Biometeorological characterization of agro-environments in Haryana, India

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Rationale

Farm Workers/Manpower Efficiency Affected

- **At higher risk to the effects of excessive heat. resources & recommended practices when working under hot conditions.**

Management

- **Drinking water often; resting and cooling down in the shade; gradually increasing workloads and allowing more frequent breaks. Efficient use of farm machinery.**
- **Symptoms based prevention & emergency response can help prevent heat-related illness.**
- **Weather based farm advisories for better preparedness.**

Category HI and Effects

Caution	**26.6-32°C: Fatigue possible with prolonged exposure and/or physical activity.**
Extreme Caution	**32.1-39.5°C: Heat cramps and heat exhaustion possible with prolonged exposure and/or physical activity.**
Danger	**39.6-51.0°C: Heat cramps or heat exhaustion likely and heatstroke possible with prolonged exposure and/or physical activity.**
Extreme Danger	**>51.0°C: Heatstroke highly likely with continued exposure**

Intent: To work out Heat Indices & Wind Chill for two agroclimatic zones

Met Data Set:

Weekly Data on temp, humidity and wind speed

Period: 1980-2011 (32 Yrs)

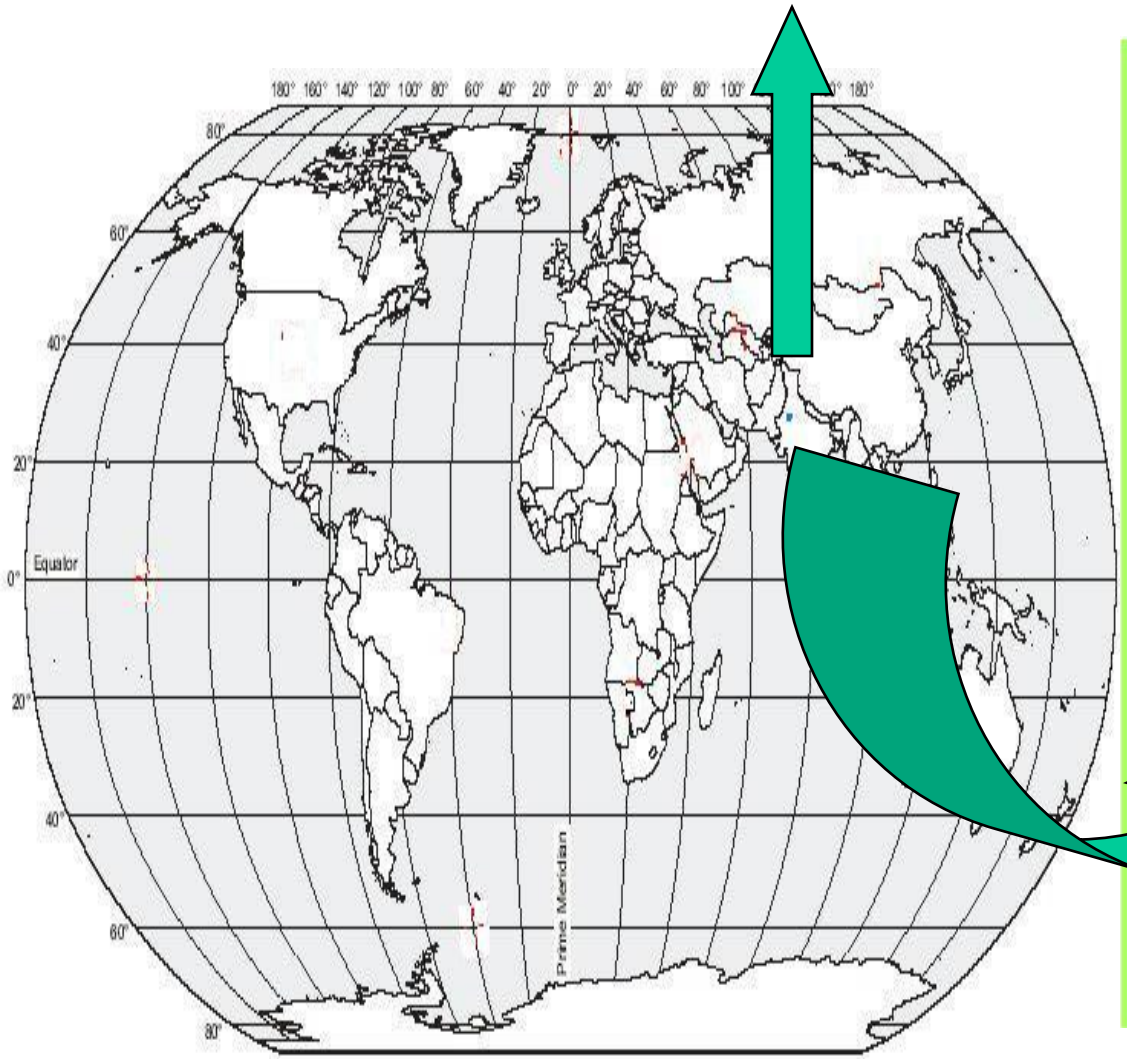
Resource: Heat Index / Wind Chill Calculator
http://www.hpc.ncep.noaa.gov

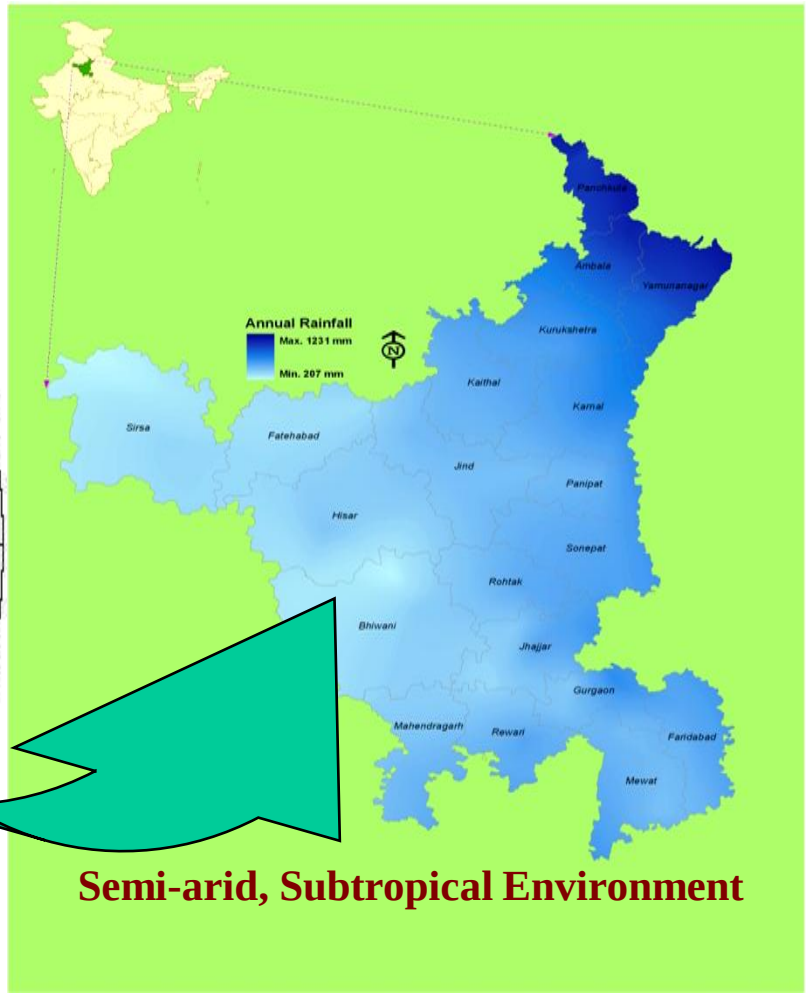
Study Domain:

- **Hisar** for Western Agroclimatic Zone
- **Karnal** for Eastern Agroclimatic Zone

Geographical co-ordinates of Haryana, India

Latitude: 27^{0}39' to 30.55'N ; Longitude: 74^{0}27' to 77^{0}36'E





Semi-arid, Subtropical Environment

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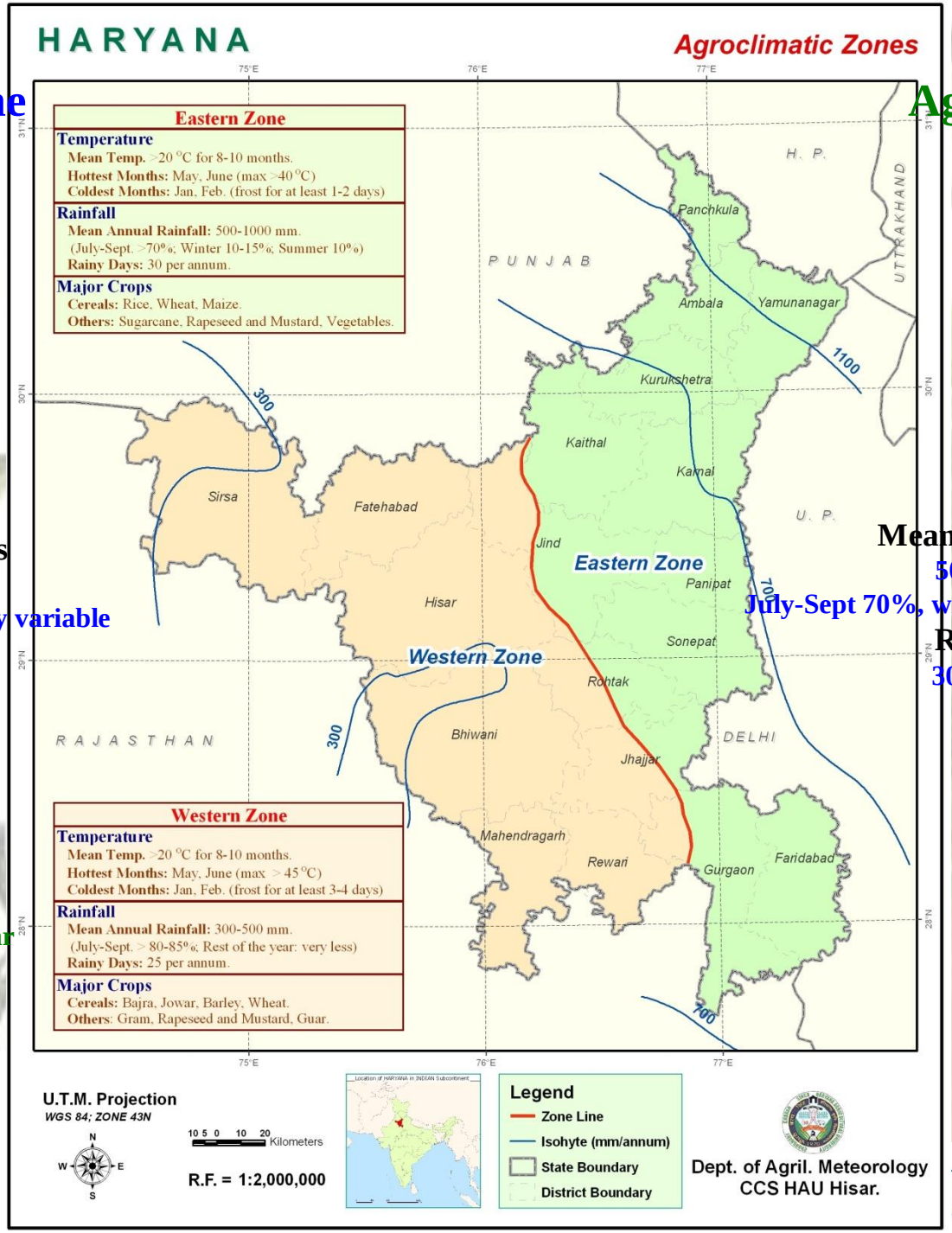
Western Agroclimatic Zone

Mean Temp
>20^{0}C for 8-10 months
Hottest Months
May-June (Max >45^{0}C
Coldest Months
Jan-Feb (Frost for 3-4 days)

Mean Annual Rains
300-500 mm
July-Sept 80-85%, rest is highly variable
Rainy Days
25 per annum

Major Crops
Wheat, millets, barley
Cotton, mustard, gram, guar



Eastern Agroclimatic Zone

Mean Temp
>20^{0}C for 8-10 months
Hottest Months
May-June (Max >40^{0}C
Coldest Months:
Jan-Feb (Frost for 2-3 days)

Mean Annual Rains
500-1000 mm
July-Sept 70%, winter 10-15%, Summer 10%
Rainy Days
30 per annum

Major Crops
Rice, wheat, maize,
sugar cane, vegetables

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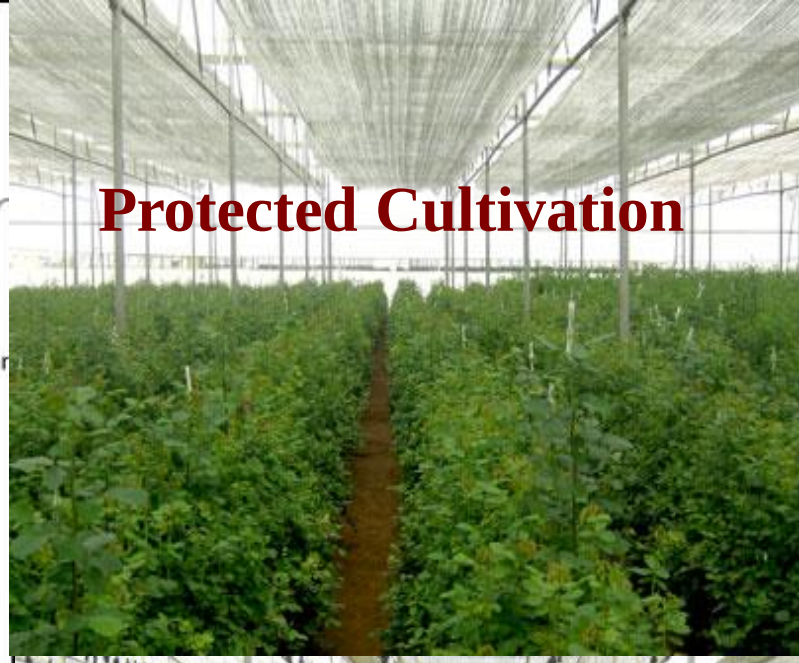
HARYANA
AGRICULTURE MAP

Natural Cultivation



Protected Cultivation

HIMACHAL PRADESH
N
CHANDIGARH
Panchkula
PUNJAB
Ambala
Yamunanagar
Kurukshetra
Indri
Kaithal
Karnal
UTTER PRADESH
Sirsa
Fatehabad
Panipat
Jind
RAJASTHAN
Hisar
Gohana
Mundhal
Sonipat
Rohtak
Bhiwani
Bahadurgarh
Charkhi Dadri
Jhajjar
DELHI
Loharu
Gurgaon
Farukh Nagar
Pataudi
Faridabad
Mahendragarh
Rewari
Nuh
Palwal
Narnaul
PALWAL

LEGEND

- Wheat
- Sugarcane
- Cotton
- Pulses
- Oil Seeds

- State Boundary
- District Boundary
- State Capital
- District Headquarter
- Major Towns

Map not to Scale

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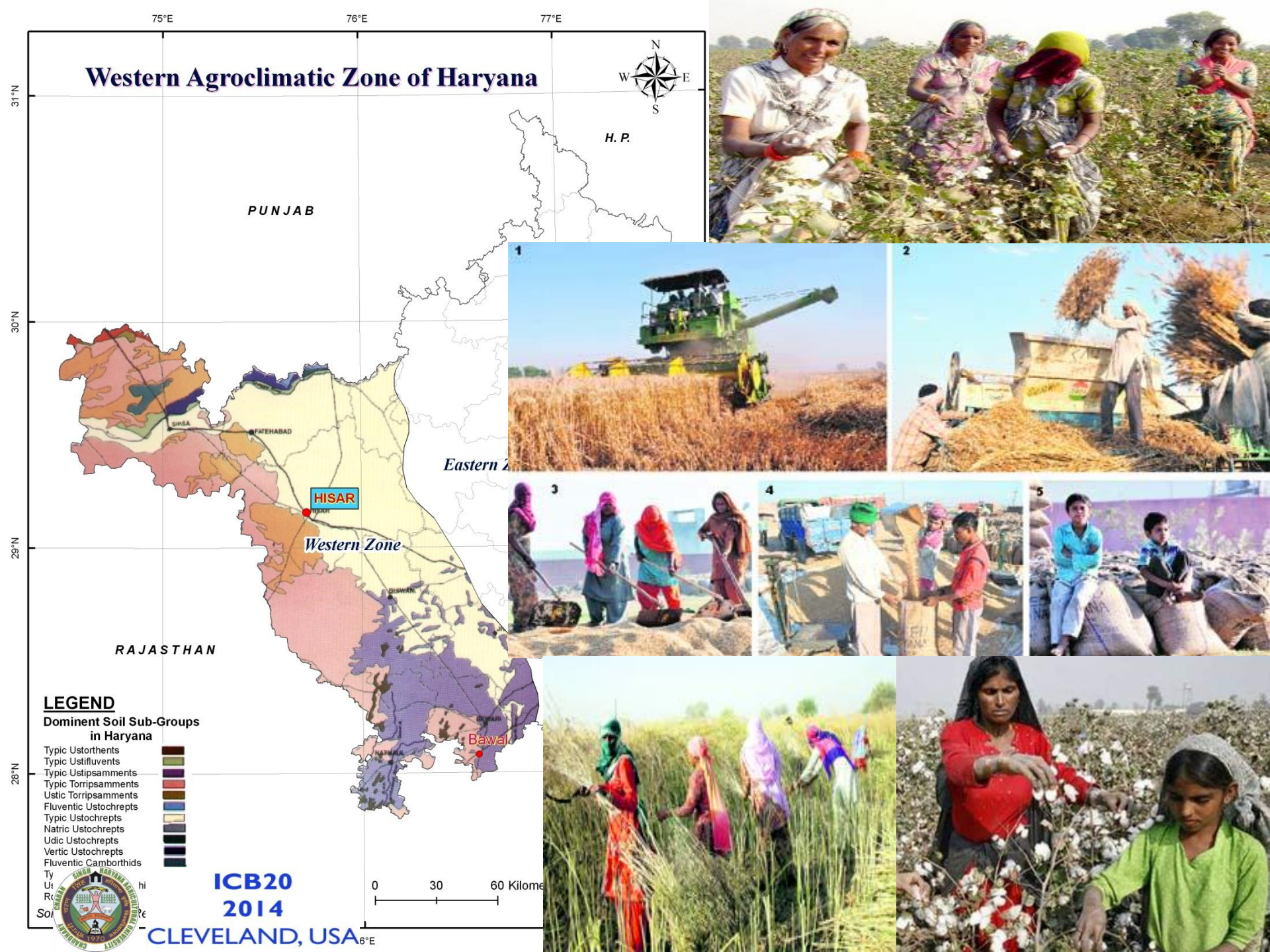
Western Agroclimatic Zone of Haryana
75°E
76°E
77°E
31°N
30°N
29°N
28°N
N
W
E
S
H. P.
PUNJAB
SIRSA
FATEHABAD
HISAR
Western Zone
BHIWANI
RAJASTHAN
Bawal
LEGEND
Dominent Soil Sub-Groups in Haryana
Typic Ustorthents
Typic Ustifluvents
Typic Ustipsamments
Typic Torripsamments
Ustic Torripsamments
Fluventic Ustochrepts
Typic Ustochrepts
Natric Ustochrepts
Udic Ustochrepts
Vertic Ustochrepts
Fluventic Camborthids
0
30
60 Kilome
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75°E 76°E 77°E

AGROCLIMATIC ZONES OF HARYANA

N W E S

Eastern Zone

Chandigarh
30.5/14.9/1146.6

Ambala
26.3/17.9/1552.5

Karnal
30/16.9/759.4

Eastern Zone

ROHTAK
Rohtak
31.8/18.4/594.7

31°N 30°N 29°N 28°N

KAITHAL KARNAL JIND PANIPAT KURUKSHETRA YAMUNANAGAR GURGAON FARIDABAD

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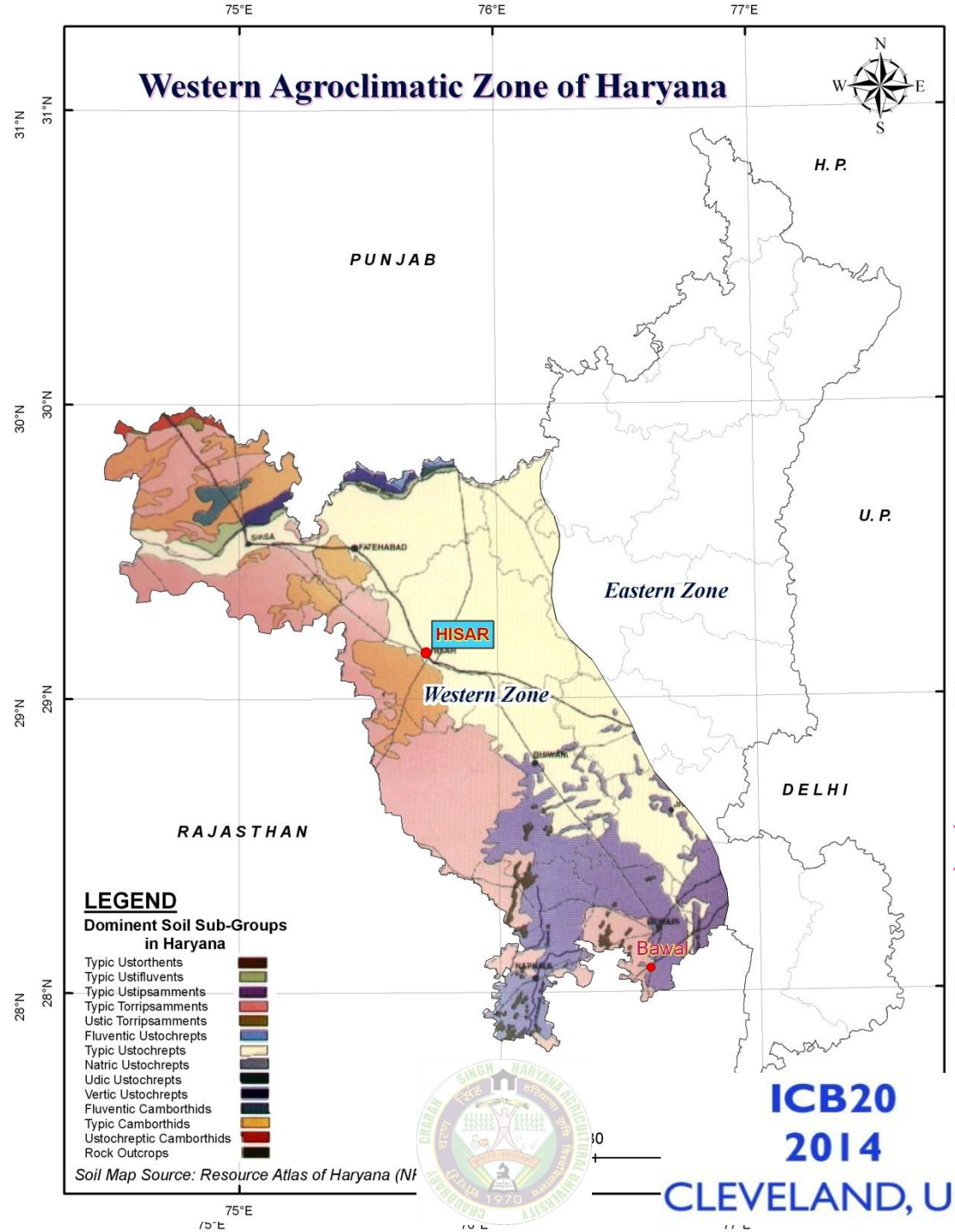

Period Categorization

- **Comfort**

  SMW: 42-14 (15/**10**-08/**04**)

- **Caution**

  SMW: 15-21 (09/**04**-27/**05**)
  37-41 (10/**09**-14/**10**)

- **Ext Caution**

  SMW: 22-36 : 28/**05**-09/**09**

- **Danger : ---**

- **Ext Danger : ---**

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Period Categorization

- **Comfort**

  SMW: 41-15 (8/**10**-15/**04**)

- **Caution**

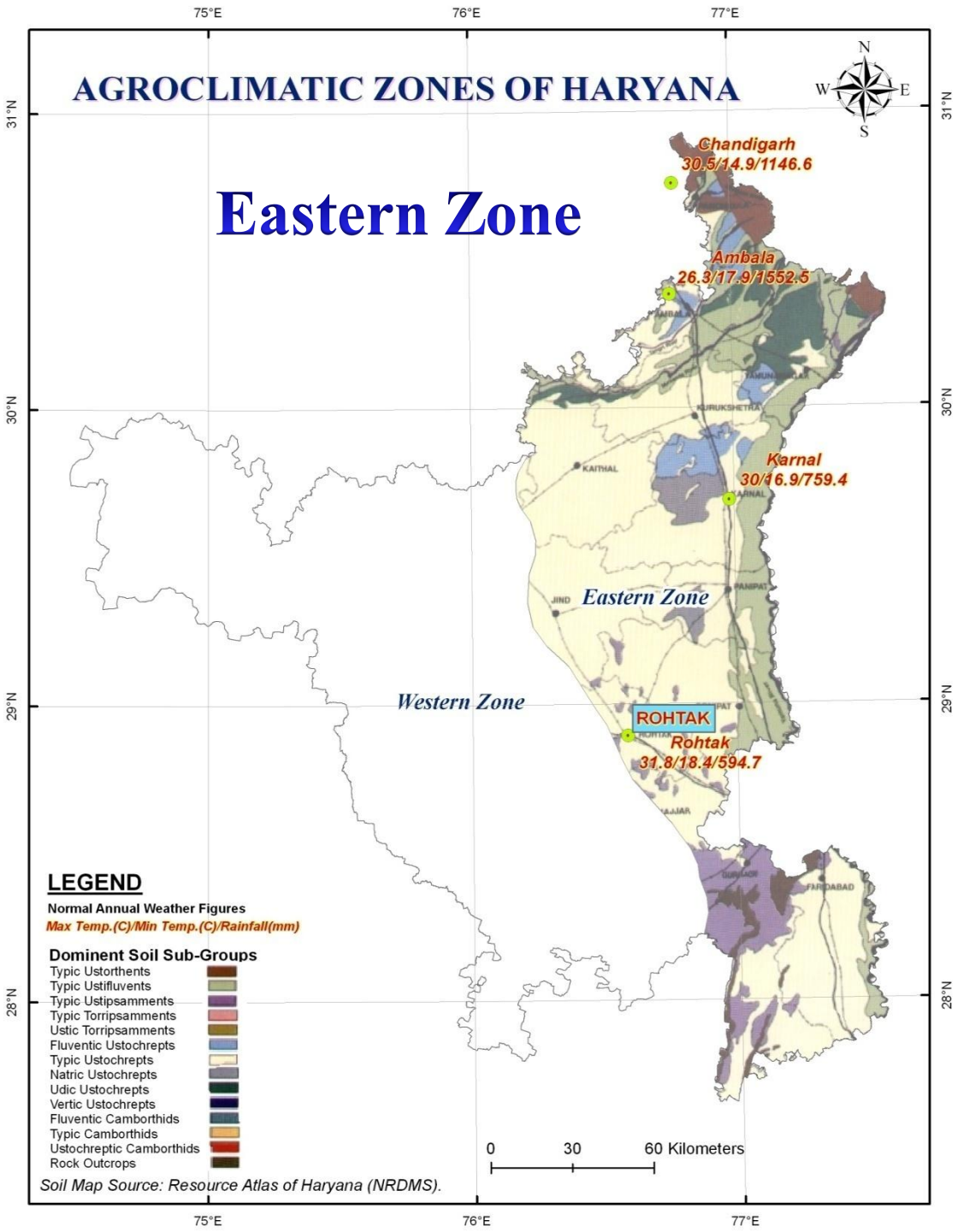
  SMW: 16-22 (16/**04**-03/**06**)
  37-40 (16/**09**-07/**10**)

- **Ext Caution**

  SMW: 23-36 : 04/**06**-09/**09**

- **Danger : ---**

- **Ext Danger : ---**



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Conclusion (s)

- **Comfort period for farm workers is bit more in Eastern Agroclimatic Zone (8 October – 15 April)**
- **Caution period for farm workers is more in Western Agroclimatic Zone (16 April – 7 October)**
- **No Danger period for farm workers in both the Agroclimatic Zones**
- **Based on wind chill, comfort environment was found throughout the year in both the zones**

Auxiliary Investigation

- **Shift in Comfort Index Pattern in the region in view of climatic change**
- **Shift towards Comfort Orientation among farm workers**
- **Overture of farm mechanization for sustainable agric production**

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Thanks!!!