

Examining the prospective cropping zone of important field crops of Tamil Nadu

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Abstract : A methodical study was made at the Agro Climate Research Centre, Tamil Nadu Agricultural University, Coimbatore during 2007 to identify the prospective districts for cultivation of important field crops in Tamil Nadu. The data on area, production and productivity of key field crops for 2002-03 to 2005-06 were collected and indices viz., Relative Spread Index (RSI) and Relative Yield Index (RYI) were analyzed. The promising districts were identified based on these RYI and RSI. The results stated that the districts such as Trichy, Thanjavur, Madurai, Tirunelveli, Cuddalore, Thiruvallur, Villupuram, Tiruvannamalai and Kancheepuram were promising districts for cultivation of rice crops. Maize shows potential for cultivation in Salem, Erode, Virudhunagar, Theni and Dindigul districts whereas sorghum was efficient in Namakkal, Perambalur, Madurai, Theni and Dindigul districts. Pearl millet was efficient in three districts such as Madurai, Thoothukudi and Virudhunagar. Pulses viz., green gram, redgram, blackgram, chickpea and horse gram are having potential area for cultivation in seven, five, five, three and three districts respectively. Salem, Theni and Tirunelveli were marked as probable areas to cultivate cotton. Oilseeds like groundnut, sunflower and sesame are having prospective area for cultivating in three, three and two districts respectively.

Keywords: *Efficient Cropping Zone, Relative Spread Index, Relative Yield Index, Field crops*

Introduction

Crops of an area are chosen by the farmers mainly based on the marketability besides the production potential. The scientific information based crop cultivation also not stable for over years and the suitability of crops of a region to be verified frequently. By this means, the farmers can take up likely crops or go for alternate cropping pattern which boost them to harvest better yield and fetch more income. To identify the potential areas of crops, calculation of Relative Yield Index and Relative Spread Index can be used and in turn Efficient Cropping Zone of the crops will be recognized.

Materials and Methods

A study was carried out at Tamil Nadu Agricultural University, Coimbatore during 2007 to categorize the Efficient Cropping Zone (E) for imperative field crops. Area, production and productivity and total cultivable area of a choice of field crops for different districts and state were collected for 2002-03 to 2005-06 (4 years) from the Season and Crop Report (2002-03 to 2005-06) for all the crops mentioned in Table 2 and 3. Relative Spread Index (RSI) and Relative Yield Index (RYI) were worked out with the subsequent data by using the following formula (Kanwar, 1972).

Table 1. Criteria for Efficient Cropping Zone

RYI	RSI	Cropping Zone
>100 (High)	>100 (High)	Most efficient cropping zone (M) with maximum yield of crop.
>100 (High)	<100 (Low)	Efficient cropping zone (E).
<100 (Low)	>100 (High)	Not efficient cropping zone (N).
< 100 (Low)	< 100 (Low)	Not efficient cropping zone (N).

$$RYI = \frac{\text{Mean yield of a particular crop in a district}}{\text{Mean yield of the crop in the state}} \times 100$$

$$RSI = \frac{\text{Area of particular crops expressed as percentage of total cultivable area in the district}}{\text{Area of crop expressed as percentage to the total cultivable area in the state}} \times 100$$

Four classes of cropping zones have been classified (Table 1) by computing both these indices, as stated by Narayanan *et al.* (2003).

Results and Discussion

Effective cropping zones for cereals and millets: *Rice:*

The perusal of rice crop area and productivity data revealed that the Most Efficient Cropping Zones (M) are Kancheepuram, Thiruvallur, Cuddalore, Villupuram, Tiruvannamalai, Trichy, Thanjavur, Madurai and Tirunelveli districts of Tamil Nadu (Table 2). The rice crop can well establish with ample water source during the crop growing period and the spread of crop with the farming community is more in these districts since these areas are situated in and around river basins. This might be reason for paddy-rice

becoming most efficient cropping zone in the above nine districts.

Maize:

Maize crop has extensive area (RSI) and superior productivity (RYI) levels in Salem, Erode, Theni, Dindigul and Virudhunagar districts (Table 2). Maize crop is sensitive to both excessive moisture and moisture stress, optimum amount of water is needed through out the crop growth stage. These districts are most appropriate with better irrigation facilities to sustain the crop. Kancheepuram, Cuddalore, Villupuram, Vellore, Tiruvannamalai, Namakkal, Dharmapuri, Karur, Pudukottai, Thanjavur, Thiruvallur, Nagapattinam and Madurai districts had better RYI, but the area is low. The yield of the crop in these regions is high and hence the crop may be promoted by better extension methodologies or the reasons for the low spread may be examined.

Sorghum:

Namakkal, Perambalur, Madurai, Theni and Dindigul districts shown as most efficient cropping zones (M) for rising sorghum crop (Table 2). Good irrigations facilities with sandy clay loam soil and adoption of advanced know-how encouraged the farmers for more sorghum cultivation in these districts. Kancheepuram, Thiruvallur, Villupuram, Vellore, Dharmapuri, Ramanathapuram, Virudhunagar, Sivagangai and Tirunelveli districts are observed as

Table 2. Efficient cropping zones of major cereals and millets over Tamil Nadu

Districts	Rice			Maize			Sorghum			Pearl millet		
	RYI	RSI	ECZ	RYI	RSI	ECZ	RYI	RSI	ECZ	RYI	RSI	ECZ
Kancheepuram	H	H	M	H	L	E	H	L	E	H	L	E
Thiruvallur	H	H	M	L	L	N	H	L	E	H	L	E
Cuddalore	H	H	M	H	L	E	L	L	N	H	L	E
Villupuram	H	H	M	H	L	E	H	L	E	L	H	N
Vellore	H	L	E	H	L	E	H	L	E	L	L	N
Tiruvannamalai	H	H	M	H	L	E	L	L	N	L	H	N
Salem	H	L	E	H	H	M	L	H	N	H	L	E
Namakkal	H	L	E	H	L	E	H	H	M	H	L	E
Dharmapuri	H	L	E	H	L	E	H	L	E	H	L	E
Coimbatore	H	L	E	L	H	N	L	H	N	H	L	E
Erode	H	L	E	H	H	M	L	L	N	H	L	E
Trichy	H	H	M	L	H	N	L	H	N	L	H	N
Karur	H	L	E	H	L	E	L	H	N	L	H	N
Perambalur	L	L	N	L	H	N	H	H	M	H	L	E
Pudukottai	L	H	N	H	L	E	L	L	N	H	L	E
Thanjavur	H	H	M	H	L	E	L	L	N	H	L	E
Thiruvarur	L	H	N	H	L	E	L	L	N	L	L	N
Nagapattinam	L	H	N	H	L	E	L	L	N	L	L	N
Madurai	H	H	M	H	L	E	H	H	M	H	H	M
Theni	H	L	E	H	H	M	H	H	M	L	H	N
Dindigul	H	L	E	H	H	M	H	H	M	H	L	E
Ramanathapuram	L	H	N	L	L	N	H	L	E	L	L	N
Virudhunagar	H	L	E	H	H	M	H	L	E	H	H	M
Sivagangai	L	H	N	L	L	N	H	L	E	H	L	E
Tirunelveli	H	H	M	L	H	N	H	L	E	H	L	E
Thoothukudi	H	L	E	L	L	N	L	L	N	H	H	M
The Nilgiris	H	L	E	L	L	N	L	L	N	L	L	N
Kanyakumari	H	L	E	L	L	N	L	L	N	L	L	N

L – Low; H – High; RSI - Relative spread index; RYI – Relative yield index; E – Efficient cropping zone; M – Most efficient cropping zone; N – Not efficient cropping zone

Table 3. Potential cropping zones of pulses over Tamil Nadu

Districts	Red gram			Blackgram			Greengram			Bengal gram			Horse gram		
	RYI	RSI	ECZ	RYI	RSI	ECZ	RYI	RSI	ECZ	RYI	RSI	ECZ	RYI	RSI	ECZ
Kancheepuram	H	L	E	H	L	E	H	L	E	L	L	N	L	L	N
Thiruvallur	H	H	M	L	L	N	H	H	M	L	L	N	L	L	N
Cuddalore	H	L	E	L	H	N	L	L	N	L	L	N	L	L	N
Villupuram	H	L	E	H	H	M	H	L	E	L	L	N	L	L	N
Vellore	L	H	N	L	L	N	L	L	N	L	L	N	L	H	N
Tiruvannamalai	L	H	N	L	L	N	L	L	N	L	L	N	L	H	N
Salem	H	L	E	H	L	E	H	H	M	L	L	N	H	L	E
Namakkal	H	H	M	H	L	E	H	H	M	L	L	N	H	L	E
Dharmapuri	H	H	M	H	L	E	H	L	E	L	H	N	H	H	M
Coimbatore	H	L	E	H	L	E	L	L	N	H	H	M	H	H	M
Erode	H	L	E	L	L	N	H	L	E	H	L	E	L	H	N
Trichy	L	H	N	L	L	N	H	L	E	L	L	N	L	L	N
Karur	L	H	N	L	L	N	H	L	E	L	L	N	L	H	N
Perambalur	H	L	E	L	L	N	H	L	E	H	L	E	L	L	N
Pudukottai	L	H	N	L	L	N	H	L	E	L	L	N	L	L	N
Thanjavur	H	L	E	H	H	M	L	H	N	L	L	N	L	L	N
Thiruvarur	L	L	N	L	H	N	L	H	N	L	L	N	L	L	N
Nagapattinam	L	L	N	L	H	N	L	H	N	L	L	N	L	L	N
Madurai	H	H	M	H	L	E	H	H	M	L	L	N	L	L	N
Theni	H	H	M	L	L	N	H	L	E	L	L	N	L	L	N
Dindigul	L	L	N	L	L	N	H	L	E	L	H	N	H	H	M
Ramanathapuram	L	L	N	L	L	N	H	L	E	L	L	N	L	L	N
Virudhunagar	H	L	E	H	H	M	H	H	M	L	L	N	L	L	N
Sivagangai	H	L	E	L	L	N	H	L	E	L	L	N	L	L	N
Tirunellveli	H	L	E	H	H	M	H	H	M	L	L	N	L	L	N
Thoothukudi	H	L	E	H	H	M	H	H	M	L	L	N	L	L	N
The Nilgiris	L	L	N	L	L	N	L	L	N	L	L	N	L	L	N
Kanyakumari	L	L	N	L	L	N	L	L	N	L	L	N	L	L	N

L – Low; H – High; RSI - Relative spread index; RYI – Relative yield index; E – Efficient cropping zone; M – Most efficient cropping zone; N – Not efficient cropping zone

Table 4. Efficient cropping zones of major oilseed crops and non food crop in Tamil Nadu

Districts	Groundnut			Sesame			Sunflower			Cotton		
	RYI	RSI	ECZ	RYI	RSI	ECZ	RYI	RSI	ECZ	RYI	RSI	ECZ
Kancheepuram	H	H	M	H	H	M	L	L	N	H	L	E
Thiruvallur	H	H	M	L	H	N	H	L	E	L	L	N
Cuddalore	H	L	E	L	H	N	L	L	N	H	L	E
Villupuram	H	H	M	L	H	N	H	L	E	H	L	E
Vellore	L	H	N	H	L	E	H	L	E	H	L	E
Tiruvannamalai	L	H	N	L	L	N	H	L	E	H	L	E
Salem	L	H	N	H	L	E	L	L	N	H	H	M
Namakkal	L	H	N	H	L	E	H	L	E	H	L	E
Dharmapuri	H	L	E	L	L	N	L	L	N	H	L	E
Coimbatore	L	L	N	L	L	N	H	L	E	L	H	N
Erode	L	H	N	H	H	M	H	H	M	H	L	E
Trichy	H	L	E	H	L	E	H	H	M	H	L	E
Karur	H	L	E	L	H	N	H	H	M	H	L	E
Perambalur	L	H	N	L	H	N	L	H	N	H	L	E
Pudukottai	L	H	N	L	L	N	H	L	E	H	L	E
Thanjavur	H	L	E	L	H	N	H	L	E	H	L	E
Thiruvarur	H	L	E	H	L	E	L	L	N	H	L	E
Nagapattinam	H	L	E	L	L	N	H	L	E	H	L	E
Madurai	L	L	N	L	L	N	L	H	N	L	H	N
Theni	L	L	N	L	L	N	L	L	N	H	H	M
Dindigul	H	L	E	L	L	N	H	H	M	H	L	E
Ramanathapuram	L	L	N	L	H	N	H	L	E	L	L	N
Virudhunagar	L	L	N	L	H	N	L	H	N	L	H	N
Sivagangai	L	L	N	L	L	N	L	L	N	H	L	E
TiruNlveli	H	L	E	L	L	N	L	H	N	H	H	M
Thoothukudi	H	L	E	L	H	N	L	H	N	L	H	N
The Nilgiris	L	L	N	L	L	N	L	L	N	L	L	N
Kanyakumari	L	L	N	L	L	N	L	L	N	L	L	N

L – Low; H – High; RSI - Relative spread index; RYI – Relative yield index; E – Efficient cropping zone; M – Most efficient cropping zone; N – Not efficient cropping zone

efficient cropping zones where the RYI is high and the RSI is low. Encouraging sorghum crop through adopting modern practices and to disseminate the techniques by various extension programme can help to spread more areas.

Pearlmillet:

Pearl millet is considered as bread and butter of the rural people, particularly in rainfed dry regions and it is an important crop in Tamil Nadu. Only Madurai, Virudhunagar and Thoothukudi districts gave high RYI and RSI and in turn represented as most efficient cropping zones for pearl millet in Tamil Nadu (Table 2). Because of its remarkable ability to withstand and grow in harsh environment and growing disease tolerant varieties in these districts assures the farmers to produce profitable harvest.

Efficient cropping zones for pulses:

Redgram:

Redgram is the most important pulse crop in Tamil Nadu. The districts such as Thiruvallur, Namakkal, Dharmapuri, Madurai and Theni registered as most efficient cropping zones. Besides these districts, Kancheepuram, Cuddalore, Villupuram, Salem, Coimbatore, Erode, Perambalur, Thanjavur, Virudhunagar, Sivagangai, Tirunelveli and Thoothukudi have high RYI and low RSI and the rest of the districts have both RSI and RYI values were low (Table 3). Pod borer tolerant varieties promoted the farmers to grow the crop widely could be the reason for wide success of the crop. Besides, mixed cropping under rainfed areas is predominant in these areas also one of the reasons for the efficient cropping zones of these districts.

Blackgram:

Villupuram, Thanjavur, Virudhunagar, Tirunelveli and Thoothukudi districts shown as most efficient cropping zones (Table 3). This crop is grown in coastal areas and semi arid climate which is prevailed in these districts might be the reason for high RYI and RSI. Besides these districts, Kancheepuram, Salem, Namakkal, Dharmapuri, Coimbatore and Madurai have high RYI due to development of specific agro techniques for blackgram in rice fallows of Tamil Nadu.

Greengram:

Greengram is the early maturing crop and fits well with almost all cropping systems. Seven districts namely Thiruvallur, Salem, Namakkal, Madurai, Virudhunagar, Tirunelveli and Thoothukudi registered as most efficient cropping zones (Table 3). The favorable environment reigned in those areas might be the reason to harvest more yield.

Chickpea:

Coimbatore, Erode, Perambalur and Tirunelveli are the prominent districts (Table 3) which have potential nature to grow this crop. This crop can establish well even under dew deposits in winter and it could be the reason for wide success of the crop.

Horsegram:

Horse gram is generally grown in vast area during *rabi* season. The districts such as Dharmapuri, Coimbatore and Dindigul have shown potential for cultivation of horse gram (Table 3). Salem and Namakkal districts had superior RYI, but the area is low because this crop is mainly grown as intercrop or mixed crop which fetches additional income to farmers.

Effective cropping zones for cotton:

Cotton is one of the most imperative cash crops, which is considered as warm season (tropical) crop. Economic yields of the crop can be realized in the region with 500 mm of rainfall. Salem, Theni and Tirunelveli are well known districts to cultivate cotton crop (Table 4). High light intensity throughout the growing period in these areas are essential for satisfactory vegetative development for minimal shedding of buds and bolls and hence for higher yields. Among the 28 districts, 17 districts are regarded as efficient cropping zones. In which, the major markets for cotton procurement are Coimbatore and Theni districts. Regulated Markets and Co-operative Marketing Societies act as facilitative organizations for cotton marketing in Tamil Nadu.

*Effective cropping zones for oilseeds:**Groundnut:*

Groundnut is grown in all parts of the Tamil Nadu. Around 70 per cent of the groundnut growing areas are sown as rainfed crop and the remaining 30 per cent under irrigated conditions. Kancheepuram, Thiruvallur and Villupuram districts are the most efficient cropping zones of groundnut crop (Table 4). The reason accredited for superior RSI and RYI values in these districts might be the marketing facility which is highly pronounced in these areas and the Villupuram district is an important groundnut market in Tamil Nadu. Cuddalore, Dharmapuri, Trichy, Karur, Thanjavur, Thiruvarur, Nagapattinam, Dindigul, Tirunelveli and Thoothukudi have higher RYI and low RSI values.

Sesame:

In Tamil Nadu, the following are the major districts in terms of high RSI values such as Cuddalore, Villupuram, Erode, Karur

and Perambalur contributing to 51 per cent of the state area and 55 per cent of the state production. Kancheepuram and Erode stand for high RSI and high RYI (Table 4). Sesame is very drought-tolerant, has an extensive root system and these districts have easy marketing feasibility which helps better yield (RYI) and area (RSI) in the above two districts.

Sunflower:

Erode district had higher area and productivity followed by Trichy, Karur and Dindigul. Efficient Cropping Zones are Thiruvallur, Villupuram, Vellore, Tiruvannamalai, Namakkal, Coimbatore, Pudukottai, Thanjavur, Nagapattinam and Ramanathapuram districts (Table 4). Sunflower is considered to be drought resistant crop. This crop can thrive well even under dry areas and the economic yield obtained also profitable. Hence, this crop can be promoted by encouraging market facilities. The outcome of the study accentuated the need for identifying the potentiality of field crops to the specified areas. The tool used had given fair idea of identifying the efficiency of the crops in different districts of Tamil Nadu.

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