

EFFICIENT CROPPING ZONES - DECADAL ANALYSIS FOR MAJOR CROPS IN TAMIL NADU

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ABSTRACT

An analytical study was done to identify the efficient cropping zones for important crops (rice, sorghum, blackgram, groundnut, cotton and sugarcane). Among the districts of Tamil Nadu, Tirunelveli and Kanyakumari were the most efficient cropping zones (MECZS) for rice. Similarly for groundnut, Chengalpet district was the MECZ. For sugarcane and blackgram no district was found to be the MECZ or efficient cropping zone (ECS). For cotton Coimbatore was the most potential area.

INTRODUCTION

The gross cultivated area in Tamil Nadu is 6.74 m ha which is 50 per cent of the total geographical area (13 m ha). Among the different field crops cultivated in Tamil Nadu, the major crops are rice (31%), groundnut (15%), sorghum (7.3%), sugarcane (3.7%), cotton (3.7%) and blackgram (3%). The performance of these crops in the state becomes very important considering production across different districts. Their productivity level has to be enhanced and sustained and this is possible only when efficient locations have been identified for these crops. This information would help to replace the uneconomical crop in the identified areas. This gives an opportunity to use the natural resources to the maximum extent possible without any degradation. Hence, an investigation was carried out at the Tamil Nadu Agricultural University, Coimbatore to identify the efficient cropping zones for major crops of Tamil Nadu as given elsewhere in this paper.

MATERIAL AND METHODS

The district wise and State data related to area, production and productivity of major crops were collected (Season and crop reports of Tamil Nadu) from the year 1987-88 to 1997-98. These data were used to compute Relative Spread Index (RSI) and Relative Yield Index (RYI) as suggested by Kanwar (1972) to

findout the efficient cropping zones in a region.

Relative spread index (RSI)

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

If RSI is

< 75	-	Low spread index
75 - 100	-	Medium spread index
> 100	-	High spread index

Relative yield index (RYI)

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

If RYI is

< 75	-	Low spread index
75-125	-	Medium spread index
> 125	-	High spread index

The combinations of RSI and RYI to identify categories of efficient cropping zones are listed in Table 1.

RESULTS AND DISCUSSION

Identification of districts for stable area and yield: Among the crops taken, the coefficient of variation (cv) for area ranged from 6-98 per cent across different districts (Table 2). Rice crop showed less variation compared to other crops since it is the stable food crop of the State. Sorghum, blackgram, groundnut, cotton and groundnut areas showed higher

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fluctuations in their area and in respect of sorghum, Karaikudi district area was highly unstable (cv = 98%). For blackgram, erstwhile North Arcot district showed highest cv (48%). In the case of cotton, Pudukottai district area

was highly unstable (cv = 75%) and for groundnut and sugarcane area highest cv (68% and 39% respectively) was noted in Tuticorin district.

Table 1. Criteria for efficient cropping zone

Category No.	RSI	RYI	Combination of RSI and RYI	Cropping Zone
1.	> 100 (High)	>125 (High)	High + High	MECZS
2.	< 75 (Low)	> 125 (High)	Low + High	ECZS
3.	> 100 (High)	< 75 (Low)	High + Low	NECZS
4.	< 75 (Low)	< 75 (Low)	Low + Low	NECZS

MECZS - Most efficient cropping zones with maximum yield

ECZS - Efficient cropping zones (the constraints have to be identified)

NECZS - Not efficient cropping zones.

In the case of cv for productivity (Table 3) lowest cv values were obtained for sugarcane as compared to other crops indicating that sugarcane yield were stable in the State. For other crops, the cv was relatively higher especially for Ramnad district (65%) in respect of rice, Thanjavur district (174%) for sorghum, Dindigul district (46%) for blackgram, Ramnad district (45.6%) for cotton and Chengalpet district (47%) for groundnut.

Identification of efficient cropping zones: Data from Table 4 indicates that Tirunelveli and Kanyakumari districts were found to be the most MECZS for rice. Eventhough Tanjore district has highest area under rice, the RYI was low which might be due to inefficient use of resources especially injudicious use of canal water. Due to monocropping of rice - rice in Tanjore belt area, soil is under depleted condition. So in future, this district can be included in MECZ by adopting better water management practices, efficient use of inputs and adopting HYV etc., For sorghum crop, Dharmapuri, Madurai and Dindigul districts were the MECZS. The RYI was very low in Coimbatore and Periyar districts due to crop diversification by the farmers towards commercial crops like cotton. Mostly sorghum is grown under rainfed

condition without adequate care and effort for achieving potential yield. More research work has to be done by the scientists to release suitable drought tolerant varieties and *in situ* moisture conservation practices based on location.

For blackgram no district was found to be the MECZ. The RSI of blackgram was high in Tanjore, Tirunelveli and Tuticorin but RYI is very low in all the districts of Tamil Nadu. This might be due to black gram is grown as a rice fallow pulse crop in Tanjore and Tirunelveli and in other districts it is grown as a rainfed marginal land crop or as a mixed crop. To improve blackgram yield, it must be grown as pure crop with adequate agronomic management practices.

MECZ for groundnut crop was Chengalpat district as in this district the crop is grown under irrigated condition due to high annual rainfall (1100 mm) and highly suitable red sandy loam soil. Though RSI was higher in Northarcot district the RYI is very low along with Dharmapuri and Coimbatore districts. So, in order to bring this districts to be a MECZ, government should provide better marketing facilities and higher price for the farmers to boost the yield. Like blackgram, for sugarcane,

Table 2. Area (ha) of the major crops grown in Tamil Nadu (average of 11 years)

Districts	Rice		Sorghum		Blackgram		Cotton		Sugarcane		Groundnut	
	Area	CV	Area	CV	Area	CV	Area	CV	Area	CV	Area	CV
Chengalpet	246376	10.6	289	71.7	3503	60.3	157	41.0	11311	37.2	64640	29.3
South Arcot	237724	15.2	11156	37.7	36011	44.6	11339	32.3	57499	17.2	148678	12.2
North Arcot	156097	28.2	24628	32.5	7616	48.3	6777	65.4	42041	22.5	205804	19.1
Salem	60574	21.5	60092	23.1	23189	21.6	21124	18.3	21321	55.7	136274	9.9
Dharmapuri	50657	25.3	39429	22.1	4573	55.4	16162	37.6	15449	17.6	73466	14.9
Coimbatore	19541	20.8	94499	17.9	5123	54.6	19060	15.8	12339	17.0	47876	19.7
Periyar	65069	17.6	28235	63.64	2147	40	8755	24.2	18378	23.9	70128	16.7
Trichy	119372	15.9	115731	16.1	7321	55	22660	48.6	21013	21.8	75107	18.4
Pudukottai	83023	18.9	2095	57.2	3496	88.3	632	75.3	1950	24.5	41609	15.2
Thanjavur	488600	6.1	*	*	92572	25.1	4780	37.1	20500	13.9	25819	30
Madurai	109621	10.6	31541	46.3	4352	45.8	29838	19.0	13722	28.6	30017	26.2
Dindigul	25550	17.4	68599	17.9	5830	27.7	7217	27.2	6018	20.4	34220	16.6
Ramnad	140241	5.9	2759	45.3	3699	45.8	3426	31.8	131	66.9	8518	27
Virudhanagar	32768	23.6	7149	19.9	8555	17.6	43844	20.3	3523	28.2	11238	13.3
Karalkudi	89000	13.3	544	97.7	655	42.7	649	39.3	4941	23.6	11392	26.3
Tirunelveli	90164	13.9	4435	47.4	17287	38.6	8214	23.4	3488	29.2	9387	27.0
Tuticorin	24719	21.4	9296	28.0	20163	16.1	36617	38.2	126	67.5	3288	39.0
Nilgiris	1957	20.4	*	*	2887	31.1	*	*	35	83.5	110	40.3
Kanyakumari	38141	11.3	*	*	*	*	*	*	*	*	439	89.7
State	2079695	7.7	497383	19.3	197921	34.2	252279	6.4	251445	17.6	1014597	10.3

* Data not available.

Table 3. Yield (kg/ha) of the major crops grown in Tamil Nadu (average of 11 years)

Districts	Rice		Sorghum		Blackgram		Cotton		Sugarcane		Groundnut	
	Yield	CV	Yield	CV	Yield	CV	Yield	CV	Yield	CV	Yield	CV
Chengalpet	3125	8.2	1420	19.5	464	13	308	24.5	112	14	2046	46.7
South Arcot	3217	12.0	972	21.9	499	16.7	373	24.7	110	8.1	1595	21.4
North Arcot	2902	9.7	1242	22.9	464	16	315	10	82.8	6.9	1407	20.1
Salem	3526	6.2	1141	16.3	559	18.3	294	28	126	12.2	1453	17.6
Dharmapuri	3196	10	1308	11.2	486	14.6	375	21.5	88	8.4	1410	19
Coimbatore	3470	7.4	536	20.4	458	24.4	385	17.1	103	10	1284	15
Periyar	3960	11.2	523	33.8	461	12.1	403	30	119	7.2	1678	13
Trichy	3289	13.5	907	30.7	601	17.3	250	24.8	113	6.6	1258	24
Pudukottai	2715	17.7	1253	36.1	438	28.7	396	13.8	105	5.9	1186	21
Thanjavur	2818	19.7	246	174	377	24.4	326	12.8	99.1	13.8	1539	16
Madurai	3533	9.3	1457	24.3	440	29.9	246	19.4	107.7	12.3	1442	21
Dindigul	4120	11.5	1319	17.2	485	45.6	456	26.3	116	6.8	1632	35
Ramnad	1386	64.5	994	24	440	31.9	150	45.6	105	3.5	805	34
Vinudhanagar	2796	29.3	1314	29.4	408	30.1	212	38.1	106	6.6	1178	28.3
Karalkudi	2101	28.4	1120	13	453	11.9	332	17.0	97.9	16.3	875	33.4
Tirunelveli	3866	15.7	1928	21	440	34.7	334	36.9	103	17.4	1756	19.8
Tuticorin	3835	17.1	1712	44.3	441	35	161	39.7	104.9	3.6	1488	14.2
Nilgiris	2362	28.32	*	*	*	*	254	81.0	95.5	33.3	1588	54.4
Kanyakumari	3688	21.91	*	*	453	14.1	*	70.6	*	*	1208	11.8
State	3012	6.8	1014	9.0	524	26.1	276	11.6	105	3.6	1431	14.4

* Data not available.

Table 4. Computed value of RSI and RYI for major crops in different districts of Tamil Nadu (average of 11 years)

Districts	Rice		Sorghum		Blackgram		Cotton		Sugarcane		Groundnut	
	RSI	RYI	RSI	RYI	RSI	RYI	RSI	RYI	RSI	RYI	RSI	RYI
Chengalpet	208	104	0.95	140	39.6	88.5	112	143	1.08	112	79.4	107
South Arcot	105	107	20.5	95.9	213	95.2	134	112	41.6	135	211.1	105
North Arcot	87	96.3	247	122	56.5	88.5	235	98.3	31.3	114	195	78.9
Salem	33	117	137	113	167	107	151	102	94.8	107	94.5	120
Dharmapuri	33	106	109	129	39.7	92.7	100	98.5	87.0	136	81.0	83.8
Coimbatore	17	115	356	52.9	60.9	87.4	86.7	89.7	141	139	91.6	98.1
Periyar	60	132	109	51.7	26.5	87.9	133	117	67.2	146	141	113
Trichy	68	109	276	89.5	55.7	115	86.7	87.9	107	90.5	99	108
Pudukottai	157	90	16.4	124	88.7	83.5	160	82.5	9.9	143	30.5	100
Thanjavur	214	94	*	*	543	71.9	23.3	108	17.4	136	74.5	94.3
Madurai	107	117	129	144	57.0	83.9	60	101	242	89	111	103
Dindigul	30	137	342	130	92.6	92.5	83.3	114	71.0	165	60.0	110
Ramnad	220	46	17.8	98.0	77.8	83.9	27.0	56.2	573	54.3	1.6	100
Virudhanagar	56	93	50.6	130	196	77.8	40.0	82.3	9.2	76.8	48.6	101
Karaikudi	225	70	5.4	110	22.2	86.4	60.0	61.4	384	120	86.4	93.3
Tirunelveli	147	210	30.1	190	380	83.9	33.3	123	500	121	45.9	98.1
Tuticorin	35	128	56.1	169	389	84.1	9.3	104	439	58.3	1.3	100
Nilgiris	84	78.4	*	*	*	*	1.0	111	0.05	92	0.8	91
Kanyakumari	117	127	*	*	118	86.4	2.66	84.4	0.05	71.7	*	*

* Data Not available.

Table 5. Classification of RSI and RYI for major crops of Tamil Nadu (average of 11 years)

Districts	Rice		Sorghum		Blackgram		Groundnut		Cotton		Sugarcane	
	RSI	RYI	RSI	RYI	RSI	RYI	RSI	RYI	RSI	RYI	RSI	RYI
Chengalpet	H	M	L	H	L	M	H	H	L	M	M	M
South Arcot	H	M	L	M	H	M	H	M	L	H	H	M
North Arcot	M	M	H	M	L	M	H	M	L	M	H	M
Salem	L	M	H	M	H	M	H	M	M	M	M	M
Dharmapuri	L	M	H	H	L	M	M	M	M	M	M	M
Coimbatore	L	M	H	L	L	M	M	M	H	M	M	M
Periyar	L	H	H	L	L	M	H	M	L	H	M	M
Trichy	L	M	H	M	L	M	M	M	H	M	M	M
Pudukottai	H	M	L	M	L	M	M	M	L	M	L	M
Thanjavur	H	M	L	M	H	M	M	M	L	M	M	M
Madurai	H	M	H	M	H	M	L	M	L	M	M	M
Dindigul	L	H	H	H	L	M	L	M	H	M	H	M
Ramnad	H	L	L	M	M	M	M	M	L	L	L	M
Vinudhanagar	L	M	L	M	H	M	L	M	L	L	L	M
Karaikudi	H	L	L	M	L	M	L	M	L	M	M	M
Tirunelveli	H	H	L	M	H	M	L	M	H	M	L	M
Tuticorin	L	H	L	H	H	M	L	M	H	M	L	M
Nilgiris	L	M	L	M	H	M	L	M	L	M	L	M
Kanyakumari	H	H	L	M	H	M	L	M	L	M	L	M

L - Low, M - Medium, H - High.

no district comes under MECZ even though its productivity is with lower cv value among the districts. This might be due to equal distribution of areas in different districts based on location of sugarcane factories. For cotton crop, Coimbatore district was found to be MECZ, mainly because it has black cotton soil and also has more number of textile industries in Tamil Nadu. The area under cotton was highest in Northarcot, Pudukkottai and Salem districts and at the same time the RYI was very low. Adoption of suitable hybrids with timely plant protection measures in these areas can bring them under MECZ.

Since, our farmers are practicing subsistence type of farming, if the districts

identified as MECZS, for the various crops discussed above has to be continued as MECZ in future also, along with prevailing Agro climatic factors, marketing facilities, infrastructural development and remunerative price has to be provided. In order to bring ECZ areas under MECZ for these crops, improved cultivars, advanced cultural practices, better management practices and availability of need based quality inputs at reasonable price must be tried. In order to popularise these crops in the MECZ, farmers are to be trained in innovative technologies to explore higher productivity, which can be done by strengthening the extension services.

REFERENCE

Kanwar, J. (1972). In: Proc. Symp. on Cropping Pattern in India, ICAR, New Delhi, pp. 11-32.