[redacted]

The account so far of the geography of sugar cane cultivation has been based on the survey of the physical and human controls, irrigation, land-use, land ownership and tenure, size of holdings, harvested, land occupancy, ranking of crops, and crop associations. Finally the economics of sugar cane cultivation has been studied. It now remains to integrate these facts for formulating agricultural regions having variable agronomic, economic and demographic problems and differential farming features and potentials. Because of the variations in area under sugar cane cultivation and its ranking in the cropping pattern in Eastern Haryana, the delineation of agricultural regions is needed for future planning and development of sugar cane and the selection of sites for new sugar cane crushing mills on the right line with the changing farm controls. The comprehensive analysis of these regions would help the planners to plan the future development of sugar cane cultivation systematically based on past experiences and to marry the potentials with performances effectively, bearing good results.

Although in general Eastern Haryana has extra-ordinary uniformity in relief and climatic conditions to favour the production of sugar cane throughout the region, yet striking diversity in its farming within the boundaries of Eastern Haryana can be observed. Accordingly, it is really difficult to put Eastern Haryana as a whole

under one crop-production region, but evidently it is rather hetrogeneous in itself. The variable soil capabilities, intensity of irrigation, the habits and traits of the farmers and the wealth of first hand statistical information make it possible to have more definite delineation of sugar cane cultivation regions on a uniform statistical basis. The fundamentals for demarcating the integrated and more comprehensive sugar cane cultivation regions are the identical areas having a similar degree of suitability for its cultivation as influenced by soils and intensity of irrigation, its economic profitability and rotation with other crops, and number of crops in crop-combinations. Obviously the basis of classification sought is objective and quantitative based on the regional types of farming derived with the help of standard statistical method, in consequence of that four regions have been obtained.

Region Where Wheat is First Ranking Crop:

In areas having fine textured loamy, fertile soil where irrigation facilities from canals and tube-wells are sufficient, wheat is a first-ranking crop and it spreads over more than 70 per cent of Eastern Haryana dimensions. Wheat occupies 29.8 per cent (1972-75 average) of the total harvested area. The percentage strength of wheat cultivation in spatial perspective ranges from 22.3 to 44.7 per cent revealing a great dispersion in the distribution of wheat

hectareage in the wheat dominated region, which may be further confirmed by the high coefficient of variability in the wheat percentage strength, i.e. 18.7 per cent.

In the northern parts of the region, wheat and rice occupy first two ranks in the crop structures. Wheat and rice are the crops of the clayey silt, silty clay, silty loam and loamy soils and are raised where irrigation facilities are intensively developed. Sugar cane ranked at third and fourth places in the crop structure of the assessment circles in these parts. Here, sugar cane is a rotational crop with rice and maize.

In the wheat domination region sugar cane is second ranking crop in the assessment circles of Khaddar Som(Ambala) and Bhangar Thanesar(Kurukshetra) in the northern parts of Eastern Haryana; Bhangar(Sonepat), Eastern Nahri, Nahri Som and Maham(Rohtak) in the central and Bhangar and Khaddar Palwal in the southern portion. Silty loam is confined to the Khaddar and loam to the Bhangar areas. Inteneity of irrigation is more than 30 per cent everywhere. On the whole, in these assessment circles potentials for improvement in sugar cane cultivation in terms of area and production accelerations exist because of sub-tropical climate, loamy soil and sugar cane crushing facilities, but the limiting factor is the scarcity of assured supply of agricultural water.

The factors affecting the further expansion of sugar cane cultivation in these assessment circles are rainfall meagreness and unreliability, fluctuations in the supply of agricultural water, frequent canal closures and, existing detrimental cultivation practices. In the light of what has been said, it appears that the future of sugar cane cultivation in these assessment circles needs a thorough agronomic-geographic-economic investigation before any action is taken to expand the programme.

Sugar cane rotation is with bajra in the assessment circles of Bhangar in Karnal, Khaddar in Sonepat and Khaddar and Bhangar of Ballabgarh. In the Khaddar-Bhangar assessment circles edaphic conditions vary from light to heavy soils and the intensity of irrigation ranges between low and very high proportions.

In the region comprising the assessment circles of Jind Khas in Jind, Western Nehri, Nehri Awal, Nehri Doyam in Rohtak and Ughar in Gurgaon, where the annual rainfall is below 600mm, soil moisture deficit is acute and soil cover is loamy, the area under sugar cane cultivation ranges between 6.3 to 11.8 per cent. No doubt sugar cane comes in the crop combinations of these assessment circles, but wheat and gram hold the first two ranks in the cropping structure. The tendency is towards diversification in Cropping.

Lastly, fodder crops occupy a significant status in the crop structure in Nardark Karnal assessment circle, where wheat-fodder-Maize-rice-sugar cane crop association is found. The Karnal sugar mill which has started functioning recently will effect the extension of sugar cane cultivation. In near future more and more hectarage will be brought under sugar cane.

Region Where Sugar Cane is First Ranking Crop:

The region where sugar cane is first ranking crop embraces the Bhangar Jagadhri assessment circle. Climatically, this assessment circle falls in dry sub-humid climate, where annual rainfall ranges between 800mm and 1000mm. Loamy soil is favourable for sugar cane culture. The physical features are favourable for the extension of tube-well irrigation. The cultivation of sugar cane is done on an extensive scale.

It is very interesting to note that intensity of cropping is moderate because of the perenniality in the sugar cane stands. The extensive cultivation of sugar cane is practised on account of the Yamuna Nagar Sugar Mills, a location factor plays a dominant role for the development of sugar cane in this region. The crop structure in this region is sugar cane-wheat-rice-fodder-maize-gram. It suggests that the farming is commercial. The commercial crop is gaining importance. The occupance of harvested

area under sugar cane exceeds 30 per cent in this region. Still there are great potentials in this region to increase the area under sugar cane and its per hectare yield.

The per hectare return from sugar cane in this region indicates that farmers should switch over from the cultivation of maize in kharif and gram in rabi (which give relatively lower returns per hectare) to sugar cane which is more profitable. This will also help in increasing the area under sugar cane cultivation. It would also be possible to increase the income of the farmers by allocating land to sugar cane where the return from this crop is maximum.

Region Where Gram is First Ranking Crop:

Gram as the chief crop, covers the assessment circles of Rajputana, Barani, Nehri Doyam, North Dehri in Rohtak and Gurgaon districts where soils are coarse loamy and loamy, having less assured irrigation (intensity of irrigation is below 40 per cent). It occupies 22.5 per cent of the cropped area in this region.

This region is located around the Rohtak sugar mills. Sugar cane rotation in this region is with bajra and gram. Rohtak sugar mill, as a locational factor plays a dominant role for the extension of sugar cane in this region. On the whole, this region has fertile soil, favourable climatic conditions (except rainfall) and, habitats of assiduous farmers. This, however, should not make it complacement.

The existing advantages should be utilized and irrigation developments must be seriously and whole-heartedly pressed forward on priority basis so that sugar cane cultivation may be expanded.

Region Where Bajra is First Ranking Crop:

Bajra domination region having potentials for the extension of sugar cane cultivation embraces the Barani and Southern Dehri assessment circles of Rohtak and Sohana and Bhuder of Gurgaon. Climatically, it can be classified as a semi-arid region having annual rainfall below 600mm. Edaphic conditions vary from light to heavy soils and the intensity of irrigation is low. On account of spatial differences in edaphic conditions and magnitude of irrigation facilities sugar cane finds a suitable place in the crop structure.

Dramatic improvement in crop sequences, crop structures and in the extension of sugar cane cultivation can be wrought in this region provided the intensity of irrigation is stepped up and the availability of agricultural water is assured in areas otherwise having favourable climate and edaphic conditions.

To sum up, this study is mainly devoted to explore the possibilities of increasing the area under sugar cane cultivation. One of the possibilities of doing so is by allocating scarce resources among competing uses so as to

maximise production. In Eastern Haryana, sugar cane is a dominating commercial crop as evidenced by the fact that 12.3 per cent of the total cropped area is under sugar cane. Therefore, this research is built around the hypothesis, that sugar cane amongst other crop is the most dominating one in the Eastern Haryana and is competing for hectareage strength with other crops, like paddy, wheat, maize, bajra and gram. A shift from the production of less profitable crops to commercial and highly profitable crop like sugar cane will largely help increasing the overall production in the region and economic status of the farmers.

During the study period many changes have taken place in the physical, biological, economic, technological and institutional set up of the Eastern Haryana. These changes naturally demand adjustments in the existing cropping patterns of different areas. Yield-increasing technology such as evolution of high yielding varieties, quick maturing crop strains, greater use of fertilizers and enhanced irrigational facilities may spare foodgrain hectareage for sugar cane.

Economic conditions have also changed because of the location of new markets, establishment of new processing units, added transportation facilities and change in price structure. Continuous adjustment of sugar cane in cropping

pattern is required to maximize the farm income consistent with the changed resource restrictions and techno-economic conditions of farm organisations. However, its adjustment in the combination of crops usually groun in the region should not be difficult, if farmers are convinced of the merit of such adjustments within the frame work of farm resources.

Importance of a suitable price policy is recognised in the development and extension of sugar cane cultivation. Fixation of price is necessary to provide satisfactory incentive and protection to marginal farmers. Knowledge of cost of production is a pre-requisite in price fixation. Generally, the price given by the sugar cane mills at factory gate is more than the price fixed by the Central Government. But there are variations in cane price in co-operative and private sector sugar mills. Government should made efforts to level up these differences, which will naturally effect the farmers incentive to grow sugar cane.

The study of the average production cost and net return from sugar cane in four villages in the sugar mills located at Yamuna Nagar and Panipat provide the information about input cost and total return from sugar cane and other competing crops. The per hectare return from sugar cane is highest in Yamuna Nagar sugar mills zone.

Consequently, we can say that sugar cane cultivation is profitable in Yamuna Nagar sugar mills zone. In Panipat sugar mills zone more facilities, like higher price or even equal to Yamuna Nagar sugar mills and regular payment by the factory to the cane growers, should be provided to the farmers, so that more incentive can be given to them for the extension of sugar cane cultivation. Karnal Co-operative sugar mills at Karnal which has recently started will naturally effect the extension of sugar cane cultivation in this region. Eastern Haryana has only four sugar factories at present. One is under construction at Sonepat, and one more has been planned at Palwal. The seventh sugar factory is needed to be set up in Kurukshetra district. This planning will effect on the extension of sugar cane cultivation in this region.

Glossary

ABI	Land flooded by rivers
ASSESSMENT CIRCLE	A sub division of a tehsil including the villages having the same land capability and productivity.
BAGAR	Sandy area
BARANI	Land Solely dependent on rainfall
BET	Loulying flood plain
BHANGAR	Old alluvium in the plains
CHAEKNUTE	Coarse loam
DAKAR	Stiff clay
DARRAR	Small ravine
GOCHANI	Wheat-gram mixture
GUR	Rough broun sugar
KANKAR	Calcareous nodules found in soil
KHADDAR	New alluvium
KHANDSARI	Sugar without crystal
KHARIF	Summer crops, harvested in September October and November
LOO	Hot-dry winds
NAILI	Channel of the Ghaggar River
NEHRI	Land irrigated by canals
RABI	Winter crops, harvested in February, March and April.
RANGOI	Colourful
ROHI	Soft loam
SALLABI	Land moistened by river percolation

SEOTI	Light loam
SEERI	Permanent labour employed on crop sharing
TAL	Lowlying level land in between sand-dunes covering a considerable area in extent.
TIBBA	Higher sandy areas in an undulating locality
UDIC	L.Udus, humid; of humid climates
USTIC	L.Ustus, burnt; of dry climate with summer rain.