***Original Research Article***

**Sustainable livelihood security vis-à-vis Agricultural Sustainability in India: A case study of Karnataka**

**Abstract**

Sustainable Development (SD) has gained prominence as a central focus for development planners, policymakers, and environmental advocates, both nationally and internationally. In India, agriculture grapples with numerous challenges that collectively contribute to sustainability issues, hindering its core goal of ensuring food security. Swaminathan (1991) defines Sustainable Livelihood Security (SLS) as encompassing livelihood options that are ecologically sound, economically viable, and socially equitable. The intrinsic connections between SLS and broader welfare objectives such as poverty reduction and human development underscore its pivotal role in achieving sustainable development. This study employs the Sustainable Livelihood Security Index (SLSI) to assess the current status of sustainability in the agriculturally diverse state of Karnataka. Factors like population density, forest cover, cropping intensity, and livestock density are utilized to gauge ecological security. Economic efficiency is measured through per capita income, milk yield, and net sown area, while social equity is assessed by indicators like female literacy, maternal mortality rate, and the percentage of the population below the poverty line (BPL). Despite inherent variations and limitations, these selected variables offer substantial insight into the overall ecological, economic, and equity dimensions of the state. The results reveal a wide range of values for sustainability status (WSLSI), spanning from 0.17 to 0.62, with corresponding ranges of 0.07 to 0.64 for economic efficiency (EEI), 0.17 to 0.77 for ecological security (ESI), and 0.12 to 0.95 for social equity (SEI). This indicates significant disparities in the livelihood security of Karnataka across its ecological, economic, and social dimensions. Notably, the districts of Dakshina Kannada, Udupi, and Chikkamagaluru emerge as top performers in both simple SLSI and weighted SLSI, excelling in all three component indices. Conversely, districts such as Raichur, Yadagiri, and Koppal exhibit lower performance across all indices, highlighting the urgent need for targeted interventions in health, education, and agricultural investment. Strategies such as technological advancements, improved infrastructure, establishment of food processing industries, and enhanced financial and marketing support are recommended to address these disparities and bolster sustainable livelihood security in underperforming districts.

**Key words:** Sustainability, Economic Efficiency, Ecological Security, Social Equity

**Introduction:**

India, being primarily agrarian, relies on agriculture for the livelihood of nearly half of its population. Despite significant technological advancements, the sector grapples with numerous challenges, hindering sustainability and exacerbating the struggle to feed the country's expanding populace. Shifting consumption patterns, population growth, and rising incomes drive up demand for agricultural products, while issues like water scarcity, soil degradation, and climate change threaten production. Additionally, agricultural instability, dwindling profits, and declining productivity prompt many farmers to leave the sector, further impeding its development. Bottlenecks in production and marketing, including limited access to modern technology, outdated farming methods, insufficient credit and investment, and inadequate marketing infrastructure, contribute to stagnation.

Sustainable agriculture entails managing resources to meet evolving human needs while preserving or enhancing environmental quality and conserving natural resources. It aims not only for efficient production but also for environmental, economic, and social well-being. Key goals include ecological balance, economic efficiency, and social equity, as commercial agriculture often leads to environmental degradation. Sustainable agricultural development seeks to preserve resources for future generations while meeting present and future food demands. Social equity is crucial for effectively managing resources and achieving ecological and economic sustainability. As we witness the environmental degradation in the name of commercial agriculture, development of sustainable agricultural systems is the need of the hour. Sustainable agricultural development focus on preserving natural resources for future generations and maintaining ecological balance in order to meet the food demands of both present generation and future generations in terms of both quantity and quality of food products. To achieve ecological balance and economic efficiency, social equity plays a vital role in successful management of resources for efficient production system. With this background an attempt is made to understand the relative status of sustainable livelihood security in the well diversified state of Karnataka where agriculture is the major occupation with the following objectives

1. To assess the Ecological Security, Economic Efficiency and Social Equity in the state of Karnataka (India).
2. To evaluate the status Sustainable Livelihood Security in Karnataka (India).

To measure the sustainability in terms of ecological security, economic efficiency and social equity Sustainable Livelihood Security Index (SLSI) has been developed by Swaminathan (1991) which has the potential of evaluating sustainable development (SD). The concept of Sustainable Livelihood Security (SLS), as defined by Swaminathan (1991), is ‘livelihood options which are ecologically secure, economically efficient and socially equitable’. The intimate conceptual, casual and operational linkages between SLS and other welfare goals like poverty alleviation, meeting basic needs for human development and quality of life (Saleth and Swaminathan, 1993) justify SLSI as a basic requirement of sustainable development of agriculture (SDA).

Karnataka is one of the major agriculture dependent states of India and which has great diversity in terms of ecological, economic and social aspects. Karnataka is divided into 10 agro- climatic zones, including dry zones covering around 9.15 million hectares. Karnataka has long coastline, perennial rivers and varying agro-climatic zones. The climate endowment supports cultivation of cash crops like coffee, coconut, mango, spices, commercial flowers, aromatic plants, cotton, sugarcane, oilseeds, grapes, pomegranate, sapota, etc. apart from many cereals and pulses cultivation and helps 65 per cent of the population of Karnataka to engage in farming activities (NDDB, 2015). In the present study, Sustainable Livelihood Security Index (SLSI) tool has been used for assessing and evaluating the existing status of agricultural sustainability in selected states. Some measures have also been suggested to promote sustainable agriculture in India.

**Methodology:**

The analytical approach used to ascertain sustainable livelihood security is the SLSI which is a composite index of three indices, viz. Ecological Security Index (ESI), Economic Efficiency Index (EEI) and Social Equity Index (SEI) as it accounts for the conflicts and synergies among economic, social and ecological aspects of Sustainable development.

The SLSI is a relative approach and proposed based on the similar procedure of Human Development Index, developed by UNDP. Let Xijk reflects the value of the ith variable, jth indices of kth district and SLSI is the index for the ith variable representing the jth indices of the SLSI of kth district Then

$$SLSI\_{ijk}= \frac{\begin{array}{c}X\_{ijk}-min X\_{ijk}\\ k \end{array}}{\begin{array}{c}maxX\_{ijk}-minX\_{ijk}\\k k \end{array}} …\left(1\right) SLSI\_{ijk}= \frac{\begin{array}{c}max X\_{ijk}- X\_{ijk}\\k \end{array}}{\begin{array}{c}max X\_{ijk}-min X\_{ijk}\\k k \end{array}} …(2)$$

where,

i = Variables (1, 2, 3, ………………., I), j = Components (1, 2, 3, J)

k = Districts (1, 2, 3,………….…, K)

Equation (1) is applicable to variables having positive implications for SLS which means the sustainability increases with the increase in the value of a particular variable and Equation (2) is applicable to variables having negative implications for SLS i.e. sustainability decreases with increase in the value of a particular variable and vice-versa. The numerators in Equation (1) measure the extent by which the kth district did better in the ith variable representing the jth component of its SLSI as compared to the region(s) showing the worst performance. The denominator is actually the range, i.e., the difference between the maximum and minimum values of a given variable across districts, which is a simple statistical measure of total variation evinced by that variable.

Having calculated the SLSIijk for all variables, the indices for various components of SLSI were calculated as a simple means of the indices of their respective variables, i.e.:

$$SLSI\_{jk}= \frac{\sum\_{i=1}^{I}SLSI\_{ijk}}{I} ………(3)$$

where,

j = 1, 2, 3,……………….,J, and, k = 1, 2, 3,………………,K

Then, the composite indicator for each region was calculated as a weighted mean of the component indices obtained from Equation (3), i.e.

$$SLSI\_{k}= \frac{\sum\_{j=1}^{J}W\_{jk }SLSI\_{ijk}}{I} ………(4)$$

The Wjk in Equation (4) denotes the weight assigned to the jth component of SLSI of kth region, and has the property that: Wik +……………………+ Wjk = 1. If the weights are identical and sum up to unity, then SLSI is calculated as a simple mean. But, when the weights are different across all js and ks, then SLSI is calculated as a weighted mean. For distinction, the former has been denoted simply as ‘SLSI’ and the latter as ‘WSLSI’.

The procedure of calculating weights is as follows: first, the inverse of the proportional contributions of ESI, EEI and SEI to SLSI is to be obtained. Then, the weights to be assigned to each component will be the ratio of its inverse contribution to the sum of all the three inverse proportions.

Due to lack of availability of data on all the variables and to maintain principle of parsimony, only 3-4 variables from each component have been selected to illustrate the three dimensions of SDA from table 1 and explained in detailed below (Table 1)

**Table 1: List of variables selected and their functional relationship with sustainable livelihood security**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sl. No.** | **Components** | **Variables** | **Unit** | **Functional Relationship** |
| 1 | Ecological security index | Population density (-) | /km2 | Negative |
| Forest cover (+) | Percentage | Positive |
| Cropping intensity (+) | Percentage | Positive |
| Livestock density (-) | /km2 | Negative |
| 2 | Economic efficiency index | Net Sown Area (+) | kg/ha | Positive |
| Milk Yield (+) | litres/day | Positive |
| Per capita income (+) | Rs/ annum | Positive |
| 3 | Social equity index | Female literacy (+) | Percentage | Positive |
| Infant Mortality (-) | Percentage | Negative |
| BPL (-) | Percentage | Negative |

**Rationale behind choosing the variables**

**Ecological security**

 Forests are crucial for maintaining ecological equilibrium and are integral to the state economy through the provision of non-timber forest products. Forest-related activities also play a key role in ensuring food security and supporting the livelihoods of forest-dependent communities. Therefore, the forest cover variable was chosen to ensure ecological security. Cropping intensity serves as an indicator of agricultural development, representing the extent of land utilized for crop cultivation in a given period. With the expansion of irrigation infrastructure, more land has been cultivated, allowing farmers to grow multiple crops in the same area within a year. Assessing agricultural sustainability in terms of ecological security requires considering cropping intensity due to its significant impact.

**Economic Efficiency**

Net sown area directly impacts food grain production, thus affecting farmers' economic efficiency. Therefore, it was chosen as a variable to assess agricultural sustainability. Per capita income serves as a reflection of overall living standards and economic prosperity, making it an apt indicator of economic efficiency. Additionally, milk yield was selected to represent economic efficiency, given the significant role of dairy farming as a major subsidiary occupation in Karnataka.

**Social Equity**

Female literacy rate, maternal mortality rate, and the population below the poverty line are crucial indicators of social equity in agricultural sustainability. Female literacy signifies women's empowerment and their potential for economic participation, while maternal mortality rate reflects health awareness and facility accessibility. The population below the poverty line provides insight into overall social equity within a region. Despite limitations, these selected variables effectively capture the ecological, economic, and equity aspects of the state's agricultural systems.

**Results and discussion:**

**Table 2: District wise Ecological Security Index of Karnataka (India).**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. No.** | **Districts** | **Population density Index** | **Forest cover Index** | **Copping Intensity Index** | **Livestock density Index** | **ESI** | **Rank** |
| 01. | Bagalkot | 0.96 | 0.13 | 0.45 | 0.00 | 0.39 | 25 |
| 02. | Bengaluru Rural | 0.94 | 0.04 | 0.00 | 0.34 | 0.33 | 28 |
| 03. | Bengaluru Urban | 0.00 | 0.01 | 0.16 | 0.53 | 0.17 | 30 |
| 04. | Belagavi | 0.95 | 0.16 | 0.57 | 0.19 | 0.47 | 16 |
| 05. | Bellary | 0.96 | 0.13 | 0.67 | 0.31 | 0.52 | 11 |
| 06. | Bidar | 0.96 | 0.04 | 0.36 | 0.61 | 0.49 | 14 |
| 07. | Vijayapura | 0.98 | 0.00 | 0.17 | 0.65 | 0.45 | 19 |
| 08. | Chamarajnagara | 0.99 | 0.60 | 0.54 | 0.72 | 0.71 | 2 |
| 09. | Chickkaballapura | 0.96 | 0.13 | 0.11 | 0.14 | 0.34 | 27 |
| 10. | Chikkamagaluru | 0.99 | 0.34 | 0.42 | 0.79 | 0.64 | 6 |
| 11. | Chitradurga | 0.99 | 0.10 | 0.58 | 0.17 | 0.46 | 18 |
| 12. | Dakshina Kannada | 0.93 | 0.32 | 0.38 | 0.86 | 0.63 | 7 |
| 13. | Davanagere | 0.95 | 0.17 | 0.48 | 0.37 | 0.49 | 13 |
| 14. | Dharwad | 0.93 | 0.08 | 0.92 | 0.69 | 0.66 | 4 |
| 15. | Gadag | 0.98 | 0.07 | 1.00 | 0.57 | 0.65 | 5 |
| 16. | Kalaburgi | 0.98 | 0.02 | 0.36 | 0.69 | 0.51 | 12 |
| 17. | Hasan | 0.97 | 0.09 | 0.48 | 0.43 | 0.49 | 15 |
| 18. | Haveri | 0.95 | 0.10 | 0.38 | 0.40 | 0.46 | 17 |
| 19. | Kodagu | 1.00 | 0.40 | 0.27 | 1.00 | 0.67 | 3 |
| 20. | Kolar | 0.94 | 0.05 | 0.05 | 0.13 | 0.29 | 29 |
| 21. | Koppal | 0.97 | 0.04 | 0.49 | 0.25 | 0.44 | 20 |
| 22. | Mandya | 0.95 | 0.04 | 0.52 | 0.09 | 0.40 | 24 |
| 23. | Mysuru | 0.92 | 0.10 | 0.70 | 0.46 | 0.54 | 10 |
| 24. | Raichur | 0.98 | 0.00 | 0.40 | 0.34 | 0.43 | 21 |
| 25. | Ramanagar | 0.96 | 0.23 | 0.03 | 0.40 | 0.40 | 23 |
| 26. | Shivmogga | 0.98 | 0.40 | 0.31 | 0.70 | 0.60 | 8 |
| 27. | Tumkur | 0.97 | 0.03 | 0.30 | 0.22 | 0.38 | 26 |
| 28. | Udupi | 0.95 | 0.34 | 0.28 | 0.79 | 0.59 | 9 |
| 29. | Uttara Kannada | 1.00 | 1.00 | 0.16 | 0.95 | 0.78 | 1 |
| 30. | Yadgiri | 0.98 | 0.06 | 0.54 | 0.12 | 0.42 | 22 |

The variables considered for Economic Efficiency are Net Sown Area, Milk Yield and Per Capita Income. The net sown area was found highest in Hassan followed by Ramanagar, Belagavi and Haveri with net sow area of 81.55, 81.07, 78.80 and 77.86 per cent, respectively. Net sown area is lowest in Uttarakannada followed by Yadgir and Tumakuru.

The highest milk yield was found in Bidar (5.66 litres) followed by Kolar and Ramnagar with a milk yield of 5.12 and 5.07 litres, respectively.The annual per capita income was highest in Bengaluru Urban (Rs. 3,20,346) followed by Dakshina Kannada and Udupi with income of Rs.2,40,448 and Rs. 2,02,618. The lowest per capita income was found in Kalaburgi, Yadgiri and Bidar with an income of Rs. 65,493, 68,928 and 73, 892 respectively (Table 3).

Economic Efficiency Index ranges between 0.07 to 0.64 reflecting more economic inequality across the districts in the state of Karnataka. The Economic Efficiency is found to be highest in Bengaluru Urban with an index value 0.64 followed by Kolar and Bengaluru rural with an index of 0.64, 0.54 and 0.51 respectively (Table 4). It is due to the fact that the per capita income is more in Bengaluru Urban and rural as a result of more employment opportunities in these districts and Kolar is performing well in Economic efficiency because of higher milk yield and more income from subsidiary occupation i.e. dairy farming.

**Table 3: District wise data on different variables considered for Economic Efficiency**

|  |  |  |
| --- | --- | --- |
| **Sl. No.** | **Districts** | **Economic Efficiency Index** |
| **Net Sown Area** | **Milk Yield** | **Per capita income** |
| 01. | Bagalkot | 71.31 | 2.82 | 121404 |
| 02. | Bengaluru Rural | 47.10 | 4.76 | 139598 |
| 03. | Bengaluru Urban | 19.05 | 5.08 | 320346 |
| 04. | Belagavi | 60.63 | 3.15 | 82287 |
| 05. | Bellary | 52.03 | 2.65 | 116807 |
| 06. | Bidar | 57.67 | 2.63 | 73892 |
| 07. | Vijayapura | 78.80 | 2.51 | 74741 |
| 08. | Chamarajnagara | 26.92 | 4.02 | 99988 |
| 09. | Chickkaballapura | 48.86 | 5.12 | 99600 |
| 10. | Chikkamagaluru | 41.35 | 3.12 | 175179 |
| 11. | Chitradurga | 51.27 | 2.82 | 88185 |
| 12. | Dakshina Kannada | 29.83 | 3.92 | 240448 |
| 13. | Davanagere | 65.79 | 3.37 | 89946 |
| 14. | Dharwad | 77.86 | 3.20 | 114827 |
| 15. | Gadag | 81.07 | 2.86 | 88942 |
| 16. | Kalaburgi | 81.55 | 2.48 | 65493 |
| 17. | Hasan | 55.53 | 3.55 | 115946 |
| 18. | Haveri | 74.62 | 3.09 | 84629 |
| 19. | Kodagu | 40.72 | 3.34 | 96939 |
| 20. | Kolar | 44.71 | 5.66 | 98953 |
| 21. | Koppal | 73.82 | 2.91 | 74134 |
| 22. | Mandya | 44.16 | 4.17 | 129304 |
| 23. | Mysuru | 55.04 | 3.90 | 100939 |
| 24. | Raichur | 56.83 | 2.51 | 78057 |
| 25. | Ramanagar | 43.17 | 4.01 | 126441 |
| 26. | Shivmogga | 26.94 | 3.13 | 148979 |
| 27. | Tumkur | 48.86 | 3.52 | 123803 |
| 28. | Udupi | 27.21 | 3.44 | 202618 |
| 29. | Uttara Kannada | 10.93 | 2.54 | 112902 |
| 30. | Yadgiri | 58.04 | 2.50 | 68928 |
|  | Average | 51.72 | 3.43 | 118475.17 |

**Table 4: District wise Economic Efficiency Index of Karnataka (India).**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl. No.** | **Districts** | **Net Sown Area** | **Milk Yield** | **Per capita Income** | **EEI** | **Rank** |
| 01. | Bagalkot | 0.86 | 0.11 | 0.22 | 0.39 | 10 |
| 02. | Bengaluru Rural | 0.51 | 0.72 | 0.29 | 0.51 | 3 |
| 03. | Bengaluru Urban | 0.12 | 0.82 | 1.00 | 0.64 | 1 |
| 04. | Belagavi | 0.70 | 0.21 | 0.07 | 0.33 | 21 |
| 05. | Bellary | 0.58 | 0.05 | 0.20 | 0.28 | 23 |
| 06. | Bidar | 0.66 | 0.05 | 0.03 | 0.25 | 27 |
| 07. | Vijayapura | 0.96 | 0.01 | 0.04 | 0.34 | 19 |
| 08. | Chamarajnagara | 0.23 | 0.48 | 0.14 | 0.28 | 22 |
| 09. | Chickkaballapura | 0.54 | 0.83 | 0.13 | 0.50 | 4 |
| 10. | Chikkamagaluru | 0.43 | 0.20 | 0.43 | 0.35 | 17 |
| 11. | Chitradurga | 0.57 | 0.11 | 0.09 | 0.26 | 25 |
| 12. | Dakshina Kannada | 0.27 | 0.45 | 0.69 | 0.47 | 5 |
| 13. | Davanagere | 0.78 | 0.28 | 0.10 | 0.38 | 14 |
| 14. | Dharwad | 0.95 | 0.23 | 0.19 | 0.46 | 6 |
| 15. | Gadag | 0.99 | 0.12 | 0.09 | 0.40 | 9 |
| 16. | Kalaburgi | 1.00 | 0.00 | 0.00 | 0.33 | 20 |
| 17. | Hasan | 0.63 | 0.34 | 0.20 | 0.39 | 13 |
| 18. | Haveri | 0.90 | 0.19 | 0.08 | 0.39 | 12 |
| 19. | Kodagu | 0.42 | 0.27 | 0.12 | 0.27 | 24 |
| 20. | Kolar | 0.48 | 1.00 | 0.13 | 0.54 | 2 |
| 21. | Koppal | 0.89 | 0.14 | 0.03 | 0.35 | 18 |
| 22. | Mandya | 0.47 | 0.53 | 0.25 | 0.42 | 7 |
| 23. | Mysuru | 0.62 | 0.45 | 0.14 | 0.40 | 8 |
| 24. | Raichur | 0.65 | 0.01 | 0.05 | 0.24 | 28 |
| 25. | Ramanagar | 0.46 | 0.48 | 0.24 | 0.39 | 11 |
| 26. | Shivmogga | 0.23 | 0.20 | 0.33 | 0.25 | 26 |
| 27. | Tumkur | 0.54 | 0.33 | 0.23 | 0.36 | 15 |
| 28. | Udupi | 0.23 | 0.30 | 0.54 | 0.36 | 16 |
| 29. | Uttara Kannada | 0.00 | 0.02 | 0.19 | 0.07 | 30 |
| 30. | Yadgiri | 0.67 | 0.01 | 0.01 | 0.23 | 29 |

Social Equity plays an important role in sustainable livelihood security. The variables considered for social equity index are Female literacy rate, Maternal Mortality and percentage of population below poverty line. Female literacy rate ranges between 41.38 % to 84.13 %. The highest female literacy rate was found in case of Dakshina kannada (84.13 %) followed by Bengaluru Urban (84.01 %) and Udupi (81.58 %). The worst performing districts interms of female literacy rate are Yadagiri (41.38 %), Raichur (48.73%) and Chamarajnagara (54.92%). Population below poverty line is more in case of Chitradurga (46.7 %), Bellary (40.8 %), Koppala (40.7 %) and Yadagiri (38 %). The better performing or districts having less population under BPL are Kodagu (1.5 %), Bengaluru Urban (1.5 %), Dakshina Kannada (1.6 %) and Chamarajnagara (1.6 %) (Table 5).

Overall, in terms of social equity Bengaluru urban stands first with an index value 0.96 followed by Dakshina Kannada (0.93), Udupi (0.83) and Kodagu (0.80). The worst performing districts in terms of social equity are Raichur (0.12), Yadgiri (0.16), Koppal (0.18) and Bellary (0.20). The social equity index ranges between 0.12 to 0.96 indicating the wide variability in social equity across the districts in Karnataka (Table 6).

**Table 5: District wise data on different variables considered for Social Equity**

|  |  |  |
| --- | --- | --- |
| **Sl. No.** | **Districts** | **Social Equity Index** |
| **Female literacy** | **Maternal Mortality** | **BPL** |
| 01. | Bagalkot | 58.4 | 163 | 35.8 |   |
| 02. | Bengaluru Rural | 70.63 | 120 | 15.7 |   |
| 03. | Bengaluru Urban | 84.01 | 73 | 1.5 |   |
| 04. | Belagavi | 64.58 | 155 | 28.8 |   |
| 05. | Bellary | 58.09 | 227 | 40.8 |   |
| 06. | Bidar | 61.55 | 134 | 35.1 |   |
| 07. | Vijayapura | 56.72 | 135 | 23.1 |   |
| 08. | Chamarajnagara | 54.92 | 142 | 1.6 |   |
| 09. | Chickkaballapura | 61.55 | 94 | 25.2 |   |
| 10. | Chikkamagaluru | 73.16 | 137 | 14.7 |   |
| 11. | Chitradurga | 65.88 | 170 | 46.7 |   |
| 12. | Dakshina Kannada | 84.13 | 89 | 1.6 |   |
| 13. | Davanagere | 68.91 | 163 | 23.3 |   |
| 14. | Dharwad | 73.46 | 157 | 34 |   |
| 15. | Gadag | 65.44 | 215 | 21.8 |   |
| 16. | Kalaburgi | 55.09 | 182 | 37.2 |   |
| 17. | Hasan | 68.6 | 98 | 11.6 |   |
| 18. | Haveri | 70.46 | 163 | 33.7 |   |
| 19. | Kodagu | 78.14 | 138 | 1.5 |   |
| 20. | Kolar | 66.84 | 140 | 10 |   |
| 21. | Koppal | 57.55 | 236 | 40.7 |   |
| 22. | Mandya | 62.54 | 111 | 16.4 |   |
| 23. | Mysuru | 67.06 | 155 | 15.5 |   |
| 24. | Raichur | 48.73 | 244 | 37.7 |   |
| 25. | Ramanagar | 61.5 | 114 | 10.5 |   |
| 26. | Shivmogga | 74.84 | 106 | 29.3 |   |
| 27. | Tumkur | 67.38 | 124 | 13 |   |
| 28. | Udupi | 81.58 | 50 | 22.4 |   |
| 29. | Uttara Kannada | 78.39 | 99 | 19.6 |   |
| 30. | Yadgiri | 41.38 | 186 | 38 |   |
|  | Average | 66.05 | 144 | 22.89 |   |

**Table 6: District wise Social Equity Index of Karnataka (India).**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl. No.** | **Districts** | **Female literacy** | **Maternal mortality** | **BPL** | **SEI** | **Rank** |
| 01. | Bagalkot | 0.40 | 0.42 | 0.24 | 0.35 | 24 |
| 02. | Bengaluru Rural | 0.68 | 0.64 | 0.69 | 0.67 | 7 |
| 03. | Bengaluru Urban | 1.00 | 0.88 | 1.00 | 0.96 | 1 |
| 04. | Belagavi | 0.54 | 0.46 | 0.40 | 0.47 | 20 |
| 05. | Bellary | 0.39 | 0.09 | 0.13 | 0.20 | 27 |
| 06. | Bidar | 0.47 | 0.57 | 0.26 | 0.43 | 22 |
| 07. | Vijayapura | 0.36 | 0.56 | 0.52 | 0.48 | 19 |
| 08. | Chamarajnagara | 0.32 | 0.53 | 1.00 | 0.61 | 14 |
| 09. | Chickkaballapura | 0.47 | 0.77 | 0.48 | 0.57 | 16 |
| 10. | Chikkamagaluru | 0.74 | 0.55 | 0.71 | 0.67 | 8 |
| 11. | Chitradurga | 0.57 | 0.38 | 0.00 | 0.32 | 25 |
| 12. | Dakshina Kannada | 1.00 | 0.80 | 1.00 | 0.93 | 2 |
| 13. | Davanagere | 0.64 | 0.42 | 0.52 | 0.53 | 17 |
| 14. | Dharwad | 0.75 | 0.45 | 0.28 | 0.49 | 18 |
| 15. | Gadag | 0.56 | 0.15 | 0.55 | 0.42 | 23 |
| 16. | Kalaburgi | 0.32 | 0.32 | 0.21 | 0.28 | 26 |
| 17. | Hasan | 0.64 | 0.75 | 0.78 | 0.72 | 6 |
| 18. | Haveri | 0.68 | 0.42 | 0.29 | 0.46 | 21 |
| 19. | Kodagu | 0.86 | 0.55 | 1.00 | 0.80 | 4 |
| 20. | Kolar | 0.60 | 0.54 | 0.81 | 0.65 | 10 |
| 21. | Koppal | 0.38 | 0.04 | 0.13 | 0.18 | 28 |
| 22. | Mandya | 0.49 | 0.69 | 0.67 | 0.62 | 13 |
| 23. | Mysuru | 0.60 | 0.46 | 0.69 | 0.58 | 15 |
| 24. | Raichur | 0.17 | 0.00 | 0.20 | 0.12 | 30 |
| 25. | Ramanagar | 0.47 | 0.67 | 0.80 | 0.65 | 11 |
| 26. | Shivmogga | 0.78 | 0.71 | 0.38 | 0.63 | 12 |
| 27. | Tumkur | 0.61 | 0.62 | 0.75 | 0.66 | 9 |
| 28. | Udupi | 0.94 | 1.00 | 0.54 | 0.83 | 3 |
| 29. | Uttara Kannada | 0.87 | 0.75 | 0.60 | 0.74 | 5 |
| 30. | Yadgiri | 0.00 | 0.30 | 0.19 | 0.16 | 29 |

Simple SLSI is calculated by taking average of ecological security index, economic efficiency index and social equity index. The range of simple SLSI is from 0.26 to 0.68 and that of weighted SLSI is from 0.17 to 0.62 which indicate the wide variations in sustainable livelihood security across the districts due to ecological, social and economic variations. Dakshina Kannada district occupied first position in both simple SLSI and Weighted SLSI indicating the high level of sustainable livelihood security in the district with simple SLSI of 0.68 and WSLSI of 0.62. In case of simple SLSI better performing districts are Dakshina Kannada, Bengaluru Urban, Udupi and Kodagu and worst performing states are Raichur (0.26), Yadgiri (0.27), Koppal (0.33) and Bellary (0.33). In case of weighted SLSI better performing districts are Dakshina kannada, Udupi, Dharwad and Chikkamagaluru with WSLSI of 0.625, 0.526,0.522 and 0.509 respectively. The worst performing districts in WSLSI are Uttara kannada, Raichur, Yadgiri and Koppal. The better performing districts in both simple SLSI and weighted SLSI are Dakshina Kannada, Udupi and Chikkamagaluru whereas worst performing districts are Raichur, Yadagiri and Koppal which needs to be given priority in boosting the agricultural investment and overall development of districts in terms health, education and technology. (Table 7)

**Table 7: Sustainable Livelihood Security Index of Karnataka (India)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sl. No.** | **Districts** | **simple SLSI** | **Rank** | **WSLSI** | **Rank** |
| 01. | Bagalkot | 0.38 | 24 | 0.377 | 21 |
| 02. | Bengaluru Rural | 0.50 | 11 | 0.462 | 9 |
| 03. | Bengaluru Urban | 0.59 | 2 | 0.361 | 22 |
| 04. | Belagavi | 0.42 | 22 | 0.408 | 20 |
| 05. | Bellary | 0.33 | 27 | 0.288 | 26 |
| 06. | Bidar | 0.39 | 23 | 0.358 | 23 |
| 07. | Vijayapura | 0.42 | 21 | 0.413 | 19 |
| 08. | Chamarajnagara | 0.54 | 6 | 0.456 | 13 |
| 09. | Chickkaballapura | 0.47 | 17 | 0.447 | 14 |
| 10. | Chikkamagaluru | 0.55 | 5 | 0.509 | 4 |
| 11. | Chitradurga | 0.34 | 26 | 0.325 | 25 |
| 12. | Dakshina Kannada | 0.68 | 1 | 0.625 | 1 |
| 13. | Davanagere | 0.47 | 18 | 0.460 | 10 |
| 14. | Dharwad | 0.53 | 7 | 0.522 | 3 |
| 15. | Gadag | 0.49 | 14 | 0.469 | 7 |
| 16. | Kalaburgi | 0.38 | 25 | 0.354 | 24 |
| 17. | Hasan | 0.53 | 8 | 0.501 | 5 |
| 18. | Haveri | 0.44 | 20 | 0.434 | 17 |
| 19. | Kodagu | 0.58 | 4 | 0.467 | 8 |
| 20. | Kolar | 0.49 | 12 | 0.439 | 15 |
| 21. | Koppal | 0.33 | 28 | 0.285 | 27 |
| 22. | Mandya | 0.48 | 16 | 0.459 | 11 |
| 23. | Mysuru | 0.51 | 10 | 0.497 | 6 |
| 24. | Raichur | 0.26 | 30 | 0.205 | 29 |
| 25. | Ramanagar | 0.48 | 15 | 0.457 | 12 |
| 26. | Shivmogga | 0.49 | 13 | 0.415 | 18 |
| 27. | Tumkur | 0.47 | 19 | 0.435 | 16 |
| 28. | Udupi | 0.59 | 3 | 0.526 | 2 |
| 29. | Uttara Kannada | 0.53 | 9 | 0.174 | 30 |
| 30. | Yadgiri | 0.27 | 29 | 0.234 | 28 |

**Conclusion:**

The Sustainable Livelihood Security Index (SLSI) serves as a potent tool for assessing the essential conditions for sustainable development within a development planning framework. Districts showing poor performance in SLSI should be prioritized for agricultural investment, focusing on implementing new technologies, upgrading infrastructure, establishing food processing industries, and providing financial and marketing support. For districts with low scores in Ecological Security Index, emphasis should be on promoting agroforestry, afforestation, soil and water conservation, and expanding cultivated areas. However, even better-performing districts must concentrate on biodiversity conservation and ecological balance maintenance.

If a district's Economic Efficiency Index lags behind other indices, efforts should be directed towards enhancing agricultural productivity and creating more employment opportunities to ensure food and income security. Similarly, districts with lower scores in the Social Equity Index require heightened attention to education, healthcare, community participation, and rural infrastructure development.

SLSI not only identifies districts in need of immediate intervention but also pinpoints specific areas for focus within each region, aiding in targeted development planning. Addressing sustainability challenges can be facilitated by evaluating SLS status in specific regions. Continuously calculating SLSI over time enhances its applicability in solving sustainable development issues and evaluating the effectiveness of government programs aimed at agricultural and overall sustainable development.

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