

Functional classification of Rainfed Arable Lands for their Judicious Planning in Semi-arid Zone of Haryana, India

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Abstract: A village-wise functional classification of rainfed sown land of tehsil Hisar of the semi-arid zone of Haryana State, over 20 consecutive summer and winter harvest seasons (summer of 1968 to winter of 1987-88), is presented. Out of the total sown area in this tehsil, 83% in summer, 86% in winter and 86% in total summer and winter seasons was found suitable for rainfed crop cultivation. However, there were great variations in the degree of their suitability. The rest of the area was not suitable for crop cultivation, but was suited to grazing, animal husbandry and forestry. These areas are mainly concentrated in the south-western part of the tehsil adjoining Thar desert. The areas lying in the transitional zone of threshold index line (i.e., 14% of summer, 12% of winter and 14% of the total summer and winter sown area) showed high possibilities of making such lands suitable for crop cultivation.

Key words: Classification, rainfed, arable land, arid zone, judicious planning.

The functional classification of arable lands, according to their quality, is an operational basis for land use planning. It differs from the land capability classification systems envisaged by the USDA (1954), All India Soil Survey and Land Use Planning Organization (1970) and FAO (1976), which needs detailed standard soil surveys and field and laboratory correlations studies. This study examines the existing productivity of land to make suggestions on its suitability for different land uses. The main criteria used is crop failure/success data, which are easy to collect at different scales from plot to field or district level, and are more reliable than the estimated production or yield estimates used by Shafi (1960), Bhatia (1967), Aggarwal (1970) and Casetti (1972). This classification sys-

tem could assist in solving landuse planning related issues.

This type of study has a significant place in functional classification of rainfed cultivated lands. The crop yield in dryland rainfed agriculture has a yield gap of 2 to 99%, when compared to irrigated. The variability of yield in irrigated agriculture is <10% under normal conditions. Hisar tehsil located in arid zone of south-western Haryana was selected for this study. In this area, 40% of the total cultivated land (1,00,000 ha) was rainfed in 1987-88. The tehsil extends 28°54' to 29°25'N and 75°23' to 75°59'E in Hisar district and is comprised of 122 villages. It is situated on the north-eastern fringe of the Thar desert. The climate

of the region is sub-tropical, hot semi-dry with monsoonal regime of rainfall in summer and cool winter seasons. The inceptisols dominate the soilscape and are loamy sand and sandy loam in texture. The subsoil water aquifer is deep seated and is mostly saline.

Materials and Methods

The study is based on the rainfed cultivated areas of tehsil Hisar. The village-wise crop sown and crop failed/success data for 20 years were taken out of the register of the revenue record from the Tehsil Accountant. The crop failure index (CFI) has been computed to identify the land resource classes. In an area, at a time, the CFI can be computed as under:

$$\begin{aligned} \text{CFI of summer/winter harvest} &= \frac{\text{Actual failed area of summer/winter harvest in a sequence of years}}{\text{Total sown area of summer/winter harvest in that sequence of years}} \times 100 & \text{(i)} \\ \text{CFI of total summer and winter harvest} &= \frac{\text{Actual failed area of total summer and winter harvests in a sequence of year}}{\text{Total sown area of summer and winter harvests in that sequence of years}} \times 100 & \text{(ii)} \\ \text{CFI ratio between summer and winter harvest} &= \frac{\text{CFI of summer harvest}}{\text{CFI of winter harvest}} \times 100 & \text{(iii)} \end{aligned}$$

The categories of CFI of the total summer and winter harvests, and that of CFI ratio between summer and winter harvests, were then grouped together for determining the rainfed agricultural land types.

Results and Discussion

A village-wise functional classification of rainfed cultivated lands of Hisar tehsil over 20 consecutive summer (*khariif*) and winter (*rabi*) harvest seasons (summer of 1968 to winter of 1987-88) is presented in Table 1 and Fig. 1. The results are discussed as under:

Land classification of rainfed sown areas of summer season

Out of the total rainfed sown area in summer season, 83% (in 104 villages) has been found above the threshold index line¹ (i.e., suitable for crop cultivation). Cultivable land of good quality was observed in 7% area, moderately good cultivable land in 24% area and fairly good land suitable for limited cultivation in 52% area.

The remaining 17% of the summer sown area (in 18 villages) was below the threshold index line (i.e., not suitable for arable farming). Of this 17% area, 14% was very well suited to grazing and animal husbandry,

¹ Threshold index line drawn under the crop failure index (CFI) 45 classifies the sown areas into two categories: (i) land suitable for crop cultivation upto CFI 45, and (ii) land unsuitable for crop cultivation above CFI 45.

Table 1. Functional classification of rainfed sown areas in Hisar tehsil (1968-69 to 1987-88)

Category No.	Crop failure index	Summer crops area ('000ha)	No. of villages	Winter crop area ('000ha)	No. of villages	Summer + winter crop area ('000 ha)	No. of villages	Land resource classes
I	<1	-	-	-	-	-	-	Very good cultivable land
II	1-15	65 (7)	8	-	-	18 (1)	2	Good cultivable land
III	15-30	240 (24)	35	163 (28)	37	413 (26)	40	Moderately good cultivable land
IV	30-45	517 (52)	61	338 (58)	61	919 (59)	63	Fairly good land suitable for limited cultivation
Total (I-IV)		822 (83)	104	501 (86)	98	1350 (86)	105	
Threshold index line								
V	45-60	137 (14)	15	72 (12)	18	219 (13.8)	16	Not suitable for crop cultivation, but very well suited to grazing and animal husbandry
VI	60-75	29 (3)	3	12 (2)	6	4 (0.2)	1	Not suitable for crop cultivation but well suited to grazing/forestry
Total (V-VI)		166 (17)	18	84 (14)	24	223 (14.0)	17	

Figures in parentheses are percentage

and 3% was well suited to grazing/forestry (Table 1).

Land classification of rainfed sown areas of winter season

Out of the total rainfed sown area in winter season, 86% (in 98 villages) has been found above the threshold index line (i.e., suitable for crop cultivation). Cultivable land of moderately good quality was observed in 28% area, and fairly good land suitable for limited cultivation in 58% area. The remaining 14% of the winter

sown area (in 24 villages) was below the threshold index line (i.e., not suitable for arable farming). Of this 14% area, 12% was very well suited to grazing and animal husbandry, and 2% was well suited to grazing/forestry (Table 1).

Land classification of total rainfed sown areas of summer and winter seasons

Out of the total rainfed sown area in both the summer and winter seasons, 86% (in 105 villages) has been found above

the threshold index line (i.e., suitable for crop cultivation). Cultivable land of good quality was observed in 1% area (in two villages), moderately good cultivable in 26% area (in 40 villages), and fairly good land suitable for limited cultivation in 59% area (in 63 villages). The remaining 14% area (in 17 villages) was below the threshold index line (i.e., not suitable for arable farming). Of this 14% area, 13.8% (in 16 villages) was very well suited to grazing and animal husbandry, and 0.2% (in one village) was well suited to grazing/forestry (Table 1).

The village-wise distribution of failure index of the total summer and winter seasons crops is shown in Fig. 1. The areas suitable for rainfed agriculture were mainly concentrated in the north-east and central parts (excluding the areas of village boundary) numbers 132 and 56/F) which is a low lying levelled area with soil having comparatively heavy texture and good soil depth. On the other hand, the areas unsuitable for rainfed crop cultivation were distributed in the south-western part of the tehsil where undulating topography with sandy nature of soil is found in addition to comparatively low rainfall (Duggal, 1975). Small pockets of suitable areas were also scattered in the southern, western and eastern parts of the tehsil.

The above discussion highlights that about 86% of the sown area in both summer and winter seasons is suitable for rainfed farming, having probability of crop failure below 45%. But for prosperous dryland farming the crop failure index should not be allowed to cross the figure of 10, if not zero.

While the areas (both in summer and winter seasons) lying in categories below the threshold index line should be devoted to non-arable uses, efforts must be made to minimize the crop Failure Index of the areas lying in categories above the threshold index line. More attention should be paid to the large areas lying in transition between the land suitable and unsuitable for rainfed crop cultivation, as these areas require less efforts to reduce their crop failure index.

Ratio between summer and winter crops failure

The CFI ratio between summer and winter crops shows that the failure index of winter crops has been higher than that of *kharif* crops in 46% of the total rainfed sown area (in 67 villages) as presented in Table 2. Of this 46% area, 1% has very high, 3% high and 42% moderately high failure index. Of the remaining 54% of total rainfed sown area (in 55 villages), 52% has moderately low and 2% low failure index when compared with that of summer crops. This seems to be either favorable weather conditions during winter season or sowing of winter crops on current fallow lands, which have assured conserved soil moisture and fertility to save the crops from complete failure.

Thus, the CFI ratio reveals that the winter harvest has been more successful than the summer harvest. Therefore, those areas which have high index of crop failure in summer harvest should be given to either winter crops or alternating fallow unless the assured water supply becomes available or more drought tolerant and disease resistant varieties of summer crops are grown.

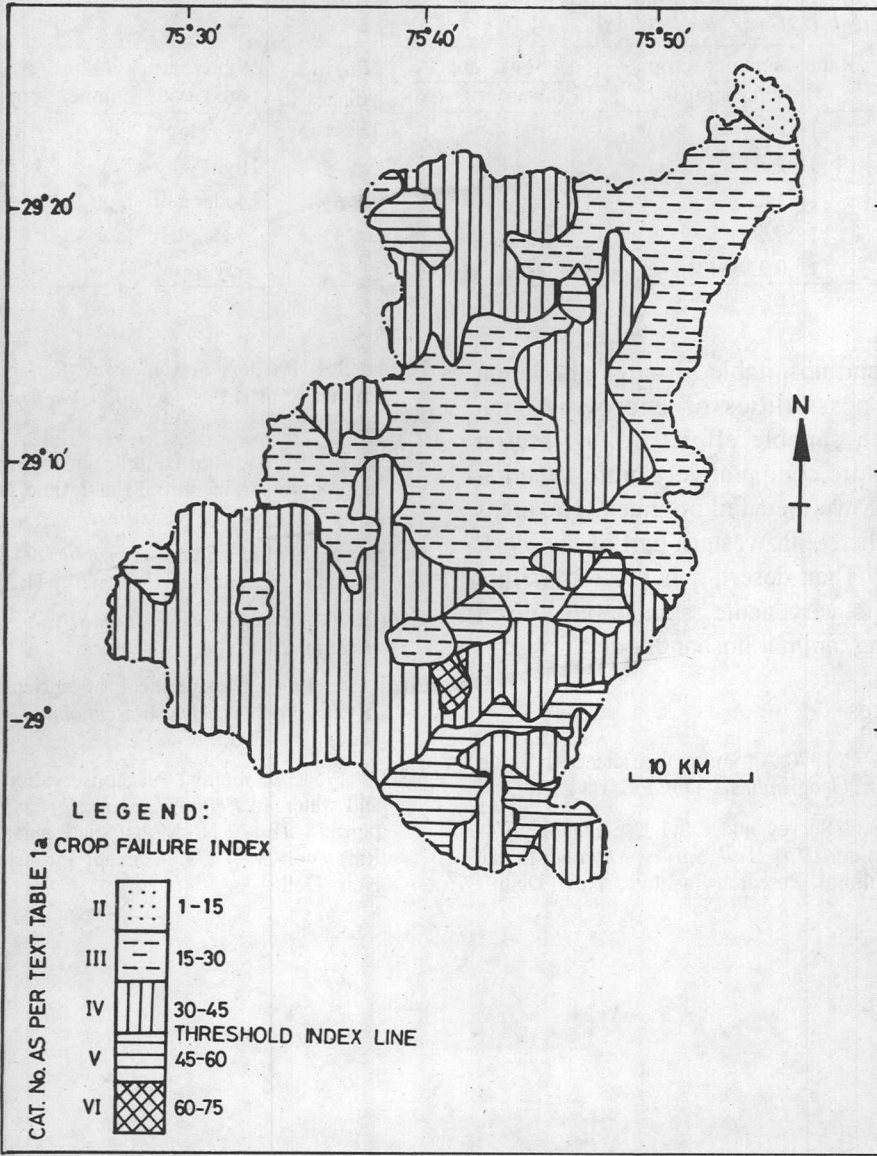


Fig. 1. Land classification of rainfed sown areas of total summer and winter seasons in Hisar tehsil (1968-69 to 1987-88).

It is suggested that CFI should be minimized to increase agricultural production. The factors affecting CFI need to be investigated. Where CFI can not be improved,

the land should better be given to other than arable uses as mentioned in Table 1. The large areas lying on the margin between the land suitable for crop cultivation

Table 2. Crop failure index ratio between summer and winter crops in rainfed sown areas of Hisar tehsil (1968-69 to 1987-88)

Category No.	Ratio, summer crops : winter crops	Sown area ('000ha)	(%)	No. of villages	Winter crops failure when compared with summer crops failure
I	1: >4	17	1	1	Very high
II	1: 2-4	42	3	5	High
III	1: 1-2	670	42	61	Moderately high
IV	1: 0.5-1	813	52	53	Moderately low
V	1: 0.25-0.5	33	2	2	Low

and the land unsuitable for crop cultivation indicate possibilities of improving such lands with suitable efforts. *Kharif* season crops require comparatively more attention to bring down their failure index. The areas lying in the south-western part of the *tehsil* adjoining Thar desert, where crop failure problem is very acute, should be utilized for grazing, animal husbandry and forestry.

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