

Letters to the Editor

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AGROCLIMATIC CLASSIFICATION OF PUNJAB AND HARYANA ON THE BASIS OF MOISTURE AVAILABILITY INDEX (MAI)

1. Most of the areas of Punjab and Haryana get annual rainfall between 40 cm and 100 cm and, therefore, form a part of the dry farming tract of India. Agroclimatic classification of this tract as a whole has been done by Sarker and Biswas (1986, 1988) on the basis of MAI (at 50% probability level) which is the ratio of weekly assured rainfall (AR) computed with the help of incomplete Gamma distribution and the corresponding potential evapotranspiration interpolated from monthly values computed by Penman's method by Rao *et al.* (1971). Same methodology has been used to classify the two States—Punjab and Haryana—taken together.

2. *Data and Method* — AR and PET data of 73 stations has been considered for study. MAI ≥ 0.3 has been taken as favourable for early stages (3-4 weeks) and ≥ 0.7 for the subsequent stages (up to grain formation) of crop growth. Classification into zones D, E, F, G has been done with the following criteria :

Zone	No. of weeks at 50% level with MAI	
	≥ 0.3	≥ 0.7
D	<10	<1
E	≥ 10	≥ 1
F	≥ 11	≥ 4
G	≥ 14	≥ 7

Soil characteristics, extracted from 'Soils of India' (Sekhon *et al.* 1972, Sidhu *et al.* 1972) have also been taken into account for final assessment of crop prospects (Fig. 1).

3. *Role of stored soil moisture* — The difference between the seasonal accumulated assured rainfall (AAR) and two-thirds of corresponding cumulative PET is the quantity of moisture stored in the soil after the rainy season. This has also been taken into account for determining the crop duration since crops can thrive on the same even after the rainy season has ceased.

4. *Zonal description* — Table 1 gives for all the zones D, E, F and G the types of soil available, range

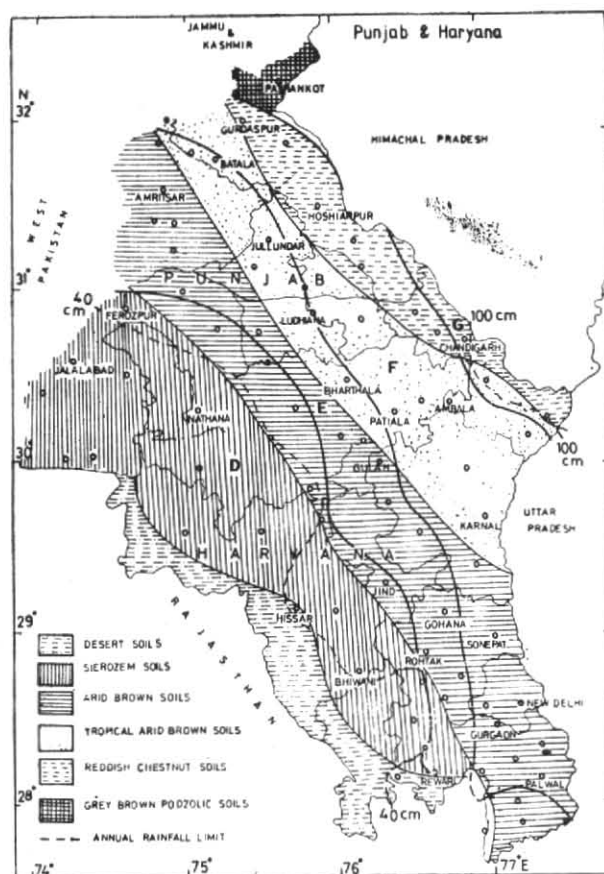


Fig. 1. Agroclimatic zones and soil types shown on locator map

of AAR, maximum number of weeks with MAI ≥ 0.3 and ≥ 0.7 and crop duration/prospects at 60% to 30% probability levels. This information is likely to be quite useful to the agriculturists, agronomists and planners for any risk level they select.

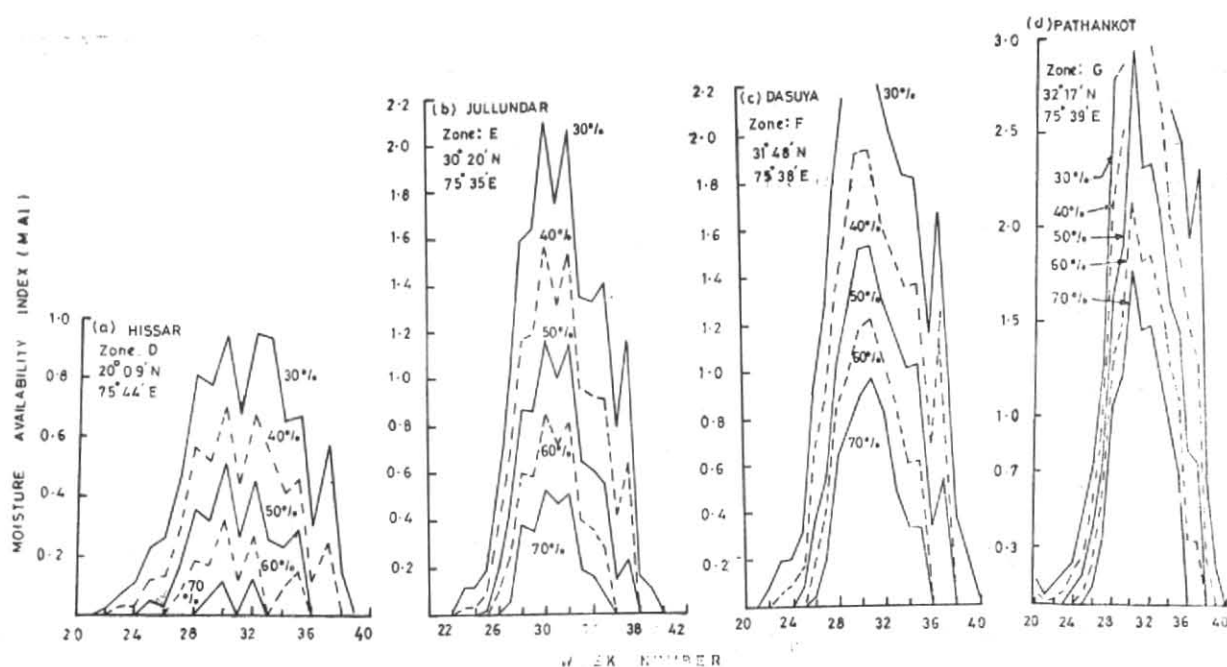
5. *Effect of irrigation* — As is well known, most of the areas of Punjab and Haryana are now well irrigated. By using these facilities with ingenuity during the periods of lull in rainfall, the duration and probability of success of the crops can be increased,

TABLE I
Zonal description at different risk levels

Zone	Soil available	Range of AAR at prob. level (mm)				Maximum No. of weeks with MAI $\geq 0.3/0.7$			
		60%	50%	40%	30%	60%	50%	40%	30%
D	Desert (sandy), Scirozem, Arid brown (Sandy loam and calcareous)	0-79	18-167	52-303	218-504	—	3-8 0-2	2-11 0-7	10-12 6-10
E	Arid brown and tropical arid brown (both sandy loam). Latter soil is weakly solonized	28-184	144-287	227-442	447-582	—	8-11 1-4	9-14 7-9	12-14 9-11
F	Arid brown, tropical arid brown & reddish chestnut (all sandy loam, recent alluvial with saline and alkaline patches)	79-283	172-422	266-607	449-814	5-10 0-6	10-12 7-9	10-18 8-12	11-16 9-14
G	Grey brown podzolic, reddish chestnuts and tropical arid brown (all sandy loam). Brown hilly in north eastern parts	380-430	533-586	738-767	1041-1086	10-11 7-8	12-13 11-12	13-15 11-13	15-17 12-14

TABLE 1 (Contd.)

Zone	Soil available	Crop duration/Prospects				Remarks
		60%	50%	40%	30%	
D	Desert (sandy), Scirozem, Arid brown (Sandy loam and calcareous)	—	—	Short duration crops crops at stations with AAR < 200 mm	12-14 weeks	AAR at 30% level is always less than 2/3rd of corresponding PET. As such, no moisture is stored in the soil.
E	Arid brown and tropical arid brown (both sandy loam). Latter soil is weakly solonized	—	8-10 weeks at stations where AAR ≥ 200 mm	10-12 weeks	16-18 weeks	AAR at 30% level is more than 2/3rd of corresponding PET resulting in storage of soil moisture and thereby increasing the crop duration.
F	Arid brown, tropical arid brown & reddish chestnut (all sandy loam, recent alluvial with saline and alkaline patches)	Short duration crops	12-14 weeks	14-16 weeks	16-18 weeks or two crops of short duration or two mixed crops—one of short and other of medium duration	AAR at 40% and 30% levels is more than 2/3rd of corresponding PET resulting in storage of soil moisture thereby increasing the crop duration.
G	Grey brown podzolic reddish chestnuts and tropical arid brown (all sandy loam). Brown hilly in north eastern parts	14-16 weeks	16-18 weeks or mixed crops as suggested under zone F	18-20 weeks	> 20 weeks	AAR at all levels is more than 2/3rd of corresponding PET. Therefore a longer duration is possible.



Figs. 2 (a-d). Moisture availability index at different probability levels for four stations : (a) Hissar, (b) Jullundar, (c) Dasuya, and (d) Pathankot

6. Crop prospects at zonal representative stations

(i) *Hissar (Zone D)* — Fig. 2 (a) shows its MAI graph at different probability levels. With the sandy soil of this station, it is possible to grow a rainfed crop of about 12 weeks' duration at 30% level only, *i. e.*, once in three years or so because at 50% level MAI does not equal to 0.7 even for a single week.

(ii) *Jullundar (Zone E)* — It has tropical arid brown soil and its MAI graph is shown in Fig. 2 (b). AAR amounts at 50%, 40% and 30% levels are 266 mm, 407 mm and 575 mm respectively. AAR is more than two-thirds PET by 127 mm at 30% level. Rainfed crops of duration 10-12 weeks, 14-16 weeks and 16-18 weeks can be raised at 50%, 40% and 30% levels respectively.

(iii) *Dasuya (Zone F)* — It has reddish chestnut soil and its MAI graph is shown in Fig. 2 (c). AAR amounts at 60%, 50%, 40% and 30% levels are 250 mm, 375 mm, 519 mm and 729 mm respectively. AAR is more than two-thirds PET by 126 mm and 261 mm at 40% and 30% levels respectively. Rainfed crops of duration 14-16 weeks and 16-18 weeks can be obtained once in two years and once in three years respectively. Also, because of stored soil moisture, two crops of short duration or two mixed crops—one of short duration and the other of medium duration — can be raised once in three years.

(iv) *Pathankot (Zone G)* — It has grey podzolic soil and its MAI graph is shown in Fig. 2 (d). AAR amounts at 60% and 50% levels are 430 mm (which is more than two-thirds PET by 200 mm or so) and 586 mm respectively. As such, rainfed crops of 16-18 weeks at 50% level and of slightly shorter duration at 60% level can be raised.

7. *Low crop potential area* — Its core is located on zone D and it comprises of Abohar, Fazilka, Muksar, Ferozepur, Zira, Nathana, Bandher, Jodhpur and Gobindgarh in Punjab and Sirsa, Fatehabad, Tohana, Hansi, Hissar, Salahwas and Beri in Haryana.

Rajaund in zone E is also having low crop potential as this station has got total AAR equal to 100 mm. It is presumably so because it is located in a rain shadow area due to significant variations in the configuration of land surface (Haryana District Gazetteers 1976).

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