Chapter-3

Landuse and Cropping Pattern
3.1 General Overview of Uzbek Agriculture:

Pattern of crop association constitute a dominant feature of agricultural landscape of an area. In the sphere of agricultural geography the importance of combinational analysis of cropping pattern of different elements can broadly be overemphasized. To know and to analyse variable position of individual crops within themselves as the integral complex, the study of crop combination regions becomes indispensable. Such studies reveal the important feature of agricultural landscape. As a matter of fact crops associates option and the choice is not arbitrary. On the other hand it is based on the environmental conditions such as climate, hydrology and edaphic. Variations in these environmental habitats determine the regionalization of cropping pattern because environmental conditions of any region are directly related to its crop ecology. It is basically an ecosystem which shapes and reshapes the growth and development of Agricultural spectrum of an area. Varying ecosystems are responsible for varied types of agricultural ecology which where, studied in relations to model systems of varying environmental conditions can help us in viewing agricultural scenario of a region in a better perspective. All sorts of developments are viewed with respect to particular set-up of environmental conditions prevailing in that area. Therefore such type of studies are important because crop ecology signifies interplay of environmental factors operating in a particular area. As such the present study is largely determined by prevailing habitats, the pattern of landscape and the nature of ecological system. Besides these variables economic influences and social behaviour also influences the cropping pattern. The study of crop association is, therefore, not only concerned with agricultural
landscape, but affords an appropriate measure to know as to how human response is involved in diversified and complex aggregate environment. The present chapter aims to find out the magnitude of regional imbalances prevailing within the crop ecology of the country. Since there does not exist uniformity in increase in area, production and yield of different crops, the instability of agriculture has also to be treated by having a detailed crop wise study in the country.

The uzbek agricultural development strategy can be characterized by three phenomena. Firstly, in comparison with several other FSU countries, in uzbekistan only a slow and gradual land reform was implemented. Administrative institutional arrangement of (planned) land use and state procurement of the strategic crops of cotton and wheat at low official prices, remained until late in the decade. However, all other agricultural domestic output markets were liberalized in the early 1990's. By that time the heirs of state (Sovkhozy) and collective farms (Kolkhozy) had been reformed into a co-operative (Joint stock company) farm, and the already functioning land lease system gave some more space to the households (Pudrat) in these farm enterprises. This policy supplemented the early reforms that provided more access by individual households to (subsidiary) plots of land for subsistence and production of high value products for the market, such as fruits, vegetables and meat. These household plots having a symbiotic relationship with the large farm enterprises, as their workers produced additional food and income on the household plots, and additional household income was generated while using subsidized collective inputs. The development of “private” or “independent” farms did not takeoff until late in the decade, mainly because of the overall existing land shortage, opposition by the rural elite and lack of market institutions necessary for the individualization farming.

Secondly, the development model during transition in Uzbekistan was based on resource extraction produced by the agricultural sector, particularly in cotton. The outflow of a net-surplus from the agricultural sector (as the subsidies in terms of inputs and
credit were outstripped by the taxation through the procurement system), provided the budget and the monetary authorities with substantial domestic finance. This made it possible to finance some key investment (energy and industrial) project and particularly urban infrastructural development. The transfer can therefore not be seen as an overall finance for industry, as only particular project, (such as the car industry in Andijan) were chosen for strategic (import substitution), rather than economic reasons. The implicit taxation of agriculture was realized by the price differentials between administrative procurement prices and world market prices, in combination with the growing wedge between the official exchange rate and the curb or (in the early year of the sum), the bazaar rate.

Thirdly, the government made an early policy decision to move towards self-sufficiency in wheat production, as part of a strategy of economic independence. It did not want to become dependent on food imports in a situation where external market-ties were still weakly developed. Therefore, embarked on an import substitution strategy in relation to wheat, while remaining largely dependent of the exports of “white gold”. Meanwhile, the population was subsidized through controlled flour and bread prices.

This step was taken after having a survey of landuse pattern in the country. It was observed previously that cereal crop production had recorded a remarkable growth and potentially of land to produce more wheat was a step towards self sufficiency. As such efforts and policies were implemented for enhancing measures towards growth and development of agricultural sector in the Republic of Uzbekistan.

The very specific feature of Uzbekistan’s agriculture is that the country has vast area of agricultural land, but only 4.2 million hectares is arable and has been brought under irrigation. Only small area can sustain rainfed production cropland is only 9.1 percent of the total surface of Uzbekistan. At the outset of the transition the average irrigated land availability per capita was only 0.37 hectares per rural inhabitant which substantiates population growth during the decade had declined to 0.28 hectares per capita in the year 2001. Therefore
land pressure is high in general, but even more specifically in certain densely populated areas such as the Fergana valley.

Agriculture has been and still is the single most important sector in the Uzbek economy. During the early period of transition, national accounting was still done by the Soviet system of material product balances, and is not very reliable. However, the share of agriculture was largely around 30 percent of GDP. There was only one outlier in 1996, when the harvest of grain and cotton suffered from severe drought (Table 3.1).

Nevertheless, the given average share severely underestimates the importance of the sector for the national economy. Not only around 65 percent of the population is rural, and 35 percent of the labour population is active in agriculture, but a much higher share of the rural population is dependent on the sector, whether in subsistence agriculture, or in informal activities related to agricultural inputs and outputs. Agricultural exports (cotton fibre) contributes 35-40 percent of total exports in the past decade. It has been estimated that this sector contributes another 5 percent to GDP. Agriculture furthermore is an important market for the supply of domestically produced commodities, such as agricultural machinery, fertilizers, pesticides, fuel and electric power. The importance of agriculture in Uzbekistan is therefore large that what can be deducted from its contribution to GDP (Fig 3.1) (Table 3.1).

Table 3.1 reveals that there are prospects of agricultural share to GDP in the Republic of Uzbekistan, provide a whole sum technological infrastructure is at large scale inorder to boost up agricultural efficiency. The further development of agriculture will require increasing application of science and technology so as to increase factor productivity. The management of science and

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>37.3</td>
<td>35.4</td>
<td>27.8</td>
<td>34.5</td>
<td>28.1</td>
<td>22.4</td>
<td>28.3</td>
<td>26.8</td>
<td>29.0</td>
<td>30.1</td>
<td>30.2</td>
<td>30.1</td>
<td>30.3</td>
<td>30.2</td>
<td>30.2</td>
</tr>
</tbody>
</table>

Fig 3.1
Share of Agriculture to G.D.P
(1991-2005)
technology development will need to be reviewed on a continuing base for ensuring that the pace of technical progress is enhanced. To add to the effectiveness of planning process, there must be emphasis on decentralization to provide the needed elements in built flexibility as well as greater involvement of people at all levels. This will ensure that development programmes particularly relating to agriculture and rural development will take adequate account of regional diversities in resource endowment needs and development potential.

The agricultural sector of Uzbekistan has absorbed much of the initial shocks of the transition, as it had a crop-mix which contained a readily tradable commodity (cotton), that brought in substantial amount of foreign exchange in the sudden absence of budget transfer from Moscow. Furthermore, the cotton sub-sector became the basis of the surplus extraction strategy and provided a large employment base.

3.2 Institutional Reforms in Agriculture:

Table 3.2 provides a broad overview of the evolution of agricultural institution in Uzbekistan since independence. At the time of independence Uzbekistan’s agriculture was organized into kolkhozy (collective farms) and sovkhozy (state farms) with a tiny proportion of the total sown land allocated to workers as personal plots. The principal difference between the two main farms of ownership was that in state farms workers were employed at fixed wages where as collective workers received the residual earning of the collectively operated enterprises after the deduction of all costs and provision for investment and welfare from gross revenue. The trend before the independence was towards an increase in the proportion of state farms. State ownership was considered to be “ownership by the entire population” a superior form of ownership in the “transition towards a communist society”, as compared to the cooperative ownership that characterized the collective farming.

By 2004 the institutional farm of agriculture had been transformed completely. At one extreme were large co-operative enterprises called shirkats, (successors to the collective farms of the...
Table 3.2
Distribution of Sown Land Among Different Farms of Organization (percent of total)

<table>
<thead>
<tr>
<th>Year</th>
<th>Collective farm</th>
<th>State farms</th>
<th>Private commercial</th>
<th>Individual</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>34.9</td>
<td>58.7</td>
<td>-</td>
<td>0.1</td>
<td>6.3</td>
</tr>
<tr>
<td>1994</td>
<td>75.3</td>
<td>1.0</td>
<td>-</td>
<td>2.1</td>
<td>21.6</td>
</tr>
<tr>
<td>2005</td>
<td>48.6</td>
<td>1.0</td>
<td>34.5</td>
<td>10.4</td>
<td>6.5</td>
</tr>
</tbody>
</table>

Source: State Committee on Statistics

past). At the other extreme, the farmer personal plots of households had been substantially increased by endowing them with more land. This category is known as dehkan farmers (smallholders). In between these two a category of private farmers had emerged, who, unlike the dehkan farmers, are relatively large, commercially oriented farms.

The evolution of agrarian institution has taken place through a number of stages. The process is still evolving. The following are the three principal stages through which changes have occurred so far.


During the first phase of reform, arguably beginning before independence and continuing through 1997-98, three principal changes took place,

i) Increased land endowment for what used to be the personal plots of the rural households during the soviet period.

ii) The abolition of the state farms and

iii) The institution of greater flexibility within the collective farms, allowing its evolution into individual farms, variously described as associations of cooperative or joint stock companies of farmers.

2) The second phase, 1997/98-2003

Among important changes during this phase was the legal recognition of the emergence of a new track of individual farms, distinct from the other farms in so far as they are much larger and commercially oriented. During
this phase the system of contracting in state was also formalized and further strengthening of individual farming took place.

During this phase independent commercial farms had started developing within shirkats under contract with the latter in the early 1990's. It is hard to trace their origin. It is possible that they grew out of the system of contracting that state farms began practising within individual farming households some of whom were able to taken on more than usual amount of dehkan holding through special contextual arrangement. These arrangements were initially not favourable for the growth of commercial private farming, they were not legally recognized entities, they were subjected to compulsory procurement price that they received.

3) The third phase 2004-06.

The restructuring of the shirkats, permitting household and small team constructing, was aimed at promoting incentive the lack of which was the principal problem with collective agriculture in the past. In this the inspiration might have been derived from the Chinese experience of instituting a similar organization of agriculture in the late 1970's that made agriculture the leading sector in ushering in an area of unprecedented economic growth. This hope was not realized in the case of uzbekistan. Overall agricultural growth, through stable, showed little improvement in productivity and an ever-increasing proportion of shirkats came to be affiliated with financial difficulty. Gradually the decision to convert the poorly performing shirkats into private farms emerged and the Presidential Decree of October 2003 made the private farm the principal farm of agricultural enterprise in the future. A cabinet decision at the same time outlined the plan to
distribute the land under 1,020 of the total 1,840 that is just over 55 percent of the shirkats to create new private commercial farms during 2004-2006.

The aim of cabinet decision in the implementation of this plan was to achieve following objectives.

i) Action to sustain and enhance the movement of economic expansion and technological development.

ii) Adoption of effective promotional measures to raise the productivity and income of poorer section of society.

iii) Expansion and qualitative improvement in facilities for health education and other basic civil amenities.

Measure for bringing about a sharp reduction in the rates of population growth.

These institutional reforms had a plan for accelerating growth and agricultural development in the country and flexibility in diversified plans in order to cope-up with many sources of uncertainty which characterize so modern agroeconomic spectrum of the Republic of Uzbekistan. It was also planned that dependence of farmers on landlords for their farm produce should be minimized so that there will be an accelerated growth in agricultural sector.

3.3 Cropping Pattern

By cropping pattern we mean the proportion of area under different crops at a point of time. It is however, a dynamic concept as no cropping pattern can be good and ideal for all time to come. The distribution of the acreages is expressed as a percentage of the total area under different crops.8

Cropping pattern may be referred to a particular location such as the country as a whole, or to smaller units like the states, districts, villages and ultimately to farms. It may like wise be related to a particular point of time. A change or shift in the pattern implies a change in the proportion of area under different crops which depends to a large extent on the facilities available to rise crops in the given
agro-climatic setting. Further, the development of marketing infrastructure and the demand pattern of the people are also factors which affect cropping pattern. As such cropping pattern plays a very important role in determining the level of agricultural production.

On the availability of alternative and more efficient crop than existing ones, new cropping pattern in a region may emerge. For intensifying the cropping pattern and multiple cropping, the short duration fertilizers responsive, high yielding varieties are required. Any cropping sequence to be adopted by the cultivator should be flexible.⁹

The crop should ensure to optimum utilization of his resources, particularly, inputs like irrigation, fertilizers, insecticides, pesticides, equipments, power and family laser. Nowadays, Uzbekistan's cropping pattern is based mainly on the traditional system of farming in which every farmer tries to produce everything even his family consumes. In Uzbekistan subsistence type of farming is practised.

It is to be noted that the cropping pattern in the plain area of the country is considered to be more elastic than in hilly areas. This is mainly due to the topography and agro-climatic conditions which vary drastically in the hilly regions. Thus, cropping pattern of a particular area is generally an outcome of trials and adjustments in respect of farm enterprises and practices.

3.4 Area Under Food and Non-Food Crops:

One peculiar feature of cropping pattern in Uzbekistan is predominance of food crops over non-food crops except cotton. The data regarding area under food and non-food crops in Uzbekistan is depicted in table 3.3 and 3.4.

The tables suggested that cotton have occupied highest proportion of total cropped area in Uzbekistan. Among non-food crops, cotton account for 76.32 percent of total cropped area in Uzbekistan. The corresponding figures for other non-food crops were 21.82 percent for fodder crops and 1.85 percent for other industrial crops. On the other hand, food crops (wheat) share in total cropped


### Table 3.3

<table>
<thead>
<tr>
<th>S No</th>
<th>Crops</th>
<th>Area (000 hectares)</th>
<th>% share</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Wheat</td>
<td>1247</td>
<td>68.93</td>
</tr>
<tr>
<td>2</td>
<td>Vegetables</td>
<td>242</td>
<td>13.37</td>
</tr>
<tr>
<td>3</td>
<td>Rice</td>
<td>199</td>
<td>11.00</td>
</tr>
<tr>
<td>4</td>
<td>Maize</td>
<td>79</td>
<td>4.36</td>
</tr>
<tr>
<td>5</td>
<td>Small grain</td>
<td>4.2</td>
<td>2.32</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1809</td>
<td>100.00</td>
</tr>
</tbody>
</table>

2. Computed on the Base of information available on FAO year Book

### Table 3.4

<table>
<thead>
<tr>
<th>S No</th>
<th>Crops</th>
<th>Area (000 hectares)</th>
<th>% share</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cotton</td>
<td>1689</td>
<td>76.32</td>
</tr>
<tr>
<td>2</td>
<td>Fodder crop</td>
<td>483</td>
<td>21.82</td>
</tr>
<tr>
<td>3</td>
<td>Other industrial crops</td>
<td>41</td>
<td>1.85</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>2213</td>
<td>100.00</td>
</tr>
</tbody>
</table>

2. Computed on the Base of information available on FAO year Book

Area was 68.93 percent; 13.37 percent by vegetables, 11.00 percent by rice 4.36% by maize and 2.32 percent by small grains. This suggests that non-food crops have occupied largest proportion of total cropped area (55.0 percent) and food crops occupied only 44.9 percent of the cropped area. Within food crops, wheat is having a dominant share followed by vegetables and rice. While as remaining crops have recorded a meager share except maize whose share has gone upto 4 percent. In case of non food crops cotton and fodder crops have relatively gone very high while as remaining crop has remarkably gone low.

### 3.5 Area Under Principal Crops:

All the great variety of crops that can be grown in the Central Asia are also grown in Uzbekistan. Wheat, Rice, Barley and Maize
Fig 3.3
Area under food crops
(2005)

2.32

- Wheat 23.4%
- Vegetables 11%
- Rice 4.36%
- Maize 0.11%
- Small grain 0.01%

Source: Table 3.3

Fig 3.4
Area under Non-Food Crops
(2005)

1.85

- Cotton 76.32%
- Fodder crop 4.45%
- Other industrial crops 19.23%

Source: Table 3.4
are principal food grain crops, while cotton is most important commercial crops grown in the Uzbekistan. However, wheat is the predominant food crop where as cotton is the predominant commercial crop in the country. The figure related to area under principal crops in the country is given in the table 3.5.

It is observed from the table 3.5 that cotton and wheat are dominant crops, and are grown in almost all the states of Uzbekistan. These crops together account for about 80.83 percent of total cropped area in Uzbekistan. The proportion of cotton to total cropped area is highest in Kashkadarya followed by Samarkand, while as it least in Namagan. As against this, Kashkadarya topped to other regions in respect of percentage share of total cropped area under wheat. This shows that wheat is predominant crop in Surkhandarya and Navoi states, while as cotton is predominant crop in Republic.

### Table 3.5

**Area Under Principal Crops (2001-2005)**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Crops</th>
<th>Area (000 hectares)</th>
<th>% share</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cotton</td>
<td>1580.9</td>
<td>43.01</td>
</tr>
<tr>
<td>2</td>
<td>Wheat</td>
<td>1390.2</td>
<td>37.82</td>
</tr>
<tr>
<td>3</td>
<td>Rice</td>
<td>193.2</td>
<td>5.25</td>
</tr>
<tr>
<td>4</td>
<td>Barley</td>
<td>276.0</td>
<td>7.50</td>
</tr>
<tr>
<td>5</td>
<td>Maize</td>
<td>75.8</td>
<td>2.06</td>
</tr>
<tr>
<td>6</td>
<td>Vegetables</td>
<td>50.2</td>
<td>1.36</td>
</tr>
<tr>
<td>7</td>
<td>Grapes</td>
<td>99.3</td>
<td>2.70</td>
</tr>
<tr>
<td>8</td>
<td>Tobacco</td>
<td>9.9</td>
<td>0.26</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>3675.5</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: FAO Stat Agricultural Data computed on the base of information available on FAO year Book

Kashkadarya and Namagan states, these states cotton and wheat have occupied 21.52 percent and 19.9 percent of total cropped area, respectively. Next to these crops, barley and rice have occupied important place in Uzbekistan accounting 7.50 percent and 5.25 percent respectively. Inferior foodgrain crops like barley, maize bajra etc have less importance in all the regions of Uzbekistan. The percentage area under vegetables is low (1.36 percent). Similar pattern is observed in case of grapes and tobacco. The percentage area under
Fig 3.5
Area under Principal Crops
(2005)

Source: Table 3.5
grapes is 2.70 percent and tobacco 0.26 percent respectively. Principal crop (wheat) has a dominant position followed by Barley and rice, others are relatively on low profile. Cotton recorded a high share because it was used as a commercial crop even during Soviet times.

3.6 Crop Diversification:

In monsoon lands, where the rainfall is often uncertain, the farmers grow two crops on the same field. Among the two crops, one required more water and the other requires less quantity of water. When the rainfall is inadequate, the one requiring less water will grow well and when the rainfall is normal the crop that requires more water will grow well. Then the farmer would reap both the crops.

In a region, a farmer grows many crops. In some plots he may grow wheat and in some others, barley, gram, vegetables and pulses, in summer and the rainy season he could grow maize, sugar cane, millet and pulses. Only in areas where adequate rainfall or irrigation facilities are available, the farmer would practise monoculture while in other areas, a variety of crops are grown. Infact, these farmers who are of average means, generally practise crop diversification.

Diversification of crops also includes growing pulses. The roots of pulses plants have nitrogen fixing bacteria that obtain nitrogen from the atmosphere and convert it into nitrates to be utilized by the plants. The utilized nitrates are broken down to their components by certain bacteria and the nitrogen is returned to the atmosphere.\textsuperscript{10}

The formula for index of crop diversification is given below

\textbf{Percentage of sown area under n crop} \quad \text{Number of crops}

In the kharif season, the farmers grow cotton (43.01 percent), wheat (37.82 percent), rice (5.25 percent), Barley (7.50 percent), maize (2.06 percent), vegetables (1.36 percent), Grapes (2.70 percent) and tobacco (0.26 percent).

The average percentage of the area under each crops is \[
\frac{100}{8} = 12.5.
\]

The method of diversification index given above is not very
accurate and is of little use. A better method was proposed by Gibbs Martin.

\[
\text{Crop Diversification Index} = \frac{\sum x^2}{(\sum x)^2}
\]

Where \(x\) is the percentage of total cropped area occupied by each crop. Taking the percentage of each crop, the formula would workout as follows.

\[
I = \frac{(43.01)^2 + (37.82)^2 + (5.25)^2 + (7.50)^2 + (2.06)^2 + (1.36)^2 + (2.70)^2 + (0.26)^2}{(43.01 + 37.82 + 5.25 + 7.50 + 2.06 + 1.36 + 2.70 + 0.26)^2}
\]

\[
I = \frac{1849.8 + 1430.3 + 27.5 + 56.2 + 4.2 + 18 + 7.2 + 0.06}{100^2}
\]

\[
I = \frac{3377.06}{10,000} = 0.33
\]

\[I = 0.33\]

The index would be \(I = 0.33\) or 0.67 index

As the value is relatively close to 1, the diversification is relatively high in Uzbekistan.

3.7 Crop Concentration:

Crop concentration means the variation in the density of any crop in an area or region at a given point of time. Pattern of crop concentration constitute a significant feature of the agricultural landscape of an area. The designation of an area as a rice, wheat or cotton region, for instance, conceals the degree of its density of cultivation. The importance of the study of concentration of crops, therefore, for the agricultural planners can not be overemphasized. The purpose of such studies is to analyse the crop patterns of an area on regional basis with a view to bring out their real concentration."

Uzbekistan has two main agricultural seasons i.e kharif and Rabi. Different crops are grown differently in these seasons like Rice, Maize, Pulses, cotton etc are the major kharif crops. The distribution pattern of major crops revealing their relative density and concentration have
to be worked out with the help of "location quotient" technique.

The location quotient technique have been applied for the determination of regional character of cropping pattern.\(^{12}\)

The method may be expressed as under

\[
\frac{\text{Area of } x \text{ crop in component areal unit}}{\text{Area of all crops in the component areal unit}} \div \frac{\text{Area of } x \text{ crop in the entire region/country}}{\text{Area of all crops in the entire region/country}}
\]

By applying this technique, if the index value is greater than unity the component areal unit accounts for a share greater than it would have had. If the distribution were uniform in the entire region, and therefore, the unit (region) has a significant concentration of the crop in question. The index value thus obtain for each crop were then put in a descending order. The index scale is calculated by dividing the array into three equal parts to distinguish the high, medium and low concentration. The main advantage of crop combination lies in the fact that it reveals variations in the density of a crop in a given region at a given point of time.

The concentration pattern of different crops in Uzbekistan is given in a table 3.6 Cotton is the dominant crop in Uzbekistan and covers an area of about 42 percent of arable land. The contiguous zone of high concentration of cotton spreads over the provinces of Bukhara, Kashkadarya and Samarkand regions. Medium concentration of cotton has been found in Djizak, surkhandarya, Tashkent and Navoi, while as low concentration is found in the regions of Andijan, Namagan, Sirdarya, Ferghana and Khorezm.

Wheat is the second important crop of Uzbekistan. It covers an area of about 31 percent of arable land. High concentration of wheat is found in Bukhara, Samarkand and Kashkadarya. Medium concentration of wheat is found in Djizak, Surkhandarya, Tashkent and Navoi. On the other hand, Andijan, Namagan, Sirdarya, Ferghana and Khorezm have the low concentrated areas.

Paddy is also an important crop in Uzbekistan covering an area of about 8 percent of the arable land. The high concentration of rice is found in Bukhara, Kashkadarya, Samarkand and Surkhandarya. Medium concentration is found in Djizak, Ferghana and Tashkent.
On the other hand, Andijan, Kashkadarya, Navoi, Khorezm and Sirdarya are the low concentrated areas.

Similarly the other important crops domesticated in Uzbekistan are vegetables, maize, small grains and other crops. These cover an area of 6 percent, 2 percent and 1 percent respectively. The concentration of these crops in different regions is shown in table 3.6 and the percentage of area occupied by these crops.

Table 3.6
Crop Concentration in Uzbekistan

<table>
<thead>
<tr>
<th>Crop</th>
<th>Degree of Concentration</th>
<th>Areal unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotton</td>
<td>High</td>
<td>Bukhara, Kashkadarya and Samarkand</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>Djizak, Surkhandarya, Tashkent, Navoi, Karakulpakstan</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>Andijan, Namagan, Sirdarya, Ferghana and Khorezm</td>
</tr>
<tr>
<td>Wheat</td>
<td>High</td>
<td>Bukhara, Kashkadarya and Samarkand</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>Djizak, Surkhandarya, Tashkent and Navoi</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>Andijan, Namagan, Sirdarya, Ferghana Khorezm &amp; Karakulpakstan</td>
</tr>
<tr>
<td>Rice</td>
<td>High</td>
<td>Bukhara, Kashkadarya, Samarkand and Surkhandarya</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>Djizak, Ferghana and Tashkent</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>Andijan, Namagan, Navoi, Khorezm, Sirdarya &amp; Karakulpakstan</td>
</tr>
<tr>
<td>Barley</td>
<td>High</td>
<td>Bukhara, Kashkadarya and Samarkand</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>Djizak, Surkhandarya, Tashkent and Ferghana</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>Andijan, Khorezm, Sirdarya, Navoi Namagan &amp; Karakulpakstan</td>
</tr>
</tbody>
</table>


3.8 Crop Combination Regions:

The study of crop combination regions constitute an important aspect of agricultural geography, as it provides a good basis for agricultural regionalization. The crops are originally grown in combination and it is rarely that a particular crop occupies a strong position of total isolation similarly other crops in a given areal unit at a given point of time have other related significance.

In 1954 weaver adopted a statistical formula for crop combination analysis of the agriculturally important regions of the Middle West in U.S.A. the method popularly known as ‘Minimum Deviation
Method" was calculated in terms of areal percentage for all the possible combination in the unit taken into consideration against a theoretical of 100 percent in case of a single crop, 50 percent in each of two association, 33.33 percent in each of three crop association regions and so on.\(^\text{13}\) Weaver formula is as such.

\[
\sum \frac{d^2}{n} = \sum = \text{Value of the crop combination} \\
\sum d^2 = \text{Difference between the actual crop percentage in a given unit and appropriate percentage in the theoretical curve.} \\
n = \text{Number of crops in a given combination.}
\]

Illustration of the Weavers formula is as follows. Cotton 42%, Wheat 31%, Fodder crops 12%, vegetables 6%, Rice 5%, Maize 2%, small grains 1% and industrial crops 1%. Weaver’s method to determine the minimum deviations appears to quite simple, but in practice, it requires much calculated work, occasionally it also tends to produce highly generalized units.

Monoculture = \(\frac{(100 - 42)^2}{1} = 3362.84\)

2 Crop Combination = \(\frac{(50 - 42)^2 + (50 - 31)^2}{2} = 212.5\)

3 Crop Combination = \(\frac{(33.33 - 42)^2 + (33.33 - 31)^2 + (33.33 - 12)^2}{3} = 178.42\)

4 Crop Combination = \(\frac{(25 - 42)^2 + (25 - 31)^2 + (25 - 12)^2 + (25 - 6)^2}{4} = 213\)

5 Crop Combination = \(\frac{(20 - 42)^2 + (20 - 31)^2 + (20 - 12)^2 + (20 - 6)^2 + (20 - 5)^2}{5} = 218.3\)

6 Crop Combination = 222.50

7\(^{th}\) Crop Combination = 209.72

8\(^{th}\) Crop Combination = 194.40
An improvement to that of weavers method was brought by Doi's methods. Doi's method is adoptable by substituting with or sum of the squared differences. Thus the combinations having the smallest will be the combination formed by the major crops only. Doi has defined in detail his statistical procedure in his paper, the Industrial Structure of Japanese Prefecture. His modified formula is that of weavers is as follows:–

$$\sum d^2$$

Mono culture = \( (100 - 42)^2 = 3362.84 \)

2 Crop Combination = \( (50 - 42)^2 + (50 - 31)^2 = 425 \)

3 Crop Combination = \( (33.33 - 42)^2 + (33.33 - 31)^2 + (33.33 - 12)^2 = 353.5 \)

4 Crop Combination = \( (25 - 42)^2 + (25 - 31)^2 + (25 - 12)^2 + (25 - 6)^2 = 1459.5 \)

It has been calculated according to weavers formula that country as a whole is three crop combination region, that is cotton, wheat and fodder crops. Where the cotton, wheat and fodder crops constitute 42, 31 and 12 percent respectively (Table 3.7)

However, it is seen from table 3.8 that state wise crop combination analysis reveal a different picture. The oblasts like Djizak, Khorezm, Navoi, Surkhandarya, Namagan, Syrdary and Tashkent all are two crop dominating regions, but the percentage share of cotton, wheat and Rice have shown a great variation. Among these states high percentage of cotton has been recorded by Kashkadarya, where the share of cotton reached to 11.9 percent. Next to Kashkadarya, the Bukhara has recorded 8.9 percent share in cotton, while as in the

<table>
<thead>
<tr>
<th>Crops</th>
<th>Area (000 hectares)</th>
<th>Percentage share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotton</td>
<td>1689</td>
<td>42.01</td>
</tr>
<tr>
<td>Wheat</td>
<td>1247</td>
<td>31.01</td>
</tr>
<tr>
<td>Fodder crop</td>
<td>483</td>
<td>12.01</td>
</tr>
<tr>
<td>Vegetables</td>
<td>242</td>
<td>6.01</td>
</tr>
<tr>
<td>Rice</td>
<td>199</td>
<td>4.95</td>
</tr>
<tr>
<td>Maize</td>
<td>79</td>
<td>1.9b</td>
</tr>
<tr>
<td>Small grains</td>
<td>42</td>
<td>1.04</td>
</tr>
<tr>
<td>Industrial crops</td>
<td>41</td>
<td>1.01</td>
</tr>
</tbody>
</table>

Source: i) FAO Production Pear Book (2005)
ii) Computed on the basis of Weavers Method of Crop Combination
Fig 3.6
Cropping Pattern
(2005)

Source: Table 3.7
remaining states the percentage share of cotton has gone above 7.0 percent.

Provinces like Andijan, Bukhara, Fergana, Kashkadarya and Samarkand are three crop and four crop region. In Andijan high percentage share has been recorded by Rice (87%), low by cotton (6.9%) and 7.6 percent area share is contributed by wheat. While as in Fergana the Rice, cotton, wheat and Barley have recorded percent share in area 9.5, 8.4, 8.3 and 8.2 percent respectively (table 3.8) Dzizak Khorezm, Navoi, Surkhandarya, Namagan, Syrdarya and Tashkent are all two crop producing provinces.

Table 3.8

<table>
<thead>
<tr>
<th>Cropped Combination Regions of Uzbekistan (2001-2005)</th>
</tr>
</thead>
<tbody>
<tr>
<td>States</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Andijan</td>
</tr>
<tr>
<td>Bukhara</td>
</tr>
<tr>
<td>Dzizak</td>
</tr>
<tr>
<td>Fergana</td>
</tr>
<tr>
<td>Kashkadarya</td>
</tr>
<tr>
<td>Khorezm</td>
</tr>
<tr>
<td>Navoi</td>
</tr>
<tr>
<td>Surkhandarya</td>
</tr>
<tr>
<td>Samarkand</td>
</tr>
<tr>
<td>Namagan</td>
</tr>
<tr>
<td>Syrdarya</td>
</tr>
<tr>
<td>Tashkent</td>
</tr>
<tr>
<td>Karakulpakistan</td>
</tr>
</tbody>
</table>

Source: i) FAO Production year Book (2005)
ii) Computed on the basis of weavers method of crop combination

Fargana is a fertile state because it is four crop combination region, within these four crops, rice production has gone high as compared to wheat. In this state wheat production has reached up to 8% while as rice has gone up to 9%. Cotton has recorded a slight growth as compared to barley. Among remaining three crop state, Andijan, Bukhara and Kashkadarya have shown a better growth. In Kashkadarya cotton has exceeded in growth (11.9%), while as rice and wheat has recorded up to 9 and 8 percent respectively. The
Fig 3.7

Crop Combination Regions
remaining two states (Andijan and Bukhara) have not gone so high in their three crop percentage share. Within two crop combination state, percentage of wheat is recording a dominant share.

3.9 Land Use Pattern:

Land forms are one of the major natural resources of a country. The nature and magnitude of economic activities, industrial and agricultural activities, mainly depend on quantum of land resources and on the manner in which these are used. Given the limited area of land, its use has to be made in a way so that it maximize the current return from it, and does not damage its potentialities for yielding better returns in future. In the wake of growing population, the limitedness of land can be more severally felt and this has to be kept in view by the planners, social scientists and researchers. Land utilization is, therefore, of great importance particularly when it can be put to alternative uses. Land utilization deals with, "The study of problem arising in the process of deciding between the alternative major types of land use and putting all types of land to their respective optimum uses".14

The country whose economy is based on agriculture like Uzbekistan, the proper land utilization is most important for overall development. It is because land is not only for agricultural use but is also the source of forest produces, medicinal herbs and water, that play a vital role in a country’s economy. Land use is the application of human controls in a relatively systematic manner to the key elements within any economic system in order to derive benefits from it.15

As already mentioned that land use pattern is affected by number of factors like natural and man made conditions. Uzbekistan’s land use pattern is largely affected by the increasing pressure of population, as it is the most populous Republic among the five Republics in Central Asia.16

The table 3.9 provides a basic overview of the land use pattern in Uzbekistan and accordingly Republic covers seven major land units.
<table>
<thead>
<tr>
<th>Year</th>
<th>Arable Land</th>
<th>%</th>
<th>Non Arable Land</th>
<th>%</th>
<th>Irrigated Land</th>
<th>%</th>
<th>Hayfield &amp; Pastures</th>
<th>%</th>
<th>Forests Area</th>
<th>%</th>
<th>Composite Land</th>
<th>%</th>
<th>Pennial Land</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992-93</td>
<td>4090</td>
<td>7.70</td>
<td>3571</td>
<td>7.75</td>
<td>36570</td>
<td>7.69</td>
<td>22870</td>
<td>7.71</td>
<td>143</td>
<td>7.48</td>
<td>525</td>
<td>5.92</td>
<td>333</td>
<td>7.54</td>
</tr>
<tr>
<td>1993-94</td>
<td>4090</td>
<td>7.70</td>
<td>3569</td>
<td>7.75</td>
<td>36574</td>
<td>7.69</td>
<td>22800</td>
<td>7.68</td>
<td>145</td>
<td>7.58</td>
<td>555</td>
<td>6.26</td>
<td>335</td>
<td>7.58</td>
</tr>
<tr>
<td>1994-95</td>
<td>4092</td>
<td>7.71</td>
<td>3579</td>
<td>7.77</td>
<td>36574</td>
<td>7.69</td>
<td>22800</td>
<td>7.68</td>
<td>146</td>
<td>7.58</td>
<td>590</td>
<td>6.65</td>
<td>335</td>
<td>7.58</td>
</tr>
<tr>
<td>1995-96</td>
<td>4093</td>
<td>7.72</td>
<td>3571</td>
<td>7.75</td>
<td>36574</td>
<td>7.69</td>
<td>22800</td>
<td>7.68</td>
<td>146</td>
<td>7.63</td>
<td>600</td>
<td>6.77</td>
<td>335</td>
<td>7.58</td>
</tr>
<tr>
<td>1996-97</td>
<td>4092</td>
<td>7.71</td>
<td>3637</td>
<td>7.89</td>
<td>36574</td>
<td>7.69</td>
<td>22800</td>
<td>7.68</td>
<td>148</td>
<td>7.74</td>
<td>630</td>
<td>7.10</td>
<td>335</td>
<td>7.58</td>
</tr>
<tr>
<td>1997-98</td>
<td>4088</td>
<td>7.70</td>
<td>3589</td>
<td>7.79</td>
<td>36574</td>
<td>7.69</td>
<td>22800</td>
<td>7.68</td>
<td>148</td>
<td>7.74</td>
<td>650</td>
<td>7.30</td>
<td>337</td>
<td>7.63</td>
</tr>
<tr>
<td>1998-99</td>
<td>4077</td>
<td>7.68</td>
<td>3580</td>
<td>7.77</td>
<td>36574</td>
<td>7.69</td>
<td>22800</td>
<td>7.68</td>
<td>148</td>
<td>7.74</td>
<td>670</td>
<td>7.56</td>
<td>340</td>
<td>7.70</td>
</tr>
<tr>
<td>1999-2000</td>
<td>4062</td>
<td>7.65</td>
<td>3565</td>
<td>7.74</td>
<td>36574</td>
<td>7.69</td>
<td>22800</td>
<td>7.68</td>
<td>148</td>
<td>7.74</td>
<td>685</td>
<td>7.72</td>
<td>340</td>
<td>7.70</td>
</tr>
<tr>
<td>2000-2001</td>
<td>4056</td>
<td>7.64</td>
<td>3467</td>
<td>7.52</td>
<td>36574</td>
<td>7.69</td>
<td>22800</td>
<td>7.68</td>
<td>148</td>
<td>7.74</td>
<td>800</td>
<td>9.02</td>
<td>350</td>
<td>7.92</td>
</tr>
<tr>
<td>2001-2002</td>
<td>4076</td>
<td>7.68</td>
<td>3468</td>
<td>7.53</td>
<td>36574</td>
<td>7.69</td>
<td>22800</td>
<td>7.68</td>
<td>148</td>
<td>7.74</td>
<td>809</td>
<td>9.12</td>
<td>357</td>
<td>8.08</td>
</tr>
<tr>
<td>2002-2003</td>
<td>4079</td>
<td>7.68</td>
<td>3468</td>
<td>7.53</td>
<td>36574</td>
<td>7.69</td>
<td>22800</td>
<td>7.68</td>
<td>148</td>
<td>7.74</td>
<td>788</td>
<td>8.89</td>
<td>340</td>
<td>7.70</td>
</tr>
<tr>
<td>2003-2004</td>
<td>4086</td>
<td>7.70</td>
<td>3452</td>
<td>7.49</td>
<td>36580</td>
<td>7.69</td>
<td>22810</td>
<td>7.69</td>
<td>148</td>
<td>7.74</td>
<td>780</td>
<td>8.80</td>
<td>339</td>
<td>7.67</td>
</tr>
<tr>
<td>2004-2005</td>
<td>4092</td>
<td>7.71</td>
<td>3452</td>
<td>7.49</td>
<td>36583</td>
<td>7.69</td>
<td>22810</td>
<td>7.69</td>
<td>148</td>
<td>7.74</td>
<td>780</td>
<td>8.80</td>
<td>339</td>
<td>7.67</td>
</tr>
<tr>
<td>TOTAL</td>
<td>53053</td>
<td>100</td>
<td>46048</td>
<td>100</td>
<td>475473</td>
<td>100</td>
<td>296490</td>
<td>9.93</td>
<td>1911</td>
<td>100</td>
<td>8862</td>
<td>100</td>
<td>4415</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Ministry of Agriculture and Water Resource, Uzbekistan 2005
Out of the total land resource area of about 44,579 sq kms, 61.5 percent is of agricultural use, 3.6 percent is under forest administration, 2 percent is made up of permanently protected area, 26 percent is unused and the remainder 6.9 percent utilized for urban areas, 2 percent for hydro-technical installation. While as, industry, transport and other non-agricultural activities occupy 4 percent.

The basic types of land use in Uzbekistan are:

i) **Arable Land:**

Arable Land is defined as the annually cultivated area under tilted crops. Natural conditions of Uzbekistan are suitable to cultivate one crop annually. Cultivation of repeated crops with the purpose to grow one crop after another (after winter, wheat and vegetables) is insignificant and limited mainly due to deficiency of irrigating water. The structure of arable land is represented by the (Fig.3.8). However, there are prospects for having extension of cultivated area which has not been brought under cultivation so far, because of lack of technology and infrastructure. However, it is observed that their will be an increase in the percent share of all crops in case unused land is brought under cultivation.

ii) **Perennial Planting:**

These are the lands occupied by fruits and bushes. Gardens are concentrated mainly in irrigated zone of 3397

<table>
<thead>
<tr>
<th>S.No</th>
<th>Crop</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cotton</td>
<td>42</td>
</tr>
<tr>
<td>2</td>
<td>Wheat</td>
<td>31</td>
</tr>
<tr>
<td>3</td>
<td>Fodder Crop</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>Vegetables</td>
<td>06</td>
</tr>
<tr>
<td>5</td>
<td>Rice</td>
<td>04</td>
</tr>
<tr>
<td>6</td>
<td>Maize</td>
<td>02</td>
</tr>
<tr>
<td>7</td>
<td>Smallgrains</td>
<td>02</td>
</tr>
<tr>
<td>8</td>
<td>Industrial</td>
<td>02</td>
</tr>
</tbody>
</table>

Source: FAO Production Year Book (2005)
Fig. 3.8
Acreable and structure of Uzbekistan
(In Percentage)

Source: 3.10
thousand hectares (96.2 Percent) and only 3.8 Percent in dry.19

iii) Hayfields and Pastures:

These are the areas covered by grasses. These areas are used for animal husbandry. Pastures on natural area in dry Zone makes 228070 thousand hectares. These are the basic forage reserves of sheep breeding. The area of watered Pastures makes 87.5 percent of the total area.20

According to environment (relief, climate) variety of pastures of Uzbekistan are subdivided into flat, plain-hilly, Piedmont-mountain and high mountain pastures. Deserted Plain pastures occupy significant area of northern sides which are the basic area of Astrakhan sheep breeding. These Pastures are used throughout the year but due to scarcity of rainfall less than 300 mm per year, pastures are ineffective.21

iv) Forests:

Forests are naturally unevenly distributed within the territory of the Republic of Uzbekistan. Natural vegetation and forests currently occupy 85 Percent of desert/Steppe area, 13 Percent of mountains and in the valley's and flood land area, which originally were well covered.22

v) Composite Area:

Composite area is a mixture of land use type on one plot (trees and crops). It is represented by homestead land. Total area of homestead land covers is about 6514 thousand hectares (2.3 percent). In structure of irrigated zone these occupy 4891 thousand hectares (11.4 percent).23

vi) Fallow Lands:

This includes all which were taken up for cultivation but are temporally out of cultivation for a period not less than one year and not more-than five years. The reason for keeping such lands fallow may be one or more like, Poverty of the cultivators, inadequate supply of water, salting of canals
and rivers, unfavourable climate and Unremunerative nature of farming (Fig.3.9). Owing to deriving the maximum production the fallow land of Uzbekistan have declined considerably.

Table 3.11
Ratio of Irrigated Area by Landuse Type (in Percentage)

<table>
<thead>
<tr>
<th>S.No</th>
<th>Land Area</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fallowland</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>Hayfield and Pastures</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>Composite Lands</td>
<td>11.4</td>
</tr>
<tr>
<td>4</td>
<td>Forests</td>
<td>1.0</td>
</tr>
<tr>
<td>5</td>
<td>Perennial Plants</td>
<td>7.9</td>
</tr>
<tr>
<td>6</td>
<td>Unirrigated</td>
<td>77.6</td>
</tr>
</tbody>
</table>

Sources: FAO Year Book 2005

It can thus be summed up from this table that there is a provision for bringing this unused productive fallow land under cultivation. A major portion of this unused non-arable land has not been brought under cultivation so far. As such chances for growth of agriculture by utilizing the fallow land are prominent.

There is an urgent need of suitable land use planning to accelerate the agricultural development. For this following step should be taken:

1. Land use should be done in planned way so that this interaction between rural and Urban may be at the maximum level.
2. The empowering of agricultural development with special reference to irrigation system, inputs and other innovative technologies should be adopted both in rural and urban regions of the Republic of Uzbekistan.
3. There should be another green revolution, white revolution, blue revolution and yellow revolution so that human resources and agricultural development may be possible further leading to enhancing the employment opportunity Visa-a-Vis poverty alleviation.
Fig. 3.9
Ratio of Irrigated area by Land Use Type
(In percentage)

Source: Table 3.11
References:
2. John, B.L.O. (1954), Crop Association Regions in Middle Eastern Regions of United States of America, Geographical Review, vol xLiv
4. Kandiyoti, D (2003), 'Pathways of Farm Restructuring in Uzbekistan Pressures and Outcomes; in Man Spoor (ed), Transition, Institutions and the Rural Sector, Boston and Maryland; Rowman and little field, lenington books.
7. Ibid, PP-142-158
8. Hussian, M.;(2001); Systematic Agricultural Geography, Rawat Publications, Jaipur and New Dehli;
9. Ibid, PP-117-118
Agricultural Landuse

Variations in Agricultural Productivity in Uzbekistan

17. "Main Macro Economic Indicators of Uzbekistan 2005
23. Ibid. PP 20-25