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Identifying potential cropping zones for important horticultural crops of Tamil Nadu

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Abstract : An analytical study was made to identify the potential districts for cultivation of horticultural crops in Tamil Nadu. The data on area, production and productivity of important horticultural crops for 1999-2000 to 2003-2004 were collected and analyzed for their Relative Spread Index (RSI) and Relative Yield Index (RYI). Based on these RSI and RYI, the potential cropping districts for important crops were identified. The study revealed that twelve districts were efficient for growing guava whereas seven, six, six, six, five and three districts were for jack, coconut, banana, lemon, mango and grapes respectively. In respect of vegetables *viz.*, brinjal, bhendi, tomato, chilies and onion are having potential area for cultivation in sixteen, seven, five, three and two districts respectively. Spices such as coriander, turmeric, ginger and garlic will be profitable only in small area of five, four, one and one districts respectively in Tamil Nadu.

Keywords: Efficient Cropping Zone, Relative Spread Index, Relative Yield Index, Horticultural crops

Introduction

Horticultural crops are playing important role in Indian agriculture. Though horticultural crops extend only seven per cent of the cropped area, their contribution to the national economy is 20 per cent of total value of the agricultural produce. The contribution of horticultural crops to the national income is also perceptible by the annual foreign exchange earnings, achieved through their export. Horticultural crops fetch 20–30 times more foreign exchange per unit area than cereals due to higher yields and higher prices available in the international market (Kumar, 1997).

Uneconomical crops may be grown in an area without knowing their potentiality which will fetch low income to the farmers. These uneconomical crops will be replaced by the crops with good potential to achieve the sustainability and self sufficiency. Growing efficient crop in an area will not only increase the production but also save the cost involved to transport for selling the produce. Advances in the agricultural sciences helped in the development of several techniques for finding out the suitable crops in the specified areas. One such tool for identifying the potential area of crops is by calculating Relative Yield Index and Relative Spread Index and in turn Efficient Cropping Zone of the crops.

Materials and Methods

The data related to area, production and productivity and total cultivable area of various horticultural crops in different districts and state were collected for 1999-2000 to 2003-2004 (5 years) from the respective Season

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). The constraints are to be identified.
< 100 (Low)	>100 (High)	Not efficient cropping zone (N).
< 100 (Low)	< 100 (Low)	Not efficient cropping zone (N).

and Crop Reports for all the crops mentioned in Table 2, 3 and 4. From the data, Relative Spread Index (RSI) and Relative Yield Index (RYI) were computed (Kanwar, 1972) by using the following formula.

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

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

By computing both these indices, four classes of cropping zones have been identified (Table 1) as suggested by Cheema *et al.* (1998).

Based on the above formula, the efficient cropping zones for different orchard trees, vegetables and spice crops were identified.

Results and Discussion

Orchad Tree crops

Coconut:

The results in Table 2 revealed that the districts of Dharmapuri, Trichy, Karur, Thanjavur, Theni and Kaniyakumari in Tamil Nadu has good potential for growing coconut as the RSI and RYI values are high (>100 %). Coconut prefers good water source throughout the year and thrive well in all types of soils. This might be the reason for these districts becoming most efficient cropping zone coconut. The districts *viz.*, Cuddalore, Salem, Namakkal, Perambalur and Thiruvarur had good yielding ability with high RYI and hence coconut can be promoted.

Mango:

Mango crop has wide area (RSI) and better productivity (RYI) levels in Thiruvallur, Vellore, Dharmapuri, Coimbatore and Theni districts (Table 2). Mango though freshly consumed, processing industries are being established for value addition aiming export market. The processing industries of mango are widespread with good marketing channels created in the above districts are the main reason for potential zones. However, the productivity level is high (RYI) in Kanchipuram, Thiruvarur, Trichy, Madurai, Theni, Sivagangai and Tirunelveli districts but the area under this crop is low.

Banana:

Banana is the high value horticultural crop, prefers fertile soil and good water sources throughout the year. Banana crop is mainly confined to the river basins where the alluvial soil with better irrigation facilities are available. Vellore, Trichy, Pudukottai, Theni, Tirunelveli and Thoothukudi districts were shown suitability to grow banana (Table 2). Though the districts

Table 2. Efficient cropping zones of different orchard tree crops in Tamil Nadu

Districts	Coconut			Mango			Banana			Grapes			Guava			Lemon			Jack		
	RYI	RSI	E	RYI	RSI	E	RYI	RSI	E	RYI	RSI	E	RYI	RSI	E	RYI	RSI	E	RYI	RSI	E
Kanchipuram	L	L	N	H	L	E	H	L	E	L	L	N	L	L	N	H	L	E	H	L	E
Thiruvallur	L	L	N	H	H	M	H	L	E	L	L	N	L	L	N	H	L	E	H	L	E
Cuddalore	H	L	E	L	L	N	L	L	N	L	L	N	H	H	M	H	L	E	H	H	M
Villupuram	L	L	N	L	L	N	L	L	N	L	L	N	L	L	N	H	L	E	H	L	E
Vellore	L	H	N	H	H	M	H	H	M	L	L	N	H	H	M	H	L	E	H	L	E
Tiruvannamalai	L	L	N	L	L	N	L	L	N	L	L	N	L	L	N	L	L	N	H	L	E
Salem	H	L	E	L	L	N	H	L	E	L	L	N	H	H	M	H	L	E	H	L	E
Namakkal	H	L	E	L	L	N	H	L	E	L	L	N	H	H	M	H	L	E	H	H	M
Dharmapuri	H	H	M	H	H	M	H	L	E	L	L	N	L	L	N	H	L	E	H	L	E
Coimbatore	L	H	N	H	H	M	L	H	N	H	H	M	L	L	N	H	L	E	H	L	E
Erode	L	H	N	L	L	N	L	H	N	L	L	N	L	L	N	H	L	E	H	L	E
Trichy	H	H	M	H	L	E	H	H	M	L	L	N	L	L	N	H	H	M	H	L	E
Karur	H	H	M	L	L	N	L	H	N	L	L	N	L	L	N	H	L	E	H	L	E
Perambalur	H	L	E	L	L	N	H	L	E	L	L	N	L	L	N	H	H	M	H	H	M
Pudukottai	L	H	N	L	L	N	H	H	M	L	L	N	L	L	N	H	L	E	H	H	M
Thanjavur	H	H	M	L	L	N	L	H	N	L	L	N	L	L	N	H	L	E	H	L	E
Thiruvarur	H	L	E	L	L	N	H	L	E	L	L	N	H	H	M	H	L	E	H	L	E
Nagapattinam	L	L	N	L	L	N	L	L	N	L	L	N	H	H	M	H	L	E	L	L	N
Madurai	L	H	N	H	L	E	H	L	E	H	H	M	H	H	M	H	L	E	H	L	E
Theni	H	H	M	H	H	M	H	H	M	H	H	M	H	H	M	H	H	M	H	L	E
Dindigul	L	H	N	H	L	E	L	H	N	L	H	N	L	H	N	H	H	M	H	H	M
Ramanathapuram	L	H	N	L	L	N	H	L	E	L	L	N	L	L	N	L	L	N	L	L	N
Virudhunagar	L	H	N	L	H	N	H	L	E	L	L	N	H	H	M	H	H	M	H	L	E
Sivagangai	L	H	N	H	L	E	H	L	E	L	L	N	H	H	M	H	L	E	H	L	E
Tirunelveli	L	H	N	H	L	E	H	H	M	L	L	N	H	H	M	H	H	M	H	L	E
Thoothukudi	L	H	N	L	L	N	H	H	M	L	L	N	H	H	M	H	L	E	L	L	N
The Nilgiris	L	L	N	L	L	N	L	L	N	L	L	N	L	L	N	H	L	E	H	H	M
Kanyakumari	H	H	M	L	L	N	L	H	N	L	L	N	L	L	N	H	L	E	H	H	M

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. Efficient cropping zones of different vegetable crops in Tamil Nadu

Districts	Tomato			Brinjal			Chillies			Bhendi			Onion		
	RYI	RSI	E	RYI	RSI	E	RYI	RSI	E	RYI	RSI	E	RYI	RSI	E
Kanchipuram	H	L	E	H	H	M	L	L	N	H	H	M	L	L	N
Thiruvallur	H	L	E	H	H	M	H	L	E	H	H	M	L	L	N
Cuddalore	H	L	E	H	L	E	H	L	E	H	H	M	H	L	E
Villupuram	H	L	E	L	H	N	H	L	E	L	L	N	H	H	M
Vellore	H	L	E	H	H	M	H	L	E	L	H	N	H	L	E
Tiruvannamalai	H	L	E	L	H	N	H	L	E	L	H	N	H	L	E
Salem	H	H	M	L	H	N	H	L	E	H	H	M	L	L	N
Namakkal	H	H	M	L	H	N	H	L	E	L	H	N	H	L	E
Dharmapuri	H	H	M	H	L	E	H	L	E	H	L	E	H	L	E
Coimbatore	H	H	M	H	H	M	H	L	E	H	H	M	H	L	E
Erode	L	L	N	H	L	E	H	L	E	H	L	E	H	H	M
Trichy	H	L	E	H	H	M	H	L	E	H	L	E	H	L	E
Karur	H	L	E	H	L	E	H	L	E	H	L	E	L	L	N
Perambalur	L	L	N	H	H	M	L	H	N	H	L	E	L	L	N
Pudukottai	H	L	E	H	H	M	H	L	E	H	L	E	H	L	E
Thanjavur	H	L	E	H	L	E	H	L	E	H	L	E	H	L	E
Thiruvarur	L	L	N	H	H	M	H	L	E	H	L	E	L	L	N
Nagapattinam	H	L	E	H	H	M	H	L	E	H	L	E	H	L	E
Madurai	H	L	E	H	H	M	L	L	N	H	H	M	L	H	N
Theni	H	H	M	H	H	M	H	L	E	H	L	E	H	L	E
Dindigul	L	H	N	L	H	N	H	L	E	L	H	N	L	L	N
Ramanathapuram	L	L	N	H	H	M	H	H	M	H	L	E	H	L	E
Virudhunagar	H	L	E	H	L	E	H	H	M	H	L	E	L	L	N
Sivagangai	H	L	E	H	H	M	L	H	N	H	L	E	H	L	E
Tirunelveli	L	L	N	H	H	M	H	H	M	H	H	M	H	L	E
Thoothukudi	L	L	N	H	L	E	L	H	N	L	H	N	L	L	N
The Nilgiris	L	L	N	H	H	M	H	L	E	L	L	N	L	L	N
Kanyakumari	H	L	E	H	H	M	L	L	N	H	L	E	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 different spice crops in Tamil Nadu

Districts	Turmeric			Ginger			Coriander			Garlic		
	RYI	RSI	E	RYI	RSI	E	RYI	RSI	E	RYI	RSI	E
Kanchipuram	H	L	E	L	L	N	L	L	N	L	L	N
Thiruvallur	H	L	E	L	L	N	H	L	E	L	L	N
Cuddalore	H	L	E	L	L	N	H	H	M	L	L	N
Villupuram	L	H	N	L	L	N	H	L	E	L	L	N
Vellore	H	H	M	L	L	N	H	L	E	L	L	N
Tiruvannamalai	H	L	E	L	L	N	H	L	E	L	L	N
Salem	L	H	N	L	L	N	H	L	E	L	L	N
Namakkal	H	H	M	L	L	N	H	L	E	L	L	N
Dharmapuri	L	H	N	L	L	N	H	L	E	L	L	N
Coimbatore	H	H	M	L	H	N	H	L	E	L	H	N
Erode	H	H	M	L	L	N	L	L	N	L	L	N
Trichy	H	L	E	L	L	N	H	H	M	L	L	N
Karur	L	L	N	L	L	N	H	L	E	L	L	N
Perambalur	H	L	E	L	L	N	H	H	M	L	L	N
Pudukottai	H	L	E	L	L	N	H	L	E	L	L	N
Thanjavur	H	L	E	L	L	N	L	H	N	L	L	N
Thiruvarur	H	L	E	L	L	N	L	L	N	L	L	N
Nagapattinam	H	L	E	L	L	N	L	L	N	L	L	N
Madurai	H	L	E	L	L	N	H	H	M	L	L	N
Theni	H	L	E	L	L	N	H	L	E	L	L	N
Dindigul	H	L	E	L	H	N	H	L	E	H	H	M
Ramanathapuram	H	L	E	L	L	N	L	H	N	L	L	N
Virudhunagar	L	L	N	L	L	N	L	H	N	L	L	N
Sivagangai	L	L	N	L	L	N	H	L	E	L	L	N
Tirunelveli	H	L	E	L	L	N	H	H	M	L	L	N
Thoothukudi	H	L	E	L	L	N	L	H	N	L	L	N
The Nilgiris	H	L	E	H	H	M	L	L	N	L	H	N
Kanyakumari	L	L	N	L	L	N	L	H	N	L	L	N

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

such as Erode, Coimbatore, Karur and also Western Ghats rain shadow districts like Dindigul and Theni had better RSI, the productivity levels are low. Hence, growing of banana in these districts may be discouraged.

Grapes:

The efficient districts for growing grapes are Coimbatore, Madurai and Theni (Table 2). Besides these districts, Dindigul has high RSI and in the rest of the districts both RSI and RYI values are low. Sub tropical climate preferred by the crop and established marketing facilities available in Coimbatore, Madurai and Theni districts might have promoted the farmers for growing grapes and best suitability of the crop.

Guava:

Cuddalore, Vellore, Salem, Namakkal, Thiuvarur, Nagapattianam, Madurai, Theni, Virudhunagar, Sivagangai, Tirunelveli and Thoothukudi districts are the Most Efficient Cropping Zones for growing Guava (Table 2). Guava can be grown under extreme soil and climatic condition which led to the widespread of the crops in these districts.

Lemon:

The districts such as Trichy, Perambalur, Theni, Dindigul, Virudhunagar and Tirunelveli are considered as Most Efficient Cropping Zones for lemon (Table 2). Crop prefers dry and warm humid climate, which prevailed in these districts might be the reason for high RYI and RSI values.

Jack:

Jack is grown in hot arid regions and home gardens. The crop can also thrive well up to 4000 feet elevation. Cuddalore, Namakkal, Perambalur, Pudukottai and Dindigul districts are in hot arid regions. Whereas, the Nilgiris and Kanyakumari districts are with cool climate where Jack is grown in home gardens which might be the reasons for best suitability of this tree crop in these districts.

Vegetables crops

Tomato:

Tomato is the most widely cultivated vegetable crop in Tamil Nadu. The crop has good potential for growing in Salem, Namakkal, Dharmapuri, Coimbatore and Theni district (Table 3). Good market facilities in cities like Bangalore, promoted Salem and Namakkal and Dharmapuri farmers for tomato cultivation and further wide adoption of drip fertigation techniques in turn gave higher RYI and RSI. Another potential market is Kerala and farmers in Coimbatore and Theni districts captured this opportunity which might be the reason for higher RSI and RYI in the two districts.

Brinjal:

Brinjal crop is also grown year-round and throughout the state. Sixteen districts such as Kanchipuram, Thiruvallur, Vellore, Coimbatore, Trichy, Perambalur, Pudukottai, Thiruvarur, Nagapattinam, Madurai, Theni, Ramanathapuram, Sivagangai, Tirunelveli, the Nilgris and Kaniyakumari registered higher RSI and RYI values which indicated potential nature to grow brinjal crop. Drip fertigation techniques, stem borer and fruit borer tolerant varieties encouraged the farmers to grow this crop widely, which could be the reason for wide success of the crop.

Chillies:

The spice cum vegetable crop is highly grown with good potential in Ramanathapuram, Virudhunagar and Tirunelveli districts (Table 3). In these three districts, chillies is grown

in rainfed condition in addition to irrigated areas might be the reason for wide acceptability.

Bhendi:

The districts such as Kanchipuram, Thiruvallur, Cuddalore, Salem, Coimbatore, Madurai and Thirunelveli are registered as most efficient cropping districts with high RYI and RSI values (Table 3). Good irrigation facilities, better market availability in addition to the adoption advanced technologies might have resulted in higher RSI and RYI values in these districts.

Onion:

Only Villupuram and Erode districts gave higher RYI and RSI and in turn denoted as most efficient cropping zones for onion in Tamil Nadu (Table 3). Better market availability with sandy clay loam soil prevailing in these districts encouraged the farmers for more onion cultivation.

Spice crops

Turmeric:

Turmeric is the most important spice crop in Tamil Nadu. The districts such as Vellore, Namakkal, Erode and Coimbatore had shown higher RYI and RSI values. Well established regulated market in Erode with canal irrigation, sandy clay loam soils with good fertility favoured this crop in these districts.

Ginger and Garlic:

Crop prefers cool, hilly climate which prevailed only in The Nilgris district gave higher RYI and RSI and in turn Most Efficient Cropping Zone. Similarly climate of Western ghats in Dindigul district favoured garlic cultivation.

Coriander:

The districts such as Cuddalore, Trichy, Perambalur, Madurai and Tirunelveli district had shown potential for cultivation of coriander crop due to the wide spread cultivation in these districts.

The study emphasized the need for identifying the potentiality of horticultural crops in the specified area. The tool used had given fair idea of identifying the efficiency of the horticultural crops in different districts of Tamil Nadu.

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