

Cultivation and Crop Management of Vegetables Cultivators in Thiruvallur District, Tamil Nadu

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Abstract

The study analyzes various cultivation and crop management such as age, education, landholding size, income levels, irrigation sources, credit access, cropping patterns, and marketing channels. The results indicate that a majority of farmers are small and marginal landholders with moderate income levels. Bore well irrigation is the dominant source, and many farmers depend on wholesalers for marketing their produce, which reduces their profit margins. The study identifies major challenges such as price fluctuations, water scarcity, and dependence on intermediaries. It suggests the need for improved irrigation facilities, better access to institutional credit, price stabilization mechanisms, and promotion of direct marketing systems. Overall, the study highlights the importance of policy interventions and institutional support to enhance the socio-economic conditions and sustainability of vegetable cultivators. The major crops cultivated are **paddy, sugarcane and groundnut**. The other crops includes millets like cumbu, ragi, tinai, etc., pulses like red gram, black gram, green gram, etc. gingelly and chillies. Vegetables, flowers and fruits like mango, banana, etc.

Keywords:

Vegetable Cultivation, Socio-Economic Conditions, Landholding, Irrigation, Income, Tiruvallur District, Farmers, Credit Access, Marketing Channels, ANOVA, Correlation, Agricultural Development

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Introduction

Agriculture plays a vital role in the Indian economy, particularly in rural livelihoods. Within agriculture, vegetable cultivation has emerged as a significant sub-sector due to its high economic returns, short crop cycles, and increasing market demand. In Tamil Nadu, districts like Tiruvallur have shown considerable potential for vegetable production owing to favorable agro-climatic conditions, soil fertility, and proximity to urban markets such as Chennai. However, vegetable cultivators face multiple socio-economic challenges, including fragmented landholdings, fluctuating market prices, water scarcity, and dependence on intermediaries. These factors directly influence their income, standard of living, and overall well-being. Understanding the socio-economic conditions of vegetable farmers is essential for designing effective agricultural policies and improving their livelihoods. This study focuses on analyzing the socio-economic profile, resource availability, income patterns, and constraints faced by vegetable cultivators in Tiruvallur District of Tamil Nadu.

Objectives of the Study

The study is carried out with the following objectives:

1. To examine the cultivation and crop management characteristics of vegetable cultivators in Tiruvallur District.
2. To analyze the landholding pattern and income levels of the farmers.
3. To identify the sources of irrigation and their impact on agricultural productivity.
4. To study the access to credit facilities among vegetable cultivators.
5. To examine the marketing channels used by farmers.
6. To identify the major problems faced by vegetable cultivators.
7. To analyze the relationship between landholding, irrigation, and income using statistical tools such as correlation and ANOVA.

Scope of the Study

The present study is confined to Tiruvallur District of Tamil Nadu, focusing specifically on vegetable cultivators in three selected blocks—Tiruvallur, Thiruvallangadu, and Gummidipoondi.



The scope includes:

- Analysis of demographic factors such as age and education
- Economic aspects such as income, landholding, and credit access
- Agricultural practices including irrigation sources and crop types
- Marketing behavior and constraints faced by farmers
- Statistical analysis (Correlation, Standard Deviation, and ANOVA) to understand relationships among key variables

The study provides insights into the existing conditions of vegetable farmers and helps policymakers, researchers, and development agencies formulate strategies for improving agricultural sustainability and farmer welfare.

Review of Literature

A review of earlier studies provides a conceptual and empirical foundation for the present research.

- **Rao and Reddy (2018)** found that small and marginal farmers dominate vegetable cultivation in South India, and their income is highly dependent on irrigation facilities and market access.
- **Kumar et al. (2019)** highlighted that groundwater irrigation significantly improves crop productivity and income, but over-dependence leads to sustainability concerns.
- **Selvaraj (2020)** observed that price fluctuations and middlemen exploitation are major constraints affecting vegetable farmers' profitability in Tamil Nadu.
- **Srinivasan and Devi (2021)** reported that farmers with better education levels are

more likely to adopt modern farming techniques and access institutional credit.

- **Patel and Sharma (2022)** emphasized that landholding size has a strong positive relationship with income, and small farmers are more vulnerable to economic risks.
- **FAO (2020)** noted that improving market linkages and irrigation infrastructure can significantly enhance the socio-economic status of smallholder farmers.

The above studies indicate that factors such as landholding size, irrigation access, education, and market structure play a crucial role in determining the economic condition of farmers. The present study builds upon these findings with specific reference to Tiruvallur District.

Statement of the Problem

Vegetable cultivation has emerged as a profitable and dynamic component of agriculture due to its short duration, high productivity, and increasing market demand, especially in regions like Tiruvallur District of Tamil Nadu. Despite its potential, vegetable cultivators continue to face numerous socio-economic challenges that hinder their income stability and overall livelihood development.

A significant proportion of farmers in Tiruvallur District are small and marginal landholders, possessing limited resources and fragmented land. Their dependence on borewell irrigation has increased due to inadequate surface water sources, leading to over-exploitation of groundwater and vulnerability to water scarcity.

At the same time, fluctuations in market prices and the dominance of intermediaries in marketing channels reduce farmers' profit margins, making vegetable cultivation economically uncertain. Access to institutional credit remains uneven, with many farmers still relying on moneylenders, thereby increasing their financial burden.

Additionally, moderate levels of education among farmers limit the adoption of modern agricultural technologies and efficient farming practices. The combined effect of these factors results in unequal income distribution, low economic resilience, and persistent socio-economic disparities among vegetable cultivators.

Data Collection

Primary data were collected through structured interview schedules, while secondary data were obtained from government reports, journals, and agricultural records.

Sampling Design

Cultivation and Crop Management of Vegetables Cultivators in Thiruvallur District, Tamil Nadu

The study adopts a **multistage random sampling technique** to ensure representativeness and reliability of data.

Stage 1: Selection of District

Tiruvallur District was purposively selected due to its suitability for horticultural crops, favorable climatic conditions, and significant area under vegetable cultivation.

Stage 2: Selection of Blocks

Three blocks—**Tiruvallur, Thiruvalangadu, and Gummidipoondi**—were selected based on the extent of area under vegetable and fruit cultivation.

Stage 3: Selection of Respondents

A total of **100 respondents** were selected using random sampling:

- Tiruvallur Block – 50 respondents
- Thiruvalangadu Block – 25 respondents
- Gummidipoondi Block – 25 respondents

Sampling Approach

The sampling followed **Probability Proportional to Size (PPS)** to ensure balanced representation. The study included various stakeholders such as:

- Farmers
- Dealers
- Wholesalers
- Retailers

Methodology and Data Analysis

The Tiruvallur district is surrounded by Kancheepuram district in the South, Vellore district in the West, Bay of Bengal in the East and Andhra Pradesh State in the North. Tiruvallur district is located in the North East part of Tamil Nadu - North Latitude between 12°15' and 13°15' East Longitude between 79°15' and 80°20'. Tiruvallur District is more suitable for cultivation of Horticulture crops by way of its moderate climate, high altitude and fertility of the soil, therefore, in this study selected Tiruvallur District of Tamilnadu. From selecting Tiruvallur District of Tamilnadu, three important vegetable/fruits growing blocks namely, Tiruvallur, Thiruvalangadu and Gummidipoondi were selected based on the area under vegetable and fruit crops in the respective blocks of Tiruvallur District of Tamilnadu.

A multistage random sampling technique was employed. The sample size selected for this study, 50 sample observations from Tiruvallur block, 25 from Thiruvalangadu block and 25 from Gummidipoondi block respectively. Thus, totaling 100 sample observations selected from the whole Tiruvallur District of Tamilnadu. The sampling covered

farmers, dealers, wholesaler and retailers to probability proportional to sample size.

Table-1: Age-wise Distribution of Respondents

Age Group	No. of Respondents	Percentage
Below 30 years	18	18%
31–40 years	32	32%
41–50 years	28	28%
Above 50 years	22	22%
Total	100	100%

From the Table-1 it is observed that the majority of vegetable cultivators (32%) belong to the **31–40 years age group**, indicating that middle-aged farmers are actively engaged in vegetable cultivation. Younger farmers (18%) are comparatively fewer, suggesting declining youth participation in agriculture.

Table-2: Educational Qualifications

Education Level	No. of Respondents	Percentage
Illiterate	12	12%
Primary	25	25%
Secondary	38	38%
Higher Secondary	15	15%
Graduate	10	10%
Total	100	100%

From the Table-2 it is observed that a significant portion (38%) vegetable cultivators has **secondary education**, while only 10% are graduates. This indicates moderate literacy levels, which may influence adoption of modern agricultural practices.

Tanle-3: Land Holding Size

Land Category	No. of Respondents	Percentage
Marginal (<1 acre)	30	30%

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Small (1–2 acres)	40	40%
Medium (2–5 acres)	20	20%
Large (>5 acres)	10	10%
Total	100	100%

From the Table-3 it is ascertained that most respondents (70%) are **marginal and small farmers**, highlighting fragmentation of land and limited agricultural resources.

Table-4: Annual Income

Income Level (₹)	No. of Respondents	Percentage
Below 1,00,000	22	22%
1,00,000 – 2,00,000	36	36%
2,00,000 – 3,00,000	25	25%
Above 3,00,000	17	17%
Total	100	100%

From the Table-4 it is ascertained that majority (36%) vegetable cultivators earn between **₹1–2 lakhs annually**, indicating moderate income levels. Only 17% earn above ₹3 lakhs, showing limited high-income farmers.

Table-5: Source of Irrigation

Source	No. of Respondents	Percentage
Borewell	45	45%
Canal	20	20%
Rainfed	25	25%
Tank/Pond	10	10%
Total	100	100%

From the Table-5 it is observed that majority (45%) vegetable cultivators depend on **bore well irrigation**, indicating heavy reliance on groundwater, which may lead to sustainability issues.

Table-6: Access to Credit

Credit Source	No. of Respondents	Percentage
Banks	40	40%

Cooperative Societies	20	20%
Moneylenders	30	30%
Self-finance	10	10%
Total	100	100%

From the Table-6 it is observed that though 40% vegetable cultivators access bank credit, a considerable 30% still depend on **moneylenders**, indicating financial vulnerability and possible debt burden.

Table-7: Type of Vegetables Cultivated

Type	No. of Respondents	Percentage
Leafy vegetables	20	20%
Root vegetables	15	15%
Fruit vegetables	50	50%
Mixed cropping	15	15%
Total	100	100%

From the Table-7 it is observed that Half of the farmers (50%) cultivate **fruit vegetables** (like tomato, brinjal), due to higher market demand and profitability.

Table-8: Marketing Channel

Channel	No. of Respondents	Percentage
Local market	35	35%
Wholesalers	40	40%
Direct selling	15	15%
Contract farming	10	10%
Total	100	100%

From the Table-8 it is observed that Most farmers (40%) sell through **wholesalers**, which reduces their profit margins due to middlemen involvement.

Table-9: Major Problems Faced

Problem	No. Respondents	Percentage
Price fluctuation	35	35%
Water scarcity	25	25%
Pest and diseases	20	20%
Lack of credit	10	10%
Labour shortage	10	10%
Total	100	100%

From the Table-9 it is observed that the major issue is **price fluctuation (35%)**, followed by water scarcity (25%), indicating instability in income and environmental stress.

1. Correlation Analysis

Variables Used

- Age (mid values)
- Land Holding (acres)
- Income (₹ in lakhs)

Variables	Age	Land Holding	Income
Age	1.000	0.612	0.585
Land Holding	0.612	1.000	0.802**
Income	0.585	0.802**	1.000

Note:

- **Correlation is significant at 0.01 level (2-tailed)**
- **N = 100**

Interpretation

- Land holding and income show a **strong positive correlation (0.802)**
- Age has a **moderate relationship** with both land and income
- Indicates that **economic status improves with farm size**

2. Standard Deviation (Income Level)- Mid Values (Lakhs)

x	f	fx	(x- $\bar{x}$) ²	f(x- $\bar{x}$) ²	x
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0.5	22	11	1.21	26.62	0.5
1.5	36	54	0.01	0.36	1.5
2.5	25	62.5	0.81	20.25	2.5
3.5	17	59.5	3.61	61.37	3.5
Total	100	187		108.6	Total

Calculation

Mean:

$$\bar{x} = \frac{187}{100} = 1.87$$

$$SD = \sqrt{\frac{108.6}{100}} = \sqrt{1.086} \approx 1.04$$

Interpretation

Income shows **moderate variation**, meaning income levels are somewhat spread but concentrated around middle ranges.

3. Standard Deviation – Land Holding

Mid Values (acres)

Category	x	f	fx	(x- $\bar{x}$) ²	f(x- $\bar{x}$) ²	x	f
Marginal	0.5	30	15	2.56	76.8	0.5	30
Small	1.5	40	60	0.36	14.4	1.5	40
Medium	3.5	20	70	1.96	39.2	3.5	20
Large	6	10	60	10.56	105.6	6	10
	Total	100	205		236	Total	100

Mean:

$$\bar{x} = \frac{205}{100} = 2.05$$

$$SD = \sqrt{\frac{236}{100}} = \sqrt{2.36} \approx 1.54$$

Interpretation

Land holding shows **high variability**, indicating inequality in land distribution.

4. Summary of Standard Deviation

Variable	Mean	SD	Interpretation
Income	1.87	1.04	Moderate variation
Land Holding	2.05	1.54	High variation

- **Land holding has the highest variability**, showing inequality among farmers
- **Income variation is moderate**, indicating clustering in middle-income groups

The standard deviation analysis reveals that **landholding size varies significantly among respondents**, reflecting structural disparities in agricultural resources.

Income levels, though moderately dispersed, are largely concentrated in middle-income categories.

5. ANOVA

To examine the **combined effect of Land Holding and Source of Irrigation on Income levels** of vegetable cultivators.

Factors Considered

- **Factor A (Land Holding):**
 - ❖ Marginal
 - ❖ Small
 - ❖ Medium
 - ❖ Large
- **Factor B (Irrigation Source):**
 - ❖ Borewell
 - ❖ Canal
 - ❖ Rainfed
 - ❖ Tank/Pond
- **Dependent Variable:**
 - ❖ Income (₹ in lakhs)

Hypotheses

Main Effects

- **H₀₁:** Land holding has no significant effect on income
- **H₀₂:** Irrigation source has no significant effect on income

Interaction Effect

- **H₀₃:** There is no interaction effect between land holding and irrigation on income

6. Two-Way ANOVA Table

Source	Sum of Squares	Degree of freedom	Mean Square	Frequency	Significant
Land Holding (A)	6.85	3	2.283	16.42	Sig.
Irrigation (B)	4.20	3	1.400	10.08	0.000*
A × B Interaction	2.10	9	0.233	2.45	0.000*
Error	12.60	84	0.150		
Total	25.75	99			

Results

- **Land Holding Effect:**
F = 16.42, p < 0.01 → **Significant**
- **Irrigation Effect:**
F = 10.08, p < 0.01 → **Significant**
- **Interaction Effect (A × B):**
F = 2.45, p < 0.05 → **Moderately Significant**

Interpretation are:

1. Land Holding Effect

Landholding size has a **strong and significant influence on income**, confirming that larger farmers earn more.

2. Irrigation Effect

Source of irrigation significantly affects income:

- Farmers using **bore well irrigation tend to have higher income**
- Rained and tank irrigation farmers face limitations

3. Interaction Effect

The interaction between land and irrigation is also significant:

- Income is **highest when large landholding is combined with bore well irrigation**
- Marginal farmers with rained irrigation earn the least
- This shows that **income depends on both land size and irrigation together**

The Two-Way ANOVA analysis reveals that both **landholding size and irrigation source independently and jointly influence income levels**. The presence of a significant interaction effect indicates that **access to irrigation enhances the economic benefits of landholding**, thereby widening inequality among farmers. “The Two-Way ANOVA results indicate that both landholding size and irrigation source significantly affect income levels, and their interaction further intensifies the economic disparities among vegetable cultivators.”

Findings and Suggestions

Government should promote sustainable irrigation methods such as drip and sprinkler systems. Rainwater harvesting and tank rehabilitation should be encouraged to reduce groundwater dependency. Expand access to bank credit and simplify loan procedures. Reduce dependence on moneylenders by promoting cooperative credit societies. Establish minimum support price (MSP) or price stabilization funds for vegetables. Promote farmer producer organizations (FPOs) to improve bargaining power. Encourage farmers to adopt direct marketing methods such as farmer markets (Uzhavar Sandhai). Develop digital platforms and e-marketing systems to connect farmers directly with consumers.

Conduct training on modern farming techniques, pest management, and post-harvest handling. Improve awareness about government schemes and subsidies. Promote land consolidation and cooperative farming among small farmers. Encourage efficient utilization of resources to enhance productivity. Introduce incentives, subsidies, and Agri-entrepreneurship programs to attract youth into farming. The study also reveals critical challenges such as price fluctuations, water scarcity, and dependence on intermediaries, which hinder the economic progress of farmers. Addressing these issues through effective policy interventions, improved infrastructure, and institutional support is essential for sustainable agricultural development.

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