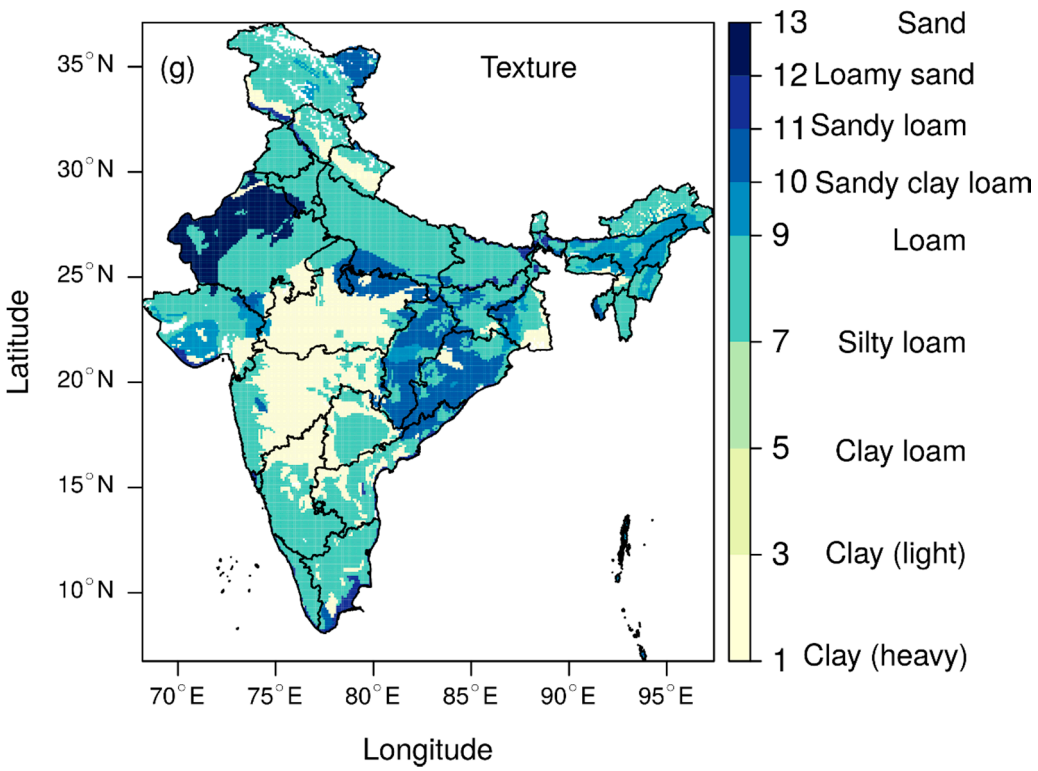


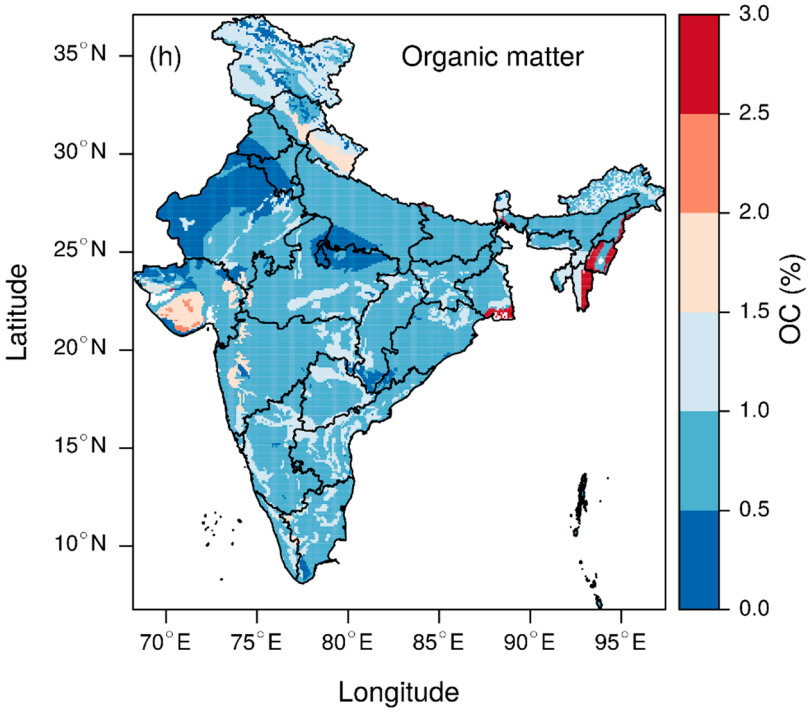

(c)
Minimum temperature
35°N
30°N
25°N
20°N
15°N
10°N
Latitude
70°E
75°E
80°E
85°E
90°E
95°E
Longitude
25
20
15
10
5
0
-5
-10
-15
Temperature (deg C)


(d)
Maximum temperature
35°N
30°N
25°N
20°N
15°N
10°N
Latitude
70°E
75°E
80°E
85°E
90°E
95°E
Longitude
30
20
10
0
-10
Temperature (deg C)


(e)
Relative Humidity
35°N
30°N
25°N
20°N
15°N
10°N
Latitude
70°E
75°E
80°E
85°E
90°E
95°E
Longitude
70
60
50
40
30
Humidity (%)


(f)
Salinity
35°N
30°N
25°N
20°N
15°N
10°N
Latitude
70°E
75°E
80°E
85°E
90°E
95°E
Longitude
30
25
20
15
10
5
0
EC (dS/m)


(g)
Texture
35°N
30°N
25°N
20°N
15°N
10°N
Latitude
70°E
75°E
80°E
85°E
90°E
95°E
Longitude
13 Sand
12 Loamy sand
11 Sandy loam
10 Sandy clay loam
9 Loam
7 Silty loam
5 Clay loam
3 Clay (light)
1 Clay (heavy)


(h)
Organic matter
35°N
30°N
25°N
20°N
15°N
10°N
Latitude
70°E
75°E
80°E
85°E
90°E
95°E
Longitude
3.0
2.5
2.0
1.5
1.0
0.5
0.0
OC (%)

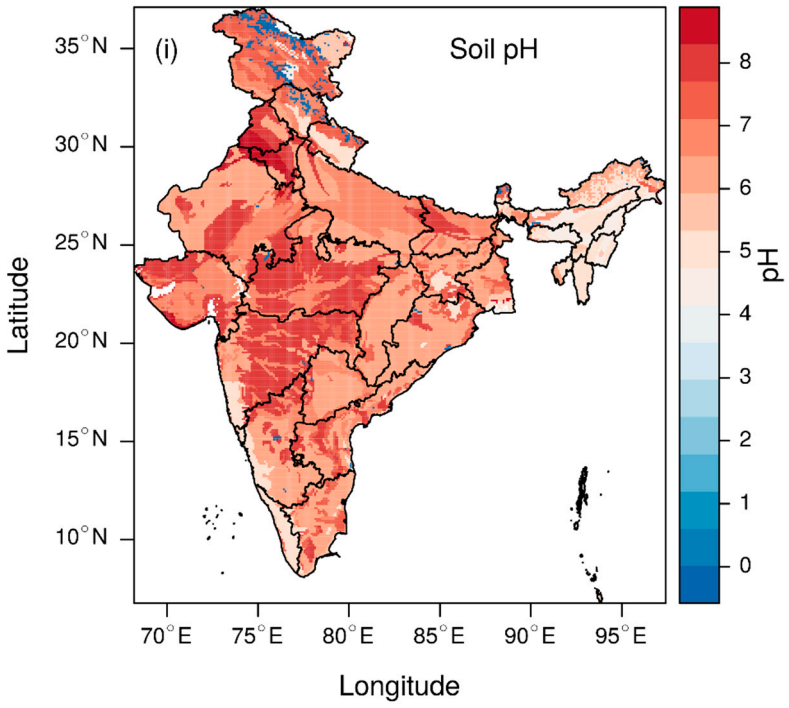


Figure S1. Spatial distribution of climatic and edaphic factors indicating the conditions for cactus growth across India.

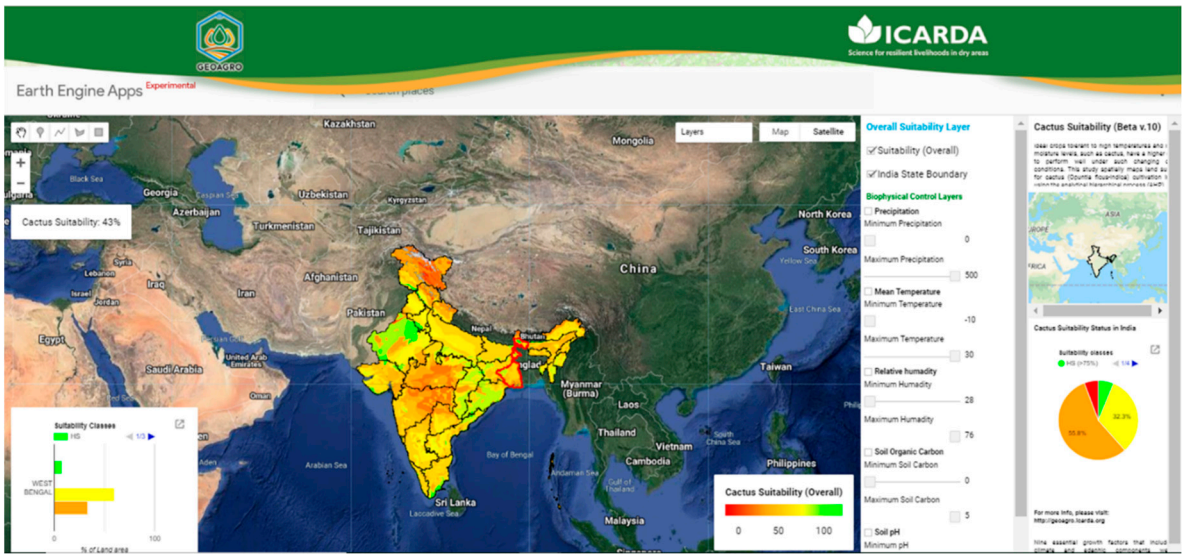


Figure S2. Interface of Decision Support Tool.

Note: A web-mapping application (Beta v 1.0) developed in the Google Earth Engine App platform and is hosted in ICARDA GeoAgro portal (https://geoagro.users.earthengine.app/view/cactus). The application shows state-wise percentage of land suitable for cactus under different suitable classes. User can select any state to generate statistical chart of that particular state. Even user can click on any pixel to see the suitability value of the selected pixel. On the right panel, spatial layers of climatic and edaphic factors are shown. These layers can be tuned to generate different suitability scenarios of cactus cultivation in India.

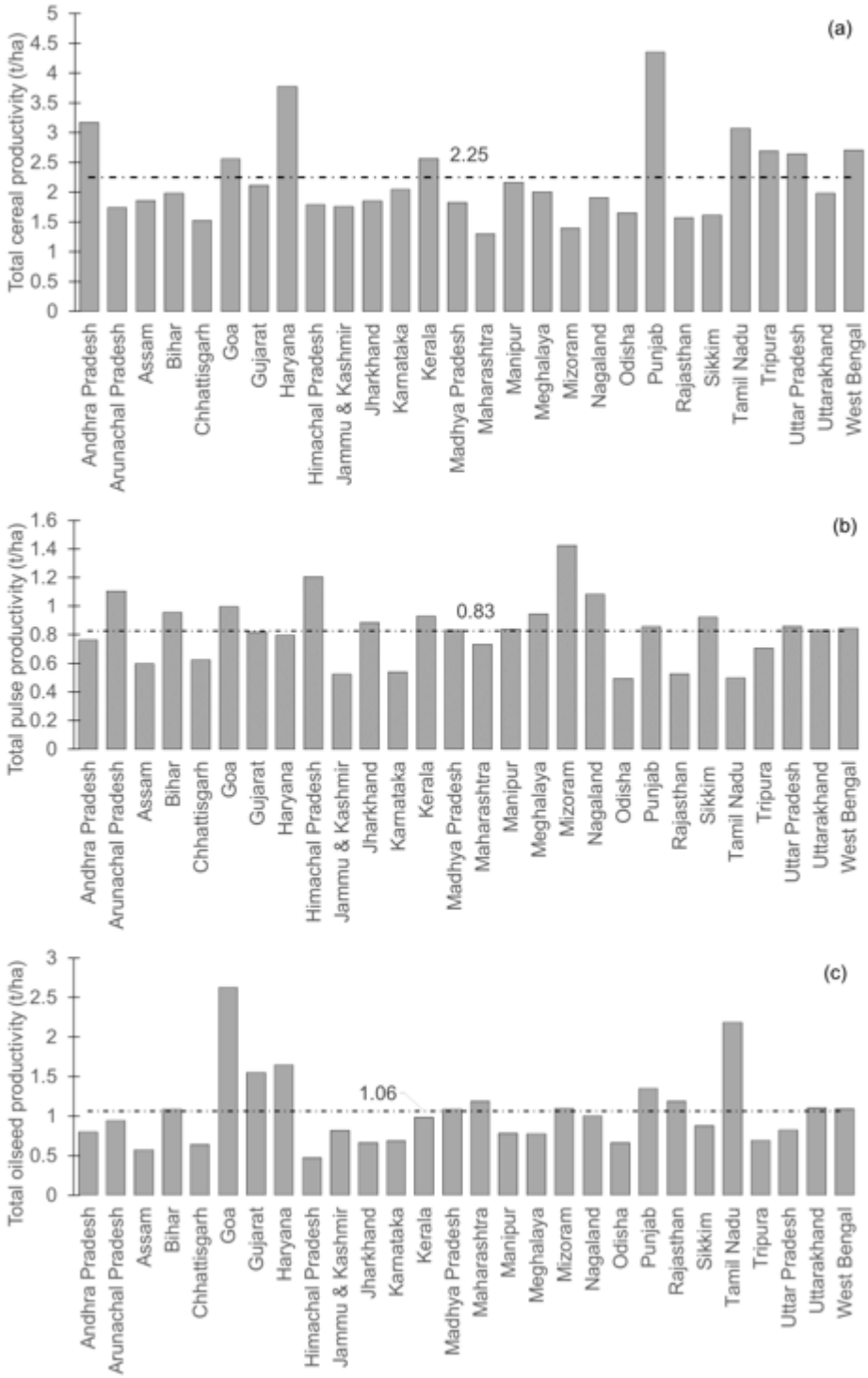


Figure S3. Average food grain production by state (or province) for (**a**) cereal, (**b**) pulses and (**c**) oilseed in India.

Note: The average values are computed from the Ministry of Agriculture reported production from 2009 to 2014. The dotted lines are the national averages for the category.

Table S1. The criteria and sub-criteria for the growth of Cactus pear.

Goal	Criteria	Sub-criteria	Description
Cactus suitability	Precipitation	> 1000 mm/year	Not Suitable
		400-800 mm/year	Optimum
		800-1000 mm/year	Suitable
		250-400 mm/year	Less Suitable
		less than 250	Not Suitable
	Minimal temperature	more than 5 °C	Optimal minimal temperature
		>-5°C to < 5 °C	Less suitable
		Less than -5°C	Not suitable
	Maximum Temperature	> 41°C	Suitable
		5 to 41°C	Optimal maximum temperature
		< 5°C	Less Suitable
	Mean Temperature	> 23°C	Less suitable
		18-23°C	Optimal mean temperature
		15 -18°C	Suitable mean temperature
		10 -15°C	Less suitable
		Less than 10°C	Not suitable
	Annual relative humidity	>60%	Optimal
		40-60%	Suitable
		<40%	Not suitable
	Soil Salinity	less than 2	Optimal
		2 to 4	Suitable
		4 to 7	Less suitable
		more than 7	Not suitable
	Soil Texture	clay (heavy)	Not suitable
		clay(light)	Not suitable
		clay loam	Not suitable
		silt loam	Less suitable
		loam	Medium suitability
		sandy clay loam	Less suitable
		sandy loam	Suitable
		loamy sand	Suitable
		sandy	Optimal soil texture
	Soil PH	>8	Not suitable
		5 to 8	Optimal
		<5	Not suitable
	Soil organic matter	1 to 2	Optimal
		0.5-1	Suitable
		less than 0.5	Less suitable
		Absent	Not suitable