CHAPTER VIII
DEVELOPMENT, ENERGY AND ENVIRONMENT:
FACTOR DIMENSIONS
CHAPTER VIII

RURAL REGIONAL DEVELOPMENT, ENERGY AND ENVIRONMENT: THE FACTOR DIMENSIONS

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8.0 Rural Regional Development, Energy and Environment:
The Factor Dimension

The main aim of the present study is to examine the integrated nature of energy use and environment in the process of rural regional development. The analysis of inter-relationship of these three important dimensions was attempted using the data collected through primary survey. From this information base, sensitive variables which are very much pertinent to explain the interwoven structure of these three elements were identified. There were 39 variables emerged under three inter related dimensions of development, energy and environment (Table 8.1). These variables include both qualitative and quantitative ones. A review of the existing literature on methodology for identifying the inter relationships, points out the method of factor analysis as the one widely used and best suited. To specify the variables for factor analysis, first a zero-order correlation matrix was computed for the selected 39 variables, the list of which is included in Table 8.1.

Correlation matrix thus built up (Appendix 8.1) indicates that among the development variables, family size, literacy level, total land area cultivated, land under wet cultivation, exhibit a strong positive correlation with the energy and environment variables (0.001 level of significance). In the energy dimension, the different types of energy consumption and agricultural equipments were found to be highly correlated with the development and environment variables. The environmental variables which exhibited a high positive association are deepened depth of the wells, earlier and current depth of the wells and the amount of fuel collected.
<table>
<thead>
<tr>
<th>Development variables</th>
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<tbody>
<tr>
<td>1. Family size</td>
</tr>
<tr>
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</tr>
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<td>3. Literates</td>
</tr>
<tr>
<td>4. Farmers</td>
</tr>
<tr>
<td>5. Non-farmers</td>
</tr>
<tr>
<td>6. Land under dry</td>
</tr>
<tr>
<td>7. Total land cultivated</td>
</tr>
<tr>
<td>8. Number of wet croppers</td>
</tr>
<tr>
<td>9. Number of dry croppers</td>
</tr>
<tr>
<td>10. Land under own cultivation</td>
</tr>
<tr>
<td>11. Land under share</td>
</tr>
<tr>
<td>12. Land under wet</td>
</tr>
<tr>
<td>13. Total number of livestock</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Energy</th>
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<tbody>
<tr>
<td>1. Electric Pumpsets - one</td>
</tr>
<tr>
<td>2. Electric Pumpsets - two</td>
</tr>
<tr>
<td>3. Electric Pumpsets - three</td>
</tr>
<tr>
<td>5. Agricultural Implements - Animal</td>
</tr>
<tr>
<td>6. Agricultural Implements - Electrical</td>
</tr>
<tr>
<td>7. Agricultural Implements - diesel</td>
</tr>
<tr>
<td>8. Firewood consumption/month</td>
</tr>
<tr>
<td>9. Dung consumption/month</td>
</tr>
<tr>
<td>10. Kerosene consumption/month</td>
</tr>
<tr>
<td>11. Manual energy</td>
</tr>
<tr>
<td>12. Animal energy</td>
</tr>
<tr>
<td>13. Mechanical energy</td>
</tr>
<tr>
<td>14. Organic manure consumption</td>
</tr>
<tr>
<td>15. Fertiliser consumption</td>
</tr>
<tr>
<td>16. Diesel consumption</td>
</tr>
<tr>
<td>17. Electric consumption</td>
</tr>
<tr>
<td>18. Crop production</td>
</tr>
<tr>
<td>19. By product production</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Earlier depth</td>
</tr>
<tr>
<td>2. Time for irrigation one acre</td>
</tr>
<tr>
<td>3. Amount of fuel collected</td>
</tr>
<tr>
<td>4. Time taken for fuel collection</td>
</tr>
<tr>
<td>5. Dung for field manuring</td>
</tr>
<tr>
<td>6. Deepened depth</td>
</tr>
<tr>
<td>7. Current depth</td>
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</table>
Factor analysis is an useful technique in identifying the underlying dimensions or factors from a large set of data, and the method can be used for easier understanding of complex phenomena. It is a technique used to identify a relatively small number of factors that can be used to represent the relationships among sets of inter-related variables.

8.1 Factor Analysis

Factor analysis usually proceeds in four steps. In the first step, the correlation matrix for all variables is computed. This matrix not only helps to identify the nature and extent of relationships among the variables, but also exhibits the appropriateness of a particular variable for further analysis. In the second step, factor extraction is done to transform a set of correlated variables to a set of uncorrelated variables as principal components. Third step is rotation wherein the factors were related to make them more interpretable. At the fourth step, scores for each factor are computed for each case. These scores are generally used for spatial representations.

Factor analysis was carried out at two levels, one taking up all the 680 sample farmers from six sample villages together with 39 identified variables, and another one taking up sample farmers of each sample village separately with 15 identified variables at village level. The variables of the original data matrix 680 x 39 are correlated with each other by multiple correlation method giving a correlation matrix of 39 x 39 (Appendix 8.1). Then factors and factor loadings were computed through extraction of the
variables (Table 8.4). The factors provide a means of discovering the underlying unities or constructs for determining the patterns, regularities and basic structure of a large number of variables. The factor loading represents the amount of correlation of a particular variable with the corresponding factor. The more a variable shares common factors with other variables, the higher is its communality.

Communality provides an indication of how successful the factors are in explaining the original data. Communality may also be defined as the 'variables validity'.

In the present study, among the variables, family size alone has 32.8 percent as communality. Out of the 39 variables, 10 variables has 71.3 percent of total variance. These ten variables are family size, illiterates, literates, farmers, non-farmers dry land area, total cultivated land, Number of wet and dry croppers and earlier depth of the well. As the communality for these variables is higher, one may also assume that these are the ones which are closely related to the other variables of the data set.

8.1.1 Factor Analysis with all the Samples

Six hundred and eighty seven households from six sample villages with 39 variables have been subjected to factor analysis. Ten factors were emerged as significant ones and these dimensions together account for three fourth of the variance. These dimensions are discussed below. Variables having factor loading more than ±.4 have been considered in identifying and for interpreting the factors.
<table>
<thead>
<tr>
<th>Variables</th>
<th>Factor Loadings</th>
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<tbody>
<tr>
<td>Dry land cultivated</td>
<td>0.45917</td>
</tr>
<tr>
<td>Total land cultivated</td>
<td>0.78339</td>
</tr>
<tr>
<td>No. of wet croppers</td>
<td>0.42289</td>
</tr>
<tr>
<td>Land on their own</td>
<td>0.79707</td>
</tr>
<tr>
<td>Electricity connection-2</td>
<td>0.55364</td>
</tr>
<tr>
<td>Electricity connection-3</td>
<td>0.64717</td>
</tr>
<tr>
<td>Wet land cultivated</td>
<td>0.81365</td>
</tr>
<tr>
<td>Manual implements</td>
<td>0.61165</td>
</tr>
<tr>
<td>Animate implements</td>
<td>0.47362</td>
</tr>
<tr>
<td>Electrical implements</td>
<td>0.81042</td>
</tr>
<tr>
<td>Diesel implements</td>
<td>0.84451</td>
</tr>
<tr>
<td>Manual energy</td>
<td>0.60824</td>
</tr>
<tr>
<td>Mechanical energy</td>
<td>0.75050</td>
</tr>
<tr>
<td>Organic manure</td>
<td>0.68847</td>
</tr>
<tr>
<td>Chemical fertilizer</td>
<td>0.82542</td>
</tr>
<tr>
<td>Diesel consumption</td>
<td>0.80895</td>
</tr>
<tr>
<td>Electricity consumption</td>
<td>0.43106</td>
</tr>
<tr>
<td>Deepened depth</td>
<td>0.49246</td>
</tr>
<tr>
<td>current depth</td>
<td>0.46790</td>
</tr>
</tbody>
</table>
Factor 2

No. of wet croppers .47707
Earlier depth of wells .87717
Electricity connection-1 .87717
Manual implements .53329
Animate implements .56380
Time for irrigation .87311
Animal energy .45958
Organic manure .42986
Current depth .74511

Factor 3

Manual energy .50331
Crop production .92241
By products .82252

Factor 4

Family Size .90506
Literates .48186

Factor 5

Illiterates .94081

Factor 6

Amount of fuel collected .83146
Time for fuel collection .73887
<table>
<thead>
<tr>
<th>Factor</th>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Landuse share</td>
<td>0.89704</td>
</tr>
<tr>
<td>Factor 8</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Farmers</td>
<td>0.82147</td>
</tr>
<tr>
<td></td>
<td>Non Farmers</td>
<td>0.52648</td>
</tr>
<tr>
<td>Factor 9</td>
<td>No. of dry croppers</td>
<td>0.46142</td>
</tr>
<tr>
<td>Factor 10</td>
<td>Dry land cultivated</td>
<td>0.40820</td>
</tr>
<tr>
<td></td>
<td>Total land cultivated</td>
<td>0.46076</td>
</tr>
</tbody>
</table>
8.1.1.1 Factor One: Dimension of HYV Farmers

Factor One explains about 32 percent of variations. Variables that are strongly correlated with Factor One are listed in Table 8.4 and Factor One may thus be Dimension of HYV Farming. This is the primary factor. Significant variables in this factor may be related to agricultural developments, energy and environments. As the study belongs to the rural regions, the agricultural variables are dominant with high positive loadings. The environment which has an immediate effect from development and energy consumption, has two significant variables in the factor. They are deepened depth of the well with a factor loading of (0.49) and (0.46) respectively. None of the significant variables in the Factor One has negative loading.

8.1.1.2 Factor Two: Dimension of Irrigation and Energy

The second factor contribution in explaining the total variance is 6.8 percent. It exhibits high positive association with the environment variables such as earlier depth of the well (0.8771), time for irrigation (.8731) and current depth of the well (.7451). Moderate positive association is found with energy variables such as well with one electric pumpsets, manual and animate equipments and organic manure consumption. Wetland which belongs to the dimension of development, loads around 0.5. This kind of factorial association indicates that higher the energy consumption greater will be the environmental impacts. This confirms the findings of chapter 6 wherein the time for irrigation is higher for the wet crops which use a high amount of direct and indirect sources of energy.
8.1.1.3 Factor Three: Dimension of Crops output and Energy

The third factor accounts for 4.5 percent of the total variance. The factor includes only three significant variables such as crop production (.9224) and crop by products production (.8225) and manual energy (.5033). Manual energy is highly associated to crop production and by products as food and fuel. Factor three exhibited an insignificant negative association towards dry cropping and animal energy. From this, it may be inferred that crop output and by products and energy especially manual energy are an associated phenomenon.

8.1.1.4 Factor Four: Social Dimension

Factor Four accounts for 4.3 percent of variance and family size and literacy emerge as significant variables. From the factor loadings of these two variables (0.9 and 0.75), it is evident that family size is an influencing determinant of literacy. The factor exhibits a negative association to land under dry cultivation and dryland farmers, agricultural equipments and commercial energy consumption. Hence it may be thought that the literacy will be less among the dry land farmers who may be generally landless share croppers and marginal farmers. Their poor economy may restrict them in using equipments and consuming commercial energy. This relationship may be compared with the commercial energy consumption of landless cultivators and marginal farmers in chapter 6.

8.1.1.5 Factor Five: Dimension of Literacy

This factor explains about 4 percent of total variance and literacy is the only significant variable. The factor exhibits a
negative association to many of the development energy and environment variables. Higher the literacy, higher will be the development inputs and energy consumption.

8.1.1.6 Factor Six: Dimension of Fuel Collection

Dimension of fuel collection includes two significant variables, of amount of fuel collected and time taken for fuel collection with a high loading of 0.83 and 0.73 respectively. This factor accounts for 3 percent of variance. The factor has negative association with literates, non-farmers, farmers with three electric pumpsets, mechanical energy and kerosene consumers and dung for field manuring. Thus it is clear that the fuel collection is the activity of landless and marginal farmers whose socio-economic conditions are poor. Those who are economically better off may not go for fuel collection.

8.1.1.7 Factor Seven: Dimension of Share Cropping

Land under share cropping forms the seventh factor with 2.8 percent of variance and this factor has less association with many other variables both positively and negatively. It has negative loading towards agricultural equipments, firewood and kerosene consumption, mechanical energy for agricultural operations and to the variables related to the depth of the wells. Most of the share croppers of the sample villages are cultivators of rainfed lands, and they generally adopt traditional methods and use agricultural by products as cooking fuel, and as such, they will definitely have negative association towards commercial energy sources and methods. This may also be compared with the variables like agri-
cultural equipments possession and consumption of organic and fertilizers which were discussed earlier in chapter 6.

8.1.1.8 Factor Eight: Dimension of Farming Community

This factor explains a 2.4 percent of variance. It has two significant variable, one with a positive loading (Farmers = 0.82) and the other with negative loading (nonfarmers = -0.56). This itself clearly indicates that farmer and non-farmers have a different socio-economic pattern which solely determines the rate and type of energy consumption pattern. The differential rate of energy consumption will in turn pose different problems towards the environment.

8.1.1.9 Factor Nine: Dimension of Dryland Farmers

This factor has the dryland farmers as a significant variable and it accounts for 2 percent of total variance. It has negative association with agricultural equipments, commercial energy, organic manure and fertiliser consumption and with depth of the wells. Dry crops are generally cultivated by using traditional methods and locally available farm manures. Hence, the commercial energy and well depth may be expected to have negative association in dryland farming.

8.1.1.10 Factor Ten: Dimension of Cultivated Land

This factor holds a share of 1.4 percent of total variance and has two significant variables such as total cropped land and land under dry crops. It has positive association to most of the variables of the three dimensions and negative association to the variable of fuel collection. From this, it is evident that higher
the land put under cultivation, lesser will be the fuel collection.

8.2 Factor Dimensions for the Sample Villages

8.2.0 Factor Analysis with Selected Variables

As the sample villages belong to different development regions, each sample village possesses varied socio-economic and environmental conditions. And also each village has differential rate of energy consumption and environmental impact owing to its status of development. Hence, factor analysis was conducted for each village separately. For the village level analysis, 15 sensitive variables was selected from the list of 39 variables allowed for the factor analysis with all 680 sample households. The selection of reduced list of variables was done so as to have a more meaningful interpretation of relationship between development, energy and environments at village level. With these 15 variables, both village level factor analysis and total sample factor analysis were carried out. Of the 15 variables (Table 8.3) the first six variables belong to the dimension of development, the next eight variables to the energy dimension, and the remaining one for the environmental dimension.

8.2.1 Correlation Analysis

The 15 x 15 correlation matrix (Table 8.4) for 680 samples was prepared as a first step to proceed to the factorisation of variables. Of the variables, the percent of wetland under cultivation, a determinant variable of development, has a high positive correlation with by products (0.81), manual energy (0.77) manure and fertiliser consumption (0.69) powered implements (0.77),
### TABLE 8.3
TRANSFORMED VARIABLES

<table>
<thead>
<tr>
<th>Variables</th>
<th>Specification of Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Total population</td>
<td>Total population</td>
</tr>
<tr>
<td>2. Literates</td>
<td>Percent of literates to total population</td>
</tr>
<tr>
<td>3. Farmers</td>
<td>Percent of farmers to total population</td>
</tr>
<tr>
<td>4. Land on own cultivation</td>
<td>Percent of land cultivated on their own to total cultivated land</td>
</tr>
<tr>
<td>5. Wetland cultivated</td>
<td>Percent of wetland to the total cultivated land</td>
</tr>
<tr>
<td>6. Livestock</td>
<td>Proportion of total livestock to the total land cultivated</td>
</tr>
<tr>
<td>7. Powered implements</td>
<td>Percent of electric pumpsets, electric and diesal agricultural implements to the total land cultivated</td>
</tr>
<tr>
<td>8. Manual and animal equipments</td>
<td>Percent of manual and animate implements to the total land cultivated</td>
</tr>
<tr>
<td>9. Household energy consumption</td>
<td>Total consumption of firewood, dung and kerosene</td>
</tr>
<tr>
<td>10. Manual and animal energy</td>
<td>Total consumption of manual and animal energy for one crop seasons in kcal per total land cultivated</td>
</tr>
<tr>
<td>11. Mechanical energy</td>
<td>Total mechanical energy consumption for one crop season in kcal per total land cultivated</td>
</tr>
<tr>
<td>12. Manure and fertiliser consumption</td>
<td>Total consumption of organic manure and chemical fertiliser in kilograms for one crop season per total land cultivated</td>
</tr>
<tr>
<td>13. Diesal and electricity consumption</td>
<td>Total diesal and electricity consumption in kcal for one crop season per total land cultivated</td>
</tr>
<tr>
<td>14. By Products</td>
<td>Total amount of crop by products for one crop season in kilograms per total land cultivated</td>
</tr>
<tr>
<td>15. Fuel</td>
<td>Proportion amount of fuel collected to the total population</td>
</tr>
</tbody>
</table>
### Table 8.4

**Energy, Environment and Development: Correlation Matrix for the Sample Villages**

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.00</td>
<td>0.00</td>
<td>-0.11*</td>
<td>0.03</td>
<td>-0.01</td>
<td>0.02</td>
<td>-0.04</td>
<td>-0.09</td>
<td>-0.20**</td>
<td>0.03</td>
<td>-0.04</td>
<td>0.09</td>
<td>0.14**</td>
<td>-0.00</td>
<td>-0.15**</td>
</tr>
<tr>
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<td>0.10</td>
<td>0.00</td>
<td>-0.09</td>
<td>0.09</td>
<td>0.00</td>
<td>0.06</td>
<td>0.01</td>
<td>0.21**</td>
<td>0.12</td>
<td>0.09</td>
<td>0.12</td>
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<td>0.04</td>
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<td>-0.00</td>
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<td>0.01</td>
<td>0.12*</td>
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<td>4</td>
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<td>0.77**</td>
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<td>0.69**</td>
<td>0.07</td>
<td>0.81**</td>
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<td>0.66**</td>
<td>0.08</td>
<td>0.70**</td>
<td>0.06</td>
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<td>0.05</td>
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<td>0.58**</td>
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<td>-0.10</td>
<td>0.16**</td>
<td>-0.18**</td>
<td>0.18**</td>
<td>0.18**</td>
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<td>0.18**</td>
<td>0.18**</td>
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</tr>
<tr>
<td>9</td>
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<td>-0.04</td>
<td>0.04</td>
<td>-0.07</td>
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<td>0.36**</td>
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<td>0.81**</td>
<td>0.81**</td>
<td>0.81**</td>
<td>0.81**</td>
<td>0.81**</td>
<td>0.81**</td>
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<tr>
<td>11</td>
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<td>0.31**</td>
<td>0.06</td>
<td>0.30**</td>
<td>-0.03</td>
<td>0.30**</td>
<td>0.03</td>
<td>0.30**</td>
<td>0.06</td>
<td>0.30**</td>
<td>0.09</td>
<td>0.30**</td>
<td>0.09</td>
<td>0.30**</td>
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<td>12</td>
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<td>0.67**</td>
<td>0.07</td>
<td>0.67**</td>
<td>0.07</td>
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<tr>
<td>13</td>
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<td>0.03</td>
<td>0.03</td>
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<td>1.00</td>
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</tr>
<tr>
<td>15</td>
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<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>


Note: * = 0.01 level of significance, ** = 0.001 level of significance
mechanical energy (0.36). It is thus clearly evident that the energy consumption rate will be higher for wet land cultivation which is the one that determines the development status of the farmers. Naturally higher energy consumption will lead to environmental deterioration. Of the energy variable, manual and animal operated implements are highly correlated with three development variables, (percent of wetland, percent of land owners and proportion of livestock) five energy variables (Powered implements, manual and animate energy, mechanical energy, diesel and electricity consumption, and by products) and one environment variable (fuel).

8.2.2 Factor Analysis with all the Sample Households

Out of the total 15 variables, 6 variables of development dimension alone explains about 74.1 percent of variance (Table 8.5). Energy variables help to explain 25 percent of variance and only 0.9 percent of variance is accounted by the environment variable. This may also be confirmed from the scree plotting of the variables, (Fig.8.1) against eigen values. This brings out that the development is the determining factor of energy and environment. The factor matrix of 15 variables for the 680 samples was transformed into six factors through extraction and rotation procedures. These six factors with a percent of variance of 54 percent have eigen value ranging from 0.29 to 4.1 (Table 8.6).

8.2.2.1 Factor One: Dimension of Agricultural Developments

Of the six factors, Factor one is the primary factor which explains about 28 percent of variance. It exhibited a high posi-
tive loading (Table 8.7) towards by products (0.9046), percent of wet land cultivated (0.8900), manual and animal-operated energy (0.8783), powered implements (0.7933) and manure and fertiliser consumption (0.7738). Almost all the variables exhibited positive loadings to this factor, excepting the household energy consumption which includes firewood, dung and kerosene. Here, also one may find that the development variables have high positive loading, indicating the predominance of development dimension.

In the present analysis, primary data collection were made at village level to examine the nexus of these three dimensions. Exhibiting each of the sample spatially on the map for the sample villages separately is found to be inadequate for any comparative study. Hence, percentage of samples for the different levels of intensity of factor score values were identified by taking class interval of factor score values. The intensity levels were categorised as very high, high, medium, low and very low. For all the six factors, nearly 90 percent of the sample scores range from -1 to +1. The remaining 10 percent of the samples secured positively around 1.8 and negatively around 3.

Agaramcheri has 5 percent of samples with high and very high intensity levels of scores for Factor One (Table 8.8). Among the sample villages, Kunnathur, the village of very low development region has high percent of samples (93%) under the very low intensity level for factor one (Fig.8.2). Elagiri even though belongs to low development region, is highly predominant in lieu of the agricultural development dimension. This may also be compared with the agricultural development of this village from chapter VI. The
highest score value for this factor is found with one sample (18.13) in Nedumpuli which has shown a clear dominance over this factor.

8.2.2.2 Factor Two: Dimension of Agricultural Energy

This factor has four energy variables as the predominant ones accounting for 10.6 percent of variance. The dominant variables with a higher factor loading are manual and animal-operated equipments (0.9175), mechanical energy (0.6534), proportion of livestock (0.5086) and powered implements (0.4160). The factor has negative association with the variables such as total population, literacy, percent of farmers and fuel. From this, it may be assumed that agricultural energy consumption is highly related to the land area under cultivation and land ownership. Higher is the land under cultivation on their own, more will be the energy consumption.

Compared to Factor One, Factor Two exhibits more number of samples with higher scores. Elagiri farmers score high (Fig.8.3) to factor two and they are the largest consumers of commercial energy for agricultural operation. Nearly 17.5 percent of the samples of this villages scored high. In the remaining villages, the highest score for samples lies between +2 and -1. The highest percent for lowest score is found in Kunnathur (Table 8.9).

8.2.2.3 Factor Three: Dimension of Farming Inputs

Factor Three is named as Dimension of Farmer Input where in only two variables of diesel and electricity consumption (0.6133) and manure and fertiliser consumption load highly. This factor has
### TABLE 8.5

**ENERGY, ENVIRONMENT AND DEVELOPMENT: EIGEN VALUES AND PERCENTAGE OF VARIANCE OF THE VARIABLES FOR THE SAMPLE VILLAGES, 1991**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Eigen Value</th>
<th>Percent of variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Population</td>
<td>4.38034</td>
<td>29.2</td>
</tr>
<tr>
<td>2. Literates</td>
<td>1.94352</td>
<td>13.0</td>
</tr>
<tr>
<td>3. Percent of farmers</td>
<td>1.38566</td>
<td>9.2</td>
</tr>
<tr>
<td>4. Proportion of wetland to total land cultivated</td>
<td>1.25275</td>
<td>8.4</td>
</tr>
<tr>
<td>5. Percentage of land owners</td>
<td>1.11006</td>
<td>7.4</td>
</tr>
<tr>
<td>6. Proportion of livestock</td>
<td>1.04049</td>
<td>6.9</td>
</tr>
<tr>
<td>7. Powered implements</td>
<td>.88122</td>
<td>5.9</td>
</tr>
<tr>
<td>8. Manual and animal operated implements</td>
<td>.69173</td>
<td>4.6</td>
</tr>
<tr>
<td>9. Household energy consumption</td>
<td>.65760</td>
<td>4.4</td>
</tr>
<tr>
<td>10. Manual and animal energy</td>
<td>.61780</td>
<td>4.1</td>
</tr>
<tr>
<td>11. Mechanical energy</td>
<td>.34299</td>
<td>2.3</td>
</tr>
<tr>
<td>12. Manure and fertilizer consumption</td>
<td>.24199</td>
<td>1.6</td>
</tr>
<tr>
<td>13. Diesel and electricity consumption</td>
<td>.17432</td>
<td>1.2</td>
</tr>
<tr>
<td>14. By products</td>
<td>.5001</td>
<td>1.0</td>
</tr>
<tr>
<td>15. Consumption</td>
<td>.12961</td>
<td>0.9</td>
</tr>
</tbody>
</table>

### TABLE 8.6

**EIGEN VALUES AND PERCENTAGE OF VARIANCE OF THE FACTORS FOR THE SAMPLE VILLAGES, 1991**

<table>
<thead>
<tr>
<th>Factors</th>
<th>Eigen Value</th>
<th>Percent of variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Dimension of HYV farming</td>
<td>4.18675</td>
<td>27.9</td>
</tr>
<tr>
<td>2. Dimension of agricultural energy</td>
<td>1.59413</td>
<td>10.6</td>
</tr>
<tr>
<td>3. Dimension of farming agricultural inputs</td>
<td>.79399</td>
<td>5.3</td>
</tr>
<tr>
<td>4. Dimension of household farming community</td>
<td>.61808</td>
<td>4.1</td>
</tr>
<tr>
<td>5. Dimension of population</td>
<td>.59626</td>
<td>4.0</td>
</tr>
<tr>
<td>6. Dimension of landowners</td>
<td>.29607</td>
<td>2.0</td>
</tr>
<tr>
<td>Variables</td>
<td>Factor loading (+)</td>
<td>Factor loading (-)</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>--------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td><strong>Factor 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Proportion of wetland to total land cultivated</td>
<td>.89008</td>
<td></td>
</tr>
<tr>
<td>2. Powered implements</td>
<td>.79333</td>
<td></td>
</tr>
<tr>
<td>3. Manual and animal energy</td>
<td>.87832</td>
<td></td>
</tr>
<tr>
<td>4. Manure and fertilizer consumption</td>
<td>.77385</td>
<td></td>
</tr>
<tr>
<td>5. By products</td>
<td>.90466</td>
<td></td>
</tr>
<tr>
<td><strong>Factor 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Proportion of livestock</td>
<td>.50863</td>
<td></td>
</tr>
<tr>
<td>2. Powered implements</td>
<td>.41601</td>
<td></td>
</tr>
<tr>
<td>3. Manual and animal operated implements</td>
<td>.91751</td>
<td></td>
</tr>
<tr>
<td>4. Mechanical energy</td>
<td>.65344</td>
<td></td>
</tr>
<tr>
<td><strong>Factor 3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Manure and fertilizer consumption</td>
<td>.52528</td>
<td></td>
</tr>
<tr>
<td>2. Diesal and electricity consumption</td>
<td>.61334</td>
<td></td>
</tr>
<tr>
<td><strong>Factor 4</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Percentage of farmers</td>
<td>.67078</td>
<td></td>
</tr>
<tr>
<td><strong>Factor 5</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Population</td>
<td>.54992</td>
<td></td>
</tr>
<tr>
<td><strong>Factor 6</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Percent of landowners</td>
<td>.48173</td>
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</tr>
</tbody>
</table>
### Table 8.8

**Factor One: Frequency Grouping of Factor Scores for the Villages Index of Agriculture**

<table>
<thead>
<tr>
<th>Villages</th>
<th>V.H.</th>
<th>H</th>
<th>M</th>
<th>L</th>
<th>V.L.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
<tr>
<td>Nedumpuli</td>
<td>1</td>
<td>0.8</td>
<td>1</td>
<td>0.8</td>
<td>6</td>
</tr>
<tr>
<td>Irumbedu</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Palayanur-Kilpadi</td>
<td>1</td>
<td>1.0</td>
<td>1</td>
<td>1.0</td>
<td>2</td>
</tr>
<tr>
<td>Agaramcheri</td>
<td>1</td>
<td>0.8</td>
<td>5</td>
<td>4.2</td>
<td>9</td>
</tr>
<tr>
<td>Elagiri</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>1.6</td>
<td>12</td>
</tr>
<tr>
<td>Kunnathur</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3</td>
<td>0.4</td>
<td>9</td>
<td>1.3</td>
<td>31</td>
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</tbody>
</table>

### Table 8.9

**Factor Two: Frequency Grouping of Index of Agricultural Energy for the Villages**

<table>
<thead>
<tr>
<th>Villages</th>
<th>V.H.</th>
<th>H</th>
<th>M</th>
<th>L</th>
<th>V.L.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
<tr>
<td>Nedumpuli</td>
<td>8</td>
<td>6.7</td>
<td>2</td>
<td>1.6</td>
<td>3</td>
</tr>
<tr>
<td>Irumbedu</td>
<td>2</td>
<td>1.6</td>
<td>3</td>
<td>2.5</td>
<td>3</td>
</tr>
<tr>
<td>Palayanur-Kilpadi</td>
<td>10</td>
<td>10.0</td>
<td>8</td>
<td>8.0</td>
<td>4</td>
</tr>
<tr>
<td>Agaramcheri</td>
<td>5</td>
<td>4.2</td>
<td>1</td>
<td>0.8</td>
<td>4</td>
</tr>
<tr>
<td>Elagiri</td>
<td>12</td>
<td>10.0</td>
<td>9</td>
<td>7.5</td>
<td>9</td>
</tr>
<tr>
<td>Kunnathur</td>
<td>-</td>
<td>-</td>
<td>6</td>
<td>6.0</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>37</td>
<td>5.4</td>
<td>29</td>
<td>4.2</td>
<td>26</td>
</tr>
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</table>
a variance of about 5.3 percent to the total. It has negative loadings to the manual and animal operated implements, by products and household energy consumption. From this, it may be understood that wherever the commercial energy dominates, there the manual and animal-operated energy and traditional methods will be reduced.

With regard to farming input factor, Palayanur-Kilpadi has larger percent of (11%) samples having very high and high intensity of scores. The maximum score value for this factor is also seen in this villages with 5.07 and 3.98 in two of the samples. A high negative score value for the Factor is found in Agaramcheri with a farmer who owns a larger dry land under cultivation. From this, it is clear that agricultural inputs are highly consumed by the wet crops than the dry crops. Once again for this Factor also Kunnathur has a higher percent of samples (92%) with a lowest level of scores (Table 8.10 and Fig.8.4) for the Factor. It is to be noted here that this village largely cultivates dry crops than the wetcrops.

8.2.2.4 Factor Four: Dimension of Farming Community

This factor has only one significant variable where percent of farmers with a share to total variance is by 4.1 percent. It has a high load of 0.7 for this factor. The factor has negative association to most of the variables of the dimensions. The factor though helps to explain the development dimension, its association to the energy and environment variables is quite weak compared to the other developmental variables like wetland cultivation, owner-
### TABLE 8.10

FACTOR THREE: FREQUENCY GROUPING INDEX OF AGRICULTURAL INPUTS FOR THE VILLAGES

<table>
<thead>
<tr>
<th>Villages</th>
<th>V.H.</th>
<th>H</th>
<th>M</th>
<th>L</th>
<th>V.L.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
<tr>
<td>Nedumpuli</td>
<td>6</td>
<td>5.0</td>
<td>3</td>
<td>2.5</td>
<td>6</td>
</tr>
<tr>
<td>Irumbedu</td>
<td>8</td>
<td>6.7</td>
<td>1</td>
<td>0.8</td>
<td>5</td>
</tr>
<tr>
<td>Palayanur-Kilpadi</td>
<td>8</td>
<td>8.0</td>
<td>3</td>
<td>3.0</td>
<td>8</td>
</tr>
<tr>
<td>Agaramcheri</td>
<td>8</td>
<td>6.7</td>
<td>5</td>
<td>4.2</td>
<td>6</td>
</tr>
<tr>
<td>Elagiri</td>
<td>10</td>
<td>8.3</td>
<td>2</td>
<td>1.6</td>
<td>5</td>
</tr>
<tr>
<td>Kunnathur</td>
<td>1</td>
<td>1.0</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>41</td>
<td>6.0</td>
<td>14</td>
<td>2.4</td>
<td>31</td>
</tr>
</tbody>
</table>

### TABLE 8.11

FACTOR FOUR: FREQUENCY GROUPING INDEX OF FARMING COMMUNITY FOR THE VILLAGES

<table>
<thead>
<tr>
<th>Villages</th>
<th>V.H.</th>
<th>H</th>
<th>M</th>
<th>L</th>
<th>V.L.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
<tr>
<td>Nedumpuli</td>
<td>8</td>
<td>6.7</td>
<td>1</td>
<td>0.8</td>
<td>-</td>
</tr>
<tr>
<td>Irumbedu</td>
<td>4</td>
<td>3.3</td>
<td>7</td>
<td>5.8</td>
<td>14</td>
</tr>
<tr>
<td>Palayanur-Kilpadi</td>
<td>8</td>
<td>8.0</td>
<td>8</td>
<td>8.0</td>
<td>9</td>
</tr>
<tr>
<td>Agaramcheri</td>
<td>10</td>
<td>8.3</td>
<td>8</td>
<td>6.7</td>
<td>7</td>
</tr>
<tr>
<td>Elagiri</td>
<td>13</td>
<td>10.8</td>
<td>6</td>
<td>5.0</td>
<td>3</td>
</tr>
<tr>
<td>Kunnathur</td>
<td>1</td>
<td>1.0</td>
<td>1</td>
<td>1.0</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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<td>31</td>
<td>4.5</td>
<td>38</td>
</tr>
</tbody>
</table>
## Table 8.12

**Factor Five: Frequency Grouping Index of Total Population for the Villages**

<table>
<thead>
<tr>
<th>Villages</th>
<th>V.H.</th>
<th>H</th>
<th>M</th>
<th>L</th>
<th>V.L.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
<tr>
<td>Nedumpuli</td>
<td>6</td>
<td>5.0</td>
<td>11</td>
<td>9.2</td>
<td>8</td>
</tr>
<tr>
<td>Irumbedu</td>
<td>5</td>
<td>4.2</td>
<td>9</td>
<td>7.6</td>
<td>14</td>
</tr>
<tr>
<td>Palayanur-Kilpadi</td>
<td>3</td>
<td>3.0</td>
<td>12</td>
<td>12.0</td>
<td>7</td>
</tr>
<tr>
<td>Agaramcheri</td>
<td>8</td>
<td>6.7</td>
<td>7</td>
<td>5.8</td>
<td>8</td>
</tr>
<tr>
<td>Elagiri</td>
<td>4</td>
<td>3.3</td>
<td>3</td>
<td>2.5</td>
<td>8</td>
</tr>
<tr>
<td>Kunnathur</td>
<td>11</td>
<td>11.0</td>
<td>4</td>
<td>4.0</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>37</td>
<td>5.5</td>
<td>46</td>
<td>6.8</td>
<td>53</td>
</tr>
</tbody>
</table>

## Table 8.13

**Factor Six: Frequency Grouping Index of Land Owners for the Villages**

<table>
<thead>
<tr>
<th>Villages</th>
<th>V.H.</th>
<th>H</th>
<th>M</th>
<th>L</th>
<th>V.L.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
<tr>
<td>Nedumpuli</td>
<td>7</td>
<td>5.8</td>
<td>12</td>
<td>10.0</td>
<td>16</td>
</tr>
<tr>
<td>Irumbedu</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>2.5</td>
<td>10</td>
</tr>
<tr>
<td>Palayanur-Kilpadi</td>
<td>5</td>
<td>5.0</td>
<td>14</td>
<td>14.0</td>
<td>26</td>
</tr>
<tr>
<td>Agaramcheri</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>1.6</td>
<td>9</td>
</tr>
<tr>
<td>Elagiri</td>
<td>1</td>
<td>0.8</td>
<td>-</td>
<td>-</td>
<td>7</td>
</tr>
<tr>
<td>Kunnathur</td>
<td>2</td>
<td>2.0</td>
<td>7</td>
<td>7.0</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>15</td>
<td>2.2</td>
<td>38</td>
<td>5.5</td>
<td>88</td>
</tr>
</tbody>
</table>
ship and so on. The factor is found to be quite dominant in the villages of low and medium development regions (Fig.8.5). The reason may be larger proportion of subsistence farmers found in the villages. The scores with a low intensity are found to be high with 87 percent of samples in Kunnathur (Table 8.11). The highest positive score value (4.346) is found in Elagiri, the village of low development region. The highest negative score value (-1.9) is seen in Nedumpuli.

8.2.2.5 Factor Five: Dimension of Population

Total population is the only variable found with a higher loading (0.55) in this factor, and this factor explains about 4 percent of variance. This factor has negative association to literacy, percent of farmers, percent of wetland area, percent of owners, powered implements, mechanical energy and manure and fertiliser consumption. As household energy consumption and manual and animate energy and livestock maintenance are directly related to population, it shows positive association to this factor. More number of samples show higher intensity of scores to this factor ranging from 5-8 in Elagiri to 15 percent in Kunnathur (Table 8.12). The percent of samples with a low intensity score is found to be less in the villages of very high and high development regions (Fig.8.6). Palayanur-Kilpadi has 61 percent of samples to the low intensity score which is the least among the sample villages. The maximum negative score is found in Elagiri (-3.2) while the highest positive score is in Nedumpuli (2.3).

8.2.2.6 Factor Six: Dimension of Land Owners

This factor has a high loading only for percent of owners
NORTH ARCOT DISTRICT
SAMPLE VILLAGES

DIMENSION OF POPULATION: FACTOR - V

REFERENCE

Very high (> 1.0)
High (0.6 - 1.0)
Medium (0.3 - 0.6)
Low (0 - 0.3)
Very low (< 0)

FIG. 8.6
(0.5) and the factor exhibits positive association to most of the variables, excepting to percent of wet land cultivated, powered implements, mechanical energy and diesel and electricity consumption. Though percent of land owners is an determinant variable of development, energy consumption is generally associated to the crops cultivated and nature and method of cultivation. This factor helps to explain only about 2 percent of total variance. Higher percent of samples with more intensity of scores is seen in Palayanur-Kilpadi (19%) and Nedumpuli (15.8%). Elagiri which is the village of low development region has lower percent to the higher intensity of scores (Table 8.13). Higher percent of samples with low intensity scores is also seen in Elagiri (Fig.8.7). The highest positive score for the samples is seen in Kunnathur (1.4) and the highest negative score (-1.9) is in Irumbedu. Nearly 8 percent of the samples shows a high negative score to this factor.

8.3 Factor Analysis - Sample Villages

Factor analysis was carried out with the selected variables for each village too, and the following is the result of factor analysis thus attempted.

8.3.1 Factor Dimensions of Nedumpuli

Nedumpuli belongs to very high development region. Correlation matrix of the variables indicated that energy variables exhibited a strong relationship to the variables of other two dimensions (Table 8.15). Of the development variables, the proportion of livestock to the gross cropped area had strong association to all the variables. For this village livestock is an important
### Table 8.2

**Energy, Environment and Development: Correlation Matrix for the Nedumpuli**

<table>
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<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
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</tr>
</tbody>
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Note: * = 0.01 level of significance, ** = 0.001 level of significance
### TABLE 8.15

**EIGEN VALUES AND PERCENTAGE OF VARIANCE FOR THE VARIABLES: NEDUMFILI**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Eigen Value</th>
<th>Percent of variance</th>
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</thead>
<tbody>
<tr>
<td>1. Population</td>
<td>6.23131</td>
<td>41.5</td>
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<tr>
<td>2. Literates</td>
<td>2.15805</td>
<td>14.4</td>
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<tr>
<td>3. Percent of farmers</td>
<td>1.83709</td>
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</tr>
<tr>
<td>4. Proportion of wetland to total land cultivated</td>
<td>1.08733</td>
<td>7.2</td>
</tr>
<tr>
<td>5. Percentage of land owners</td>
<td>.99826</td>
<td>6.7</td>
</tr>
<tr>
<td>6. Proportion of livestock</td>
<td>.73992</td>
<td>4.9</td>
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<td>7. Powered implements</td>
<td>.63510</td>
<td>4.2</td>
</tr>
<tr>
<td>8. Manual and animal operated implements</td>
<td>.52810</td>
<td>3.5</td>
</tr>
<tr>
<td>9. Household energy consumption</td>
<td>.43482</td>
<td>2.9</td>
</tr>
<tr>
<td>10. Manual and animal energy</td>
<td>.22485</td>
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</tr>
<tr>
<td>11. Mechanical energy</td>
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<td>.5</td>
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<td>12. Manure and fertilizer consumption</td>
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<td>.1</td>
</tr>
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<td>13. Diesal and electricity consumption</td>
<td>.01305</td>
<td>.1</td>
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<td>14. By products</td>
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<td>.1</td>
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<tr>
<td>15. Consumption</td>
<td>.00383</td>
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</tbody>
</table>

### TABLE 8.16

**EIGEN VALUES AND PERCENTAGE OF VARIANCE FOR FACTORS: NEDUMFILI**

<table>
<thead>
<tr>
<th>Factors</th>
<th>Eigen Value</th>
<th>Percent of variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Dimension of HYV farming</td>
<td>6.18973</td>
<td>41.3</td>
</tr>
<tr>
<td>2. Dimension of agricultural energy</td>
<td>1.82160</td>
<td>12.1</td>
</tr>
<tr>
<td>3. Dimension of farming agricultural inputs</td>
<td>1.26631</td>
<td>8.4</td>
</tr>
<tr>
<td>4. Dimension of household farming community</td>
<td>.64462</td>
<td>4.3</td>
</tr>
</tbody>
</table>
source of economy, which provided a subsidiary income to the dry farmers. In the factor analysis, four dimensions are emerging as significant ones. They are: dimension of HYV farming, dimension of traditional energy, dimension of commercial energy, and dimension of socio-economic. These dimensions put together explain about of total variation.

8.3.1.1 Factor One: Dimension of HYV Farming

The first factor may be referred as the prime factor, as it has a eigen value of 6.18 (Table 8.16). This factor indicated a clear cut relationship towards 7 variables such as the proportion of wet land under cultivation, powered implements, manual and animal energy, mechanical energy, manure and fertiliser consumption and by-products. The factor loading of these variables were high ranging from 0.93 to 0.99 (Table 8.17). The factor has a positive association to all the variables excepting the amount of fuel collected. As the factor show a high association to the variables of the three dimension, it may be understood that they are the interrelated ones, wherein the effect of one, has an immediate impact on the other. Among the samples, nearly 80 percent of them scored a very low intensity (Table 8.18).

8.3.1.2 Factor Two: Dimension of Traditional Energy

The second factor with a eigen value of 1.8, accounts for 12 percent of variance, and named as traditional energy. It showed a high positive relationship of 0.92 and 0.71 to the manual and animal operated implements and proportion of livestock to the gross cropped area respectively. This factor has negative association to the social variables of population and literacy, household
TABLE 8.17

ENERGY ENVIRONMENT AND DEVELOPMENT: FACTOR DIMENSIONS AND FACTOR LOADINGS FOR NEDUMPULI, 1991

<table>
<thead>
<tr>
<th>Variables</th>
<th>Factor loading (+)</th>
<th>Factor loading (-)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.9886</td>
<td>.9751</td>
</tr>
<tr>
<td>1. Proportion of wet land to total land cultivated</td>
<td>.9860</td>
<td>.9866</td>
</tr>
<tr>
<td>2. Powered implements</td>
<td>.9374</td>
<td>.9769</td>
</tr>
<tr>
<td>3. Manual and animal energy</td>
<td>.7184</td>
<td>.9291</td>
</tr>
<tr>
<td>4. Mechanical energy</td>
<td>.4692</td>
<td></td>
</tr>
<tr>
<td>5. Manual and fertiliser consumption</td>
<td>.9130</td>
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<tr>
<td>6. By products</td>
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</tr>
<tr>
<td></td>
<td>.6359</td>
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</tbody>
</table>

Note: Only factor loadings of +.4 or higher and -.4 or higher are included in the tabulation
<table>
<thead>
<tr>
<th>Factors</th>
<th>Very high</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>Very low</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
<tr>
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<td>-</td>
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<td>7</td>
<td>5.8</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 8.18

Frequency Grouping Scores for Nedumpuli
energy consumption and fuel collection. This may be due to the
factor’s strong association to the agricultural variables. For
this factor, the scores of very low intensity were found among 82
percent of the samples and only 8.3 percent of the samples were
identified with very high and high intensity (Table 8.18).

8.3.1.3 Factor Three: Dimension of Commercial Energy Consumption

Factor three is found to be highly related to the household
energy consumption and to diesel and electricity consumption. It
is named as the factor of commercial energy consumption with a
factor loading of 0.46 and 0.91 respectively. It has strong asso-
ciation to the commercial energy variables and a negative loading
to the traditional energy variables. From this, it may be assumed
that in the process of advancement in agriculture, the traditional
energy sources were replaced by the commercial energy sources. The
percentile grouping of factor three indicated that nearly 82.5
percent of the samples was with very low intensity of scores
(Table 8.18).

8.3.1.4 Factor Four: Dimension of Socio-economy

The dimension of socio-economy showed a high association
positively to the percentage farmers (0.63) and negatively to
literacy (−0.47). It also showed negative association to the
variables of HYV farming. Thus it is clear that the adoption of
new agronomic techniques is highly oriented to the farm size,
education and economy and not to the percentage of farmers. This
factor was seen among 75 percent of the samples with a very low
intensity score and 10 percent with a high and very high category
(Table 8.18).
8.3.2 Factor Dimensions of Irumbedu

Out of the total variables selected, for analytical purpose, percentage of wet land under cultivation and proportion of livestock and manual energy are the variables having strong relationship with other variables. The relationship of this variable ranges from 0.4 to 0.8 at 0.001 level of significance (Table 8.19). In this village, both dry and wet crops were given equal importance and the traditional and commercial energy sources were also equally used. From the correlation matrix, it may be seen that both manual and animal energy and mechanical energy had an equal relationship (0.4) with the other variables. There are five factor dimensions which jointly account for 56 percent of total variance (Table 8.21).

8.3.2.1 Factor One: Dimension of HYV Farming

This factor has a high positive associateship to three of the variables such as proportion of wet land under cultivation, percent of farm owners and powered implements. Manual and animal energy as mechanical energy were equally used in this village. The scores for this factor were high among 30 percent of the samples (Table 8.23).

8.3.2.2 Factor Two: Dimension of Traditional Farming

This factor has an eigen value of 1.65, and explains 11 percent of total variance (Table 8.21). It showed a close relationship to proportion of wet land under cultivation, proportion of livestock and manual energy (Table 8.22). Hence it is referred as the dimension of traditional farming. It has negative loading
TABLE 8.19

ENERGY, ENVIRONMENT AND DEVELOPMENT: CORRELATION MATRIX FOR THE IRUMBEDU

<table>
<thead>
<tr>
<th></th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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Note: * = 0.01 level of significance, ** = 0.001 level of significance
### Table 8.20

**Eigen Values and Percentage of Variance for the Variables: Irumbedu**

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<tr>
<th>Variables</th>
<th>Eigen Value</th>
<th>Percent of variance</th>
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<td>3. Percent of farmers</td>
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<td>4. Proportion of wetland to total land cultivated</td>
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<td>5. Percentage of land owners</td>
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<tr>
<td>6. Proportion of livestock</td>
<td>.95588</td>
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<td>8. Manual and animal operated implements</td>
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<td>15. Consumption</td>
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### Table 8.21

**Eigen Values and Percentage of Variance for Factors: Irumbedu**

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<th>Factors</th>
<th>Eigen Value</th>
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</tr>
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<td>1. Dimension of HYV farming</td>
<td>4.35002</td>
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<td>2. Dimension of agricultural energy</td>
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<td>3. Dimension of farming agricultural inputs</td>
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<td>4. Dimension of household farming community</td>
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<td>5. Dimension of population</td>
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<td>(-)</td>
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<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td><strong>Factor 1</strong></td>
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<td></td>
</tr>
<tr>
<td>1. Proportion of wetland to total land cultivated</td>
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</tr>
<tr>
<td>2. Percent of landowners</td>
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<tr>
<td>3. Powered implements</td>
<td>0.7528</td>
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<td>4. Manual and animal energy</td>
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<td>0.5090</td>
</tr>
<tr>
<td><strong>Factor 2</strong></td>
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<td></td>
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<td>1. Proportion of wetland to total land cultivated</td>
<td>0.4469</td>
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<td>2. Proportion of livestock</td>
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<td>3. Manual and animal-operated implements</td>
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<td><strong>Factor 3</strong></td>
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<td>1. Mechanical energy</td>
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<td>2. Manure and Fertilizer consumption</td>
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<td>3. Diesel and electricity consumption</td>
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<td><strong>Factor 4</strong></td>
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<td></td>
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<tr>
<td>1. Proportion of wetland to total land cultivated</td>
<td>0.8339</td>
<td></td>
</tr>
<tr>
<td><strong>Factor 5</strong></td>
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</tr>
<tr>
<td>1. Powered implements</td>
<td></td>
<td>0.4524</td>
</tr>
</tbody>
</table>

Note: Only factor loadings +.4 or higher and -.4 or higher are included in the tabulation.
percent of farmers, manure and fertiliser consumption, diesel and electricity consumption and fuel collection. This may indicate the factor's closeness to the traditional farming. The score values for the factor were of low and very low for 85 percent of the samples (Table 8.23).

8.3.2.3 Factor Three: Dimension of Commercial Energy

This factor shows negative association to most of the variables and it helps to explain 7.7 percent of the total variance. It has an eigen value of 1.15 (Table 8.21). It's positive association was high with manure and fertiliser consumption and diesel and electricity consumption. High negative association was found with mechanical energy. In this village, the small farmers are dominant who give more preference to the manual and animal energy in the cropping activity than the mechanical energy. As some of the large and medium farmers use a higher proportion of mechanical energy, the scoring of the samples for this factor is more in the low and very low intensity level for 73 percent of the samples (Table 8.23).

8.3.2.4 Factor Four: Dimension of Population

The fourth factor, dimension of population is so named as total population is the only variable found with high loading (0.833). It has an eigen value of 0.75 with about 5 percent of variance. Positive association of the factor is seen with percent of farmers, proportion of livestock, household energy consumption, manual energy and by-products (Table 8.22). As it is a social variable, it determines only availability of manual energy and rate of household energy consumption. Animal care and feed for the
Table 8.23

Frequency Grouping of Scores for Irumbedu

<table>
<thead>
<tr>
<th>Factors</th>
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<th></th>
<th>High</th>
<th></th>
<th>Medium</th>
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<th>Low</th>
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<th>Very low</th>
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<td>%</td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
</tr>
<tr>
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<td>6.6</td>
<td>4</td>
<td>3.3</td>
<td>15</td>
<td>12.5</td>
<td>58</td>
<td>48.5</td>
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<td>7.5</td>
<td>9</td>
<td>7.5</td>
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<td>32.5</td>
<td>57</td>
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<td>6</td>
<td>5</td>
<td>12</td>
<td>10</td>
<td>28</td>
<td>23.3</td>
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<td>7.5</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>18</td>
<td>-</td>
<td>82</td>
<td>83.3</td>
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</table>
animals in the form of by-products is generally provided by human beings. The scores for this factor is high in the low and very low intensity with 70 percent of the samples (Table 8.23).

8.3.2.5 Factor Five: Dimension of Powered Implements

This factor accounts for only 3.2 percent of variance. As powered implements is the only variable having a high factor loading, it is so named. It has high negative association to percent of land owners, manure and fertiliser consumption and by-products. The score value for this factor is found in the two extremes among 83.3% of samples with very low (16.6%) intensity.

8.3.3 Factor Dimensions of Palayanur-Kilpadi

This village represents the medium development region. The analysis for this village exhibited 6 factors. The correlation matrix of the variables of dimensions for this village (Table 8.24), showed that the percent of wet land cultivated, powered implements, manure and fertiliser consumption, manual and animal energy and mechanical energy are the variables highly associated to others. Eighty percent of total variance was explained by these six factors (Table 8.26). Dimensions of HYV farming, traditional farming and commercial energy alone account for 50 percent of total variance.

8.3.3.1 Factor One: Dimension of HYV Farming

This factor is the prime factor which has a very high loading (Table 8.27) to the variables such as proportion of wet land cultivated (0.97), percent of land owners (0.94) and mechanical energy (0.89). It has a high negative association to manual energy
TABLE 8.12

ENERGY, ENVIRONMENT AND DEVELOPMENT: CORRELATION MATRIX FOR THE PALAYANUR-KILPADI

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Note: * = 0.01 level of significance, ** = 0.001 level of significance
### TABLE 8.25

**EIGEN VALUES AND PERCENTAGE OF VARIANCE FOR THE VARIABLES: PALAYANUR-KILPADI**

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<th>Eigen Value</th>
<th>Percent of Variance</th>
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</thead>
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<td>1. Population</td>
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<tr>
<td>4. Proportion of wetland to total land cultivated</td>
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<td>8.9</td>
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<td>5. Percentage of land owners</td>
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### TABLE 8.26

**EIGEN VALUES AND PERCENTAGE OF VARIANCE FOR FACTORS: PALAYANUR-KILPADI**

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<th>Eigen Value</th>
<th>Percent of Variance</th>
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</thead>
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<td>1. Dimension of HYV farming</td>
<td>4.46454</td>
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<td>2. Dimension of agricultural energy</td>
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</tr>
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<td>4.1</td>
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<tr>
<td>6. Dimension of landowners</td>
<td>.51202</td>
<td>3.4</td>
</tr>
</tbody>
</table>
### TABLE 8.27

**ENERGY, ENVIRONMENT AND DEVELOPMENT: FACTOR DIMENSIONS AND FACTOR LOADINGS FOR PALAYANUR-KILPADI, 1991**

<table>
<thead>
<tr>
<th>Variables</th>
<th>(+)</th>
<th>(-)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Factor 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Proportion of wetland to total land cultivated</td>
<td>.9751</td>
<td></td>
</tr>
<tr>
<td>2. Percent of landowners</td>
<td>.9488</td>
<td></td>
</tr>
<tr>
<td>3. Mechanical energy</td>
<td>.8959</td>
<td></td>
</tr>
<tr>
<td><strong>Factor 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Manual and animal energy</td>
<td>.8728</td>
<td></td>
</tr>
<tr>
<td>2. Manure and fertiliser consumption</td>
<td>.4690</td>
<td></td>
</tr>
<tr>
<td>3. By products</td>
<td>.9186</td>
<td></td>
</tr>
<tr>
<td><strong>Factor 3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Manure and fertilizer consumption</td>
<td>.8123</td>
<td></td>
</tr>
<tr>
<td>2. Diesel and electricity consumption</td>
<td>.7340</td>
<td></td>
</tr>
<tr>
<td><strong>Factor 4</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Manual and animal operated implements</td>
<td>.7695</td>
<td></td>
</tr>
<tr>
<td><strong>Factor 5</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Household energy consumption</td>
<td>.8619</td>
<td></td>
</tr>
</tbody>
</table>

Note: Only factor loadings of +.4 or higher and -.4 or higher are included in the tabulation.
**Table 8.28**

Frequency Grouping of Scores for Palayanur – Kilpadi

| Factors  | Very high |  |  | Medium |  |  | Low  |  | Very low |
|----------|-----------|--|--|--|---|--|--|---|--|---|
|          | No | % | No | % | No | % | No | % | No | % |
| Factor I | 22 | 22 | - | - | - | - | - | - | 78 | 78 |
| Factor II | 7 | 7 | 2 | 2 | 10 | 10 | 9 | 9 | 72 | 72 |
| Factor III | 9 | 9 | 3 | 3 | 5 | 5 | 8 | 8 | 75 | 75 |
| Factor IV | 14 | 14 | 7 | 7 | 17 | 17 | 10 | 10 | 52 | 52 |
| Factor V | 13 | 13 | 8 | 8 | 10 | 10 | 15 | 15 | 54 | 54 |
| Factor VI | 7 | 7 | 17 | 17 | 12 | 12 | 21 | 21 | 43 | 43 |
which itself exhibits the modern techniques being adopted in the farming. The score values for this factor falls in the two extremes of very high and very low within 22 percent and 78 percent of samples respectively (Table 8.28).

8.3.3.2 Factor Two: Dimension of Traditional Farming

This factor has an eigen value of 2.02 and accounts for a variance of 13.5 percent. Manual and animal energy and by-products are the two variables that show clear dominance in this factor. Most of the HYV farming variables show negative association to this factor. Nearly 81 percent of the samples have low and very low level of scores for this factor (Table 8.28).

8.3.3.3 Factor Three: Dimension of Commercial Energy

Commercial energy sources such as diesal and electricity consumption and fertiliser and manure consumption are the two variables that dominate the factor. It has an eigen value of 1.4 and a variance of about 5.6 percent. It has positive association to literacy (Table 8.28).

8.3.3.4 Factor Four: Dimension of Manual and Animal Operated-Equipments

The factor four has a variance of 5.6 percent with an eigen value of 0.84. Manual and animal operated-equipments is the only variable of high loading (0.769) and the factor has positive association to most of the variables. About 70 percent of the samples has low and very low scores (Table 8.28).

8.3.3.5 Factor Five: Dimension of Household Energy Consumption

Household energy consumption is the only variable with high
factor value (0.861) in this factor. As it is highly related to household sector, it shows positive relationship to population, literacy and livestocks. As most of the household energy comes from farms and livestock, it has strong association to this factor. The score value of this factor is found to be distributed in all the levels of intensity of scores (Table 8.28).

8.3.3.6 Factor Six: Dimension of Literacy

Literacy forms this factor with a high loading of 0.683 and the factor shows positive relationship with population, manual energy, mechanical energy, manure and fertiliser consumption, diesel and electricity consumption. As the literacy rate goes high, the consumption of energy also goes high. The factor also show positive relation to fuel collection. Seven percent of samples has very high scores and 43 percent very low scores.

8.3.4 Factor Dimensions of Agaramcheri

In the present analysis, the variables such as proportion of wetland cultivation, percent of land owners, proportion of livestock, powered implements, manual and animal-operated implements, manure and fertiliser consumption and literacy are the highly correlated variables. The correlation values for this variables range between .25 to .77 (Table 8.29). Only first five factors have eigen value more than one and these factors explain about 60 percent of the variance (Table 8.32).

8.3.4.1 Factor One: Dimensions of NYV Farming

Only three variables have high loading of about 0.67 to 0.96 in this prime factor. The variables are proportion of wetland
<table>
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<tr>
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<th>2</th>
<th>3</th>
<th>4</th>
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<td>.39**</td>
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<td>.40**</td>
<td>.48**</td>
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<td>.40**</td>
<td>.13</td>
<td>.36**</td>
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<td>.26*</td>
<td>.34*</td>
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</tr>
</tbody>
</table>


Note: * = 0.01 level of significance, ** = 0.001 level of significance
### Table 8.30

**Eigen Values and Percentage of Variance for the Variables: Agaramcheri**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Eigen Value</th>
<th>Percent of variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Population</td>
<td>3.99222</td>
<td>26.6</td>
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<td>2. Literates</td>
<td>2.16567</td>
<td>14.4</td>
</tr>
<tr>
<td>3. Percent of farmers</td>
<td>1.66066</td>
<td>11.1</td>
</tr>
<tr>
<td>4. Proportion of wetland to total land cultivated</td>
<td>1.38536</td>
<td>9.2</td>
</tr>
<tr>
<td>5. Percentage of land owners</td>
<td>1.29329</td>
<td>8.6</td>
</tr>
<tr>
<td>6. Proportion of livestock</td>
<td>.91530</td>
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</tr>
<tr>
<td>7. Powered implements</td>
<td>.78566</td>
<td>5.2</td>
</tr>
<tr>
<td>8. Manual and animal operated implements</td>
<td>.76156</td>
<td>5.1</td>
</tr>
<tr>
<td>9. Household energy consumption</td>
<td>.64958</td>
<td>4.3</td>
</tr>
<tr>
<td>10. Manual and animal energy</td>
<td>.46093</td>
<td>3.1</td>
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<tr>
<td>11. Mechanical energy</td>
<td>.31209</td>
<td>2.1</td>
</tr>
<tr>
<td>12. Manure and fertilizer consumption</td>
<td>.26286</td>
<td>1.8</td>
</tr>
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<td>13. Diesel and electricity consumption</td>
<td>.20551</td>
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<tr>
<td>14. By products</td>
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<td>.7</td>
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<tr>
<td>15. Consumption</td>
<td>.03945</td>
<td>.3</td>
</tr>
</tbody>
</table>

### Table 8.31

**Eigen Values and Percentage of Variance for Factors: Agaramcheri**

<table>
<thead>
<tr>
<th>Factors</th>
<th>Eigen Value</th>
<th>Percent of variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Dimension of HYV farming</td>
<td>3.74183</td>
<td>24.9</td>
</tr>
<tr>
<td>2. Dimension of agricultural energy</td>
<td>1.83485</td>
<td>12.2</td>
</tr>
<tr>
<td>3. Dimension of farming agricultural inputs</td>
<td>1.45270</td>
<td>9.7</td>
</tr>
<tr>
<td>4. Dimension of household farming community</td>
<td>1.06052</td>
<td>7.1</td>
</tr>
<tr>
<td>5. Dimension of population</td>
<td>.64761</td>
<td>4.3</td>
</tr>
</tbody>
</table>
### Table 8.32

**Energy, Environment and Development Factor Dimensions and Factor Loadings for Agaramcheri, 1991**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Factor loading (+)</th>
<th>Factor loading (-)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Factor 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Proportion of wetland to total land cultivated</td>
<td>0.8887</td>
<td></td>
</tr>
<tr>
<td>2. Powered implements</td>
<td>0.6791</td>
<td></td>
</tr>
<tr>
<td>3. By products</td>
<td>0.9696</td>
<td></td>
</tr>
<tr>
<td><strong>Factor 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Proportion of livestock</td>
<td>0.6803</td>
<td></td>
</tr>
<tr>
<td>2. Manual and animal-operated implements</td>
<td>0.9060</td>
<td></td>
</tr>
<tr>
<td><strong>Factor 3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Manual and animal energy</td>
<td>0.5832</td>
<td></td>
</tr>
<tr>
<td>2. Mechanical energy</td>
<td>0.9775</td>
<td></td>
</tr>
<tr>
<td><strong>Factor 4</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Literates</td>
<td>0.5468</td>
<td></td>
</tr>
<tr>
<td>2. Manure and fertilizer consumption</td>
<td>0.7411</td>
<td></td>
</tr>
<tr>
<td>3. Diesel and electricity consumption</td>
<td>0.5242</td>
<td></td>
</tr>
<tr>
<td><strong>Factor 5</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Percent of farmers</td>
<td>0.5656</td>
<td></td>
</tr>
<tr>
<td>2. Percent of landowners</td>
<td>0.5878</td>
<td></td>
</tr>
</tbody>
</table>

Note: Only factor loadings of +.4 or higher and -.4 or higher are included in the tabulation.
cultivated, powered implements and by-products. This factor has positive association to most of the variables. This village predominately uses all the types of energy and techniques for cropping activity. Nearly 96 percent of the score values for this factor lies in the low and very low intensity level (Table 8.33).

8.3.4.2 Factor Two: Dimension of Non-Commercial Energy

The factor is named as dimension of non-commercial energy as two of the variables such as proportion of livestock and manual and animal-operated implements scores a high factor value. This factor shows considerable amount of negative factor value to the commercial energy sources. Thus it may be said wherever the proportion of non-commercial energy use is high, the commercial energy use is less. For this factor also, about 81 percent of the sample households were placed by scores in the low and very low level (Table 8.33).

8.3.4.3 Factor Three: Dimension of Agricultural Energy

This is the third factor with a variance of 9.7 percent and an eigen value of 1.45. The factor is called as dimension of agricultural energy as both commercial and non-commercial energy have a (0.97) high factor value. The (0.58) factor has a negative association to household energy consumption by-products and fuel collection as these are unrelated ones to cropping activity. Around 93 percent of the score value for this factor lies in the low and very low level (Table 8.33).

8.3.4.4 Factor Four: Dimension of Commercial Energy

Among the three variables of high factor values, two belongs
Table 8.33

Frequency Grouping of scores of Agaramcheri

<table>
<thead>
<tr>
<th>Factors</th>
<th>Very high</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>Very low</th>
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</thead>
<tbody>
<tr>
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<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
<td>No</td>
</tr>
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<td>1</td>
<td>0.8</td>
<td>3</td>
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<td>5</td>
<td>4.1</td>
<td>9</td>
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<tr>
<td>Factor III</td>
<td>2</td>
<td>1.6</td>
<td>1</td>
<td>0.8</td>
<td>5</td>
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<td>Factor IV</td>
<td>7</td>
<td>7.5</td>
<td>4</td>
<td>3.3</td>
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<td>Factor V</td>
<td>6</td>
<td>5</td>
<td>12</td>
<td>10</td>
<td>13</td>
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</table>
to the commercial energy. Hence it is referred as the dimension of commercial energy. The consumption pattern of commercial energy is high among the literate population than illiterates. And also, the factor shows negative association to proportion of livestock and manual and animal-operated equipments. Compared to the all other factors, the sample households of about 22 percent scores high value (Table 8.33).

8.3.4.5 Factor Five: Index of Farming Community

This is the last factor with an eigen value of 0.64 and a variance of about 4.3 percent. The factor has a positive loading to percentage of farmers (0.56) and to percentage of land owners (0.58). The factor has high negative association to household energy consumption. As part of the household energy comes from the agricultural sector, it may have negative association. The score value for this factor is found to be distributed in all the intensity levels with 15 percent in the very high and high level to 60 percent in the low level (Table 8.33).

8.3.5 Factor Dimension of Elagiri

The correlation matrix of 15 x 15 (Table 8.34) for this village exhibits the proportion of wet land cultivation. Mechanical energy and powered implements are the highly correlated variables of the villages. Population has shown its clear association with household energy consumption with a positive relationship of about 0.52 and a negative relationship of (-0.26) (Table 8.34). The extraction of these fifteen variables shows that only the five development variables has eigen value of more than one and these
<table>
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15. Fuel Collection.

Note: * = 0.01 level of significance, ** = 0.001 level of significance
variables account for about 65 percent of variance (Table 8.35). This village gives more emphasis to the energy use in cropping activity than the other inputs.

8.3.5.1 Factor One: Dimension of Agricultural Energy

Of all the factors, three variables of this factor namely powered implements (0.808), mechanical energy (0.908) and manual and animal-operated implements (0.952) shows a high factor value (Table 8.37). As the factor has equal weightage to commercial and non-commercial sources it is named as the dimension of agricultural energy. This factor has negative association to three of the development variables (population, literacy and percent of farmers) and fuel collection. This factor may be considered as the foremost factor of the village, as it has an eigen value of 2.9 and a variance of 19.5 percent. The score value for this factor is estimated to 89 percent in the low and very low level and only about 5 percent in the high and very high level (Table 8.38).

8.3.5.2 Factor Two: Dimension of Household Energy

The factor two has an eigen value of 1.7 and a variance of 11.5 percent. The factor shows high positive relation with population and household energy (0.709) and (0.692) a high negative relation to fuel collection (-0.492). It exhibits negative association to most of the farming variables indicating the clearcut bifurcation between the farming energy and household energy. As most of the villagers goes for fuel collection to the nearby Elagiri forest, 16 percent of the score values falls in the very high and high level intensity (Table 8.38).
### TABLE 8.35

**EIGENVALUE AND PERCENTAGE OF VARIANCE FOR THE VARIABLES: ELAGIRI**

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<tr>
<th>Variables</th>
<th>Eigen Value</th>
<th>Percent of variance</th>
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<td>5. Percentage of land owners</td>
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<td>7. Powered implements</td>
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<td>8. Manual and animal operated implements</td>
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<td>9. Household energy consumption</td>
<td>0.63988</td>
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<td>10. Manual and animal energy</td>
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<tr>
<td>12. Manure and fertilizer consumption</td>
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<td>13. Diesel and electricity consumption</td>
<td>0.35111</td>
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<td>14. By products</td>
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<tr>
<td>15. Consumption</td>
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### TABLE 8.36

**EIGEN VALUES AND PERCENTAGE OF VARIANCE FOR THE FACTOR: ELAGIRI**

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<td>(-)</td>
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<td>3. Manual and animal-operated implements</td>
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Note: Only factor loadings of +.4 or higher and -.4 or higher are included in the tabulation
Table 8.38

Frequency Grouping of Scores of Elagirl

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<td>12.5</td>
<td>9</td>
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</table>
8.3.5.3 Factor Three: Dimension of Non-Commercial Energy

The non-commercial energy variables such as manual and animal energy and by-products are the only two variables that have high factor loading for this factor (Table 8.37). It shows positive association to most of the variables. It has 14 percent of the score values in the very high and the high level and 77 percent in the low and very low level of intensity (Table 8.38).

8.3.5.4 Factor Four: Dimension of Manure and Fertiliser Consumption

Factor four has an eigen value of 0.8 and a variance of about 5.6 percent. Manure and fertiliser consumption is the only variable found with a high loading of 0.679 and it has negative association to the non-commercial energy sources. As the village gives higher priority to commercial energy in farming, fifteen percent of the score values for this factor lies in the very high and high level of intensity (Table 8.38).

8.3.5.5 Factor Five: Dimension of Literacy

Literacy has a loading of about 0.693 which is higher than the other variables of this factor. Hence forth, the factor is termed as dimension of literacy. This factor has the least amount of eigen value (0.66) and a variance of about 4.5 percent. Most of the farming variables is found to have negative relation with this factor. But it is quite interesting to find that it has shown about 0.155 of positive correlation to the fuel collection. In this village, the easily accessible forest nearby the village, allows even the literates to go for firewood cutting in the forest. The score value for this factor ranges between 18 percent in
the very high and high level to 67.5 percent in the low and very low level. Some values are very high and high in 18 percent of samples and low and very low in 68 percent of samples (Table 8.38).

8.3.6 Factor Dimensions of Kunnathur

This is the village of very low development region. Here also, the proportion of wetland, percent of land owners and proportion livestock exhibited a high correlation (Table 8.39). Only four factors were extracted for this village, and they explain an variance of about 55.2 percent (Table 8.41).

8.3.6.1 Factor One: Dimension of HYV Farming

Out of the 15 variables, four variables namely proportion of wetland cultivated, proportion of livestock, powered implements and manual and animal-operated implements forms this factors (Table 8.42). This is the prime factor for the village with an eigen value of 4.64 and a variance of 31 percent. The factor also has high negative association to manure and fertiliser consumption. This may be due to dominance of dry cropping which applies less amount of manure and fertiliser for farming. As the villages consist of large proportion of marginal farmers, their method of cropping operation also oriented towards simpler methods. The score value for this factor lies among 11 percent in the very high and high level, and 65 percent in the low and very low level (Table 8.43).

8.3.6.2 Factor Two: Dimension of Agricultural Energy

Out of the four variables with high factor value, three has
TABLE 8.39

ENERGY, ENVIRONMENT AND DEVELOPMENT: CORRELATION MATRIX FOR THE KU cardhar

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Note: * = 0.01 level of significance, ** = 0.001 level of significance
### TABLE 8.40

**EIGEN VALUES AND PERCENTAGE OF VARIANCE FOR THE VARIABLES: KUNNATHUR**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Eigen Value</th>
<th>Percent of variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Population</td>
<td>4.94744</td>
<td>33.0</td>
</tr>
<tr>
<td>2. Literates</td>
<td>2.05465</td>
<td>13.7</td>
</tr>
<tr>
<td>3. Percent of farmers</td>
<td>1.82395</td>
<td>12.2</td>
</tr>
<tr>
<td>4. Proportion of wetland to total land cultivated</td>
<td>1.11646</td>
<td>7.4</td>
</tr>
<tr>
<td>5. Percentage of land owners</td>
<td>.96952</td>
<td>6.5</td>
</tr>
<tr>
<td>6. Proportion of livestock</td>
<td>.79925</td>
<td>5.3</td>
</tr>
<tr>
<td>7. Powered implements</td>
<td>.73448</td>
<td>4.9</td>
</tr>
<tr>
<td>9. Household energy consumption</td>
<td>.52231</td>
<td>3.5</td>
</tr>
<tr>
<td>10. Manual and animal energy</td>
<td>.40784</td>
<td>2.7</td>
</tr>
<tr>
<td>11. Mechanical energy</td>
<td>.32441</td>
<td>2.2</td>
</tr>
<tr>
<td>12. Manure and fertilizer consumption</td>
<td>.20384</td>
<td>1.4</td>
</tr>
<tr>
<td>13. Diesel and electricity consumption</td>
<td>.18674</td>
<td>1.2</td>
</tr>
<tr>
<td>14. By products</td>
<td>.11386</td>
<td>.8</td>
</tr>
<tr>
<td>15. Consumption</td>
<td>.09507</td>
<td>.6</td>
</tr>
</tbody>
</table>

### TABLE 8.41

**EIGEN VALUES AND PERCENTAGE OF VARIANCE FOR FACTORS: KUNNATHUR**

<table>
<thead>
<tr>
<th>Factors</th>
<th>Eigen Value</th>
<th>Percent of variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Dimension of HYV farming</td>
<td>4.64656</td>
<td>31.0</td>
</tr>
<tr>
<td>2. Dimension of agricultural energy</td>
<td>1.70192</td>
<td>11.3</td>
</tr>
<tr>
<td>3. Dimension of farming agricultural inputs</td>
<td>1.35136</td>
<td>9.0</td>
</tr>
<tr>
<td>4. Dimension of household farming community</td>
<td>.58026</td>
<td>3.9</td>
</tr>
</tbody>
</table>
TABLE 8.42

ENERGY, ENVIRONMENT AND DEVELOPMENT: FACTOR DIMENSIONS AND FACTOR LOADINGS FOR KUNNATHUR, 1991

<table>
<thead>
<tr>
<th>Variables</th>
<th>Factor loading</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(+)</td>
</tr>
<tr>
<td></td>
<td>(-)</td>
</tr>
<tr>
<td>Factor 1</td>
<td></td>
</tr>
<tr>
<td>1. Proportion of wetland to total land cultivated</td>
<td>.5607</td>
</tr>
<tr>
<td>2. Proportion of livestock</td>
<td>.7618</td>
</tr>
<tr>
<td>3. Powered implements</td>
<td>.6790</td>
</tr>
<tr>
<td>4. Manual and animal operated implements</td>
<td>.7813</td>
</tr>
<tr>
<td>5. Manure and fertiliser consumption</td>
<td>.5467</td>
</tr>
<tr>
<td>Factor 2</td>
<td></td>
</tr>
<tr>
<td>1. Mechanical energy</td>
<td>.9332</td>
</tr>
<tr>
<td>2. Manure and fertiliser consumption</td>
<td>.5975</td>
</tr>
<tr>
<td>3. Diesel and electricity consumption</td>
<td>.6279</td>
</tr>
<tr>
<td>4. By products</td>
<td>.7916</td>
</tr>
<tr>
<td>Factor 3</td>
<td></td>
</tr>
<tr>
<td>1. Proportion of wetland to total land cultivated</td>
<td>.5103</td>
</tr>
<tr>
<td>2. Percent of landowners</td>
<td>.6894</td>
</tr>
<tr>
<td>3. Manual and animal energy</td>
<td>.9560</td>
</tr>
<tr>
<td>Factor 4</td>
<td></td>
</tr>
<tr>
<td>1. Population</td>
<td>.4974</td>
</tr>
<tr>
<td>2. Literates</td>
<td>.4851</td>
</tr>
</tbody>
</table>

Note: Only factor loadings of +.4 or higher and -.4 or higher are included in the tabulation.
Table 8.43

Frequency Grouping of Scores for Kunnathur

<table>
<thead>
<tr>
<th>Factors</th>
<th>Very high</th>
<th></th>
<th>High</th>
<th></th>
<th>Medium</th>
<th></th>
<th>Low</th>
<th></th>
<th>Very low</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
<td>No</td>
<td>%</td>
</tr>
<tr>
<td>Factor I</td>
<td>8</td>
<td>8</td>
<td>3</td>
<td>3</td>
<td>24</td>
<td>24</td>
<td>14</td>
<td>14</td>
<td>51</td>
<td>51</td>
</tr>
<tr>
<td>Factor II</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>12</td>
<td>12</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Factor III</td>
<td>15</td>
<td>15</td>
<td>11</td>
<td>11</td>
<td>8</td>
<td>8</td>
<td>10</td>
<td>10</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>Factor IV</td>
<td>7</td>
<td>7</td>
<td>4</td>
<td>4</td>
<td>21</td>
<td>21</td>
<td>18</td>
<td>18</td>
<td>56</td>
<td>50</td>
</tr>
</tbody>
</table>
positive relation and one has negative relation with the factor. The village is noted for its dry crop cultivation, and uses mainly indigenous energy sources. But some of the large and medium farmers who own higher extent of wet land, uses mechanical energy for field operations. Hence the mechanical energy has a strong negative associateship to the factor. Most of HYV farming variables have negative relation to this factor. The score values for the factor are high and very high in 5 percent of samples (Table 8.43).

8.3.6.3 Factor Three: Dimension of Traditional Farming

The factor has a variance of about 9 percent and the eigen value is about 1.3. Manual energy is the variable that has very high factor value (0.95) for this factor. It has a high negative factor loading for the variables such as proportion of wet land cultivated and percent of land owners. Most of the land owners of the village belongs to the small and marginal land holding groups and they prefer to use manual and animal-operated equipments for cropping. Hence the variables of HYV farming shows less association in this village. The score values for this factor are high and very high in 26 percent of samples and low and very low level of intensity in 56 percent of samples (Table 8.43).

8.3.6.4 Factor Four: Social Dimension

Population and literacy are the two variables that form the fourth factor with a loading of about (-0.49) and 0.48 respectively. The village rests more on man power for cropping than on commercial power. Fuel collection shows a positive relation to the factor than the other variables. As a village of very low develop-
ment region, fuel collection is part of their day-to-day work. Percent of samples with low and very low level score values for the factor is more in the village (Table 8.4).

The analysis clearly indicated that the variables of development dimensions were the determining factors of energy and environment. In both the analyses, the dimensions of HYV farming was found to be the prime factor. And in this factor, the development variables like the wetland, wetland farmers, percent of total land cultivated and proportion of livestock, load heavily than the factors of other two dimensions. Energy variables formed the second and third factors which were consequent to the development variables in explaining the data set. The environment variables were found to have high positive and negative loadings in the factors of development and energy. All these findings may point out that the development determines the energy consumption pattern which has an effect on environment.