Chapter 1

Research Objects and Work Method

1.1 Research Object

The Absheron, Shirvan, Guba-Khachmaz and Lankaran regions were comparatively studied according the climatic condition, a quantity of the active temperatures ($T_{air} > 10^0$), rainfalls and evaporation because of differentness (**Scheme**).

Grey-brown (Gypsic Calcisols)

1. Absheron region, weakly smashed wave-like plain, arid subtropic zone, grey-brown soils, wormwood-solonchak-ephemer plants;

2. Absheron region, weakly smashed wave-like plain, arid subtropic zone, irrigative grey-brown soils, vegetable-fodder and vegetable-beans crop rotation.

Alluvial meadow-forest (Irragric Mollic Fluvisols)

3. Kuba-Khahmaz region, weakly smashed wave-like plain, humid subtropic zone, alluvial meadow-forest soils, forest, forest-like and meadow forest plants;

4. Kuba-Khahmaz region, weakly smashed wave-like plain, humid subtropic zone, irrigative alluvial meadow-forest soils, vegetable-fodder crop rotation.

Gleyey-yellow (Gleyic Livosols)

5. Lankaran region, flat terrace plain, moderately subtropic zone, gleyey-yellow soils, hirkan meadows, bog and bushes;

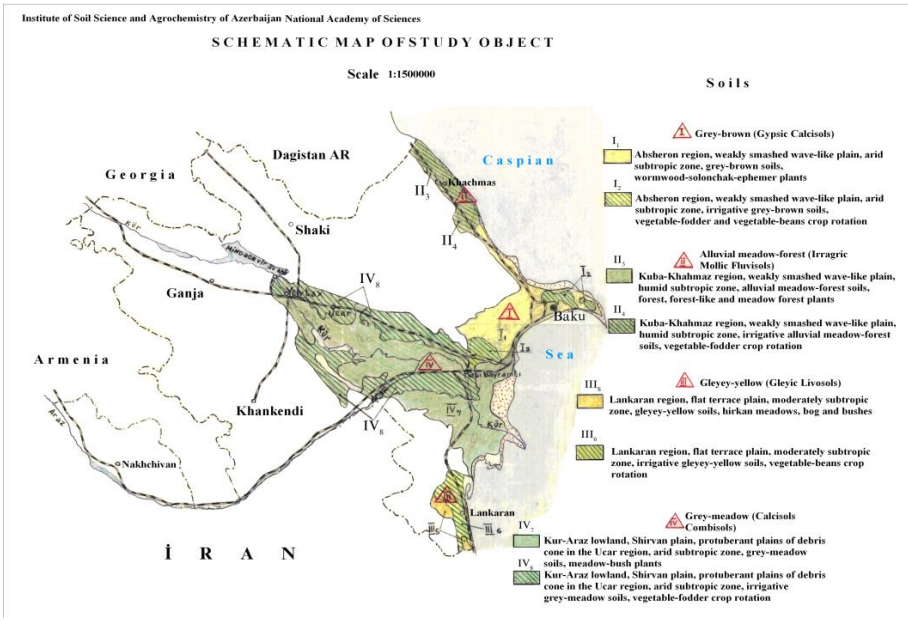
6. Lankaran region, flat terrace plain, moderately subtropic zone, irrigative gleyey-yellow soils, vegetable-beans crop rotation.

Grey-meadow (Calcisols Combisols)

7. Kur-Araz lowland, Shirvan plain, protuberant plains of debris cone in the Ucar region, arid subtropic zone, grey-meadow soils, meadow-bush plants;

8. Kur-Araz lowland, Shirvan plain, protuberant plains of debris cone in the Ucar region, arid subtropic zone, irrigative grey-meadow soils, vegetable-fodder crop rotation.

Six-field vegetable-fodder crop rotation scheme in irrigative grey-brown soils (I scheme) 1. lucerne annual+barley for green folder; 2. lucerne two year; 3. watermelon; 4. potato; 5. garlic; 6. white head cabbage+tomato and five-field vegetable bean crop rotation scheme (II scheme): 1. potato; 2. vegetable bean; 3. watermelon; 4. tomato; 5. vegetable bean. For a comparison as tomato, watermelon, potato, garlic, white head cabbage and vegetable bean are used in constant sowing (Table 1, 2).



A research object is irrigative grey-brown soil in Absheron, irrigative grey-meadow soils in Shirvan, irrigative alluvial meadow-forest soil in Guba-Khacmaz and irrigative gleyey-yellow soil of the Lankaran district. Six-field vegetable-fodder crop rotation scheme in irrigative grey-brown soils (I scheme) 1. lucerne annual+barley for green folder; 2. lucerne two year; 3. watermelon; 4. potato; 5. garlic; 6. white head cabbage+tomato and five-field vegetable bean crop rotation scheme (II scheme): 1. potato; 2. vegetable bean; 3. watermelon; 4. tomato; 5. vegetable bean. For a comparison as tomato, watermelon, potato, garlic, white head cabbage and vegetable bean are used in constant sowing (Table 1, 2).

Table 1. *Scheme I-The six-field vegetable-fodder crop rotation in irrigative gray-brown soils.*

Years Number of the field	**1992**	**1993**	**199 4**
1	Annual lucerne+ barley	Lucerne of the second year	Water-melon
2	Lucerne of the second year	Water-melon	Potato
3	Water- melon	Potato	Garlic
4	Potato	Garlic	White head cabbage+ tomato
5	Garlic	White head cabbage+ tomato	Annual lucerne+ barley
6	White head cabbage+ tomato	Annual lucerne+ barley	Lucerne of the second year

Table 1. *Continued.*

Years Number of the field	**1995**	**1996**	**1997**
1	Potato	Garlic	White head cabbage+ tomato
2	Garlic	White head cabbage+ tomato	Annual lucerne+ barley
3	White head cabbage+ tomato	Annual lucerne+ barley	Lucerne of the second year
4	Annual lucerne+ barley	Lucerne of the second year	Water-melon
5	Lucerne of the second year	Water-melon	Potato
6	Water-melon	Potato	Garlic

Table 2. *Scheme II-The five-field vegetable-beans crop rotation in irrigative gray-brown soils.*

Years Number of the field	1992	1993	199 4	1995	1996
1	Potato	Vegetable-bean	Watermelon	Tomato	Vegetable-bean
2	Vegetable-bean	Watermelon	Tomato	Vegetable-bean	Potato
3	Watermelon	Tomato	Vegetable-bean	Potato	Vegetable-bean
4	Tomato	Vegetable-bean	Potato	Vegetable-bean	Watermelon
5	Vegetable-bean	Potato	Vegetable-bean	Watermelon	Tomato

A reserach work in grey-meadow soils has been conducted in four-field vegetable fodder crop rotation: 1. lucerne annual; 2. lucerne two year; 3. cucumber: 4: tomato. Tomato and a cucumber has been used in the constant sowing (Table 3).

The six-field vegetable-fodder crop rotation scheme which is applied in alluvial meadow-forestry soils: 1. barley for lucerne+green fodder; 2. lucerne two year; 3. head onion; 4. cucumber; 5. white head cabbage; 6 barley+tomato for green fodder. Cucumber, whitehead cabbage, tomato and head onion have been planted in constant sowing for a comparison (Table 4).

Table 3. *The four-field vegetable-fodder crop rotation in irrigative grey-meadow soils.*

Years Number of the field	2001	2002	2003	2004
1	Annual lucerne	Lucerne of the second year	Cucumber	Tomato
2	Lucerne of the second year	Cucumber	Tomato	Annual lucerne
3	Cucumber	Tomato	Annual lucerne	Lucerne of the second year
4	Tomato	Annual lucerne	Lucerne of the second year	Cucumber

Table 4. *The six-field vegetable-fodder crop rotation in irrigative alluvial meadow-forest soils.*

Years Number of the field	1992	1993	199 4
1	Annual lucerne+ barley	Lucerne of the second year	Head onion
2	Lucerne of the second year	Head onion	Cucumber
3	Head onion	Cucumber	White head cabbage
4	Cucumber	White head cabbage	Green fodder+ tomato
5	White head cabbage	Green fodder+ tomato	Annual lucerne+ barley
6	Green fodder+ tomato	Annual lucerne+ barley	Lucerne of the second year

Table 4. *Continued.*

Years Number of the field	1995	1996	1997
1	Cucumber	White head cabbage	Green fodder+ tomato
2	White head cabbage	Green fodder+ tomato	Annual lucerne+ barley
3	Green fodder+ tomato	Annual lucerne+ barley	Lucerne of the second year
4	Annual lucerne+ barley	Lucerne of the second year	Head onion
5	Lucerne of the second year	Head onion	Cucumber
6	Head onion	Cucumber	White head cabbage

The five-field vegetable crop rotation scheme is applied in gleyey-yellow soils: 1. tomato; 2. maize for white head cabbage+silage; 3. head onion; 4. vegetable bean; 5. vegetable bean. In order to define the changes occuring in the soils under plants in the crop rotation vegetable plants of the same name have been used and a whitehead cabbage, tomato, maize, head onion and vegetable-bean have been in the same area for five years (Table 5).

Table 5. *The five-field vegetable-beans crop rotation in irrigative gleyey-yellow soils.*

Years Number of the field	1993	1994	1995	1996	1997
1	Tomato	White head cabbage+ corn for silage	Head onion	Vegetable-bean	Vegetable-bean
2	White head cabbage+ corn for silage	Head onion	Vegetable-bean	Vegetable-bean	Tomato
3	Head onion	Vegetable-bean	Vegetable-bean	Tomato	White head cabbage+ corn for silage
4	Vegetable-bean	Vegetable-bean	Tomato	White head cabbage+ corn for silage	Head onion
5	Vegetable-bean	Tomato	White head cabbage+ corn for silage	Head onion	Vegetable-bean

1.2 Research (Work) Method

Organization of vegetable and fodder plants, selection of schemes and applying fertilizer norms and agrotechnical measures have been fulfilled basing on perennial researches (1985-2005), consequences of the specialists researches of the Azerbaijan Institute of Scientific Research Vegetable-growing and other sources (Babayev and et. al., 2000; by editor Babayev, 1992). The field experiments are put on three secondaries by a systematic method (Dospexov, 1979). The research work was carried out on crop rotations in the grey-brown soils in the Absheron subsidiary, of the Institute of SR Vegetables-growing in 1992-1997. The vegetable plants was 66.37%, fodder crops were 33.3% on six field vegetable-fodder crop rotation (I scheme), the vegetable plants which are grown interrow were 60% and beans were 40% on five-field vegetable beans.

Consisting of 200 kv.m and three secondaries of each field area the total area on the first scheme was 200x3x6=3600kv.m, on the second scheme was

200x3x5=3000 kv.m, on the constant sowing was 6x600=3600 kv.m, a total area of the experiment was 3600+3000+3600=10200 kv.m.

The research work has been conducted on the four-field vegetable-fodder crop rotation in grey-meadow soils in the Ujar support point zone of the Shirvan plain in 2001-2004. Vegetable and fodder crops form 50%. An area of each field is 200 kv.m, an area of the crop rotation consisting of three secondaries is 200x3x4=2400 kv.m, on the constant sowing it is 200x3x2 =1200 kv.m, a total area of the experiment is 2400+1200=3600 kv.m.

The six-field vegetable-fodder tillage scheme of the Guba-Khacmaz zone alluvial meadow-forestry soils was tested in the Gusarchay Zonal Experimental Station in 1992-1997 and vegetable plants form 33.7%, fodder crops-66.3%. Consisting of 200 kv.m, three secondaries of each field area, an area was 200x3x6 =3600 kv.m, 200x3x4=2400 kv.m in the constant sowing, a total area was 3600+2400=6000 kv.m.

The crop rotation of five-field vegetable-beans was tested in gleyey-yellow soils of the Lankaran Zonal Experimental Station in 1993-1997. A total area of the field is 200 x3 x5=3000 kv.m by consisting each field area of 200 kv.m and three secondories on the experiment area, the experiment total area is 3000+3000=6000 kv.m on the constant sowing. A scheme of the crop rotation in the five-field beans: 1.tomato; 2 white-head cabbage + a maize for silage; 3. head onion; 4 vegetable bean; 5.vegetable bean.

In order to define the changes occurring in the soils under plants of the crop rotation the vegetable plants of the same name are used on the constant sowing and white-head cabbage, tomato, maize, head onion and vegetable bean were planted in the same area for five years. The phenological observations over the growing plants at the vegetation period (March-October months).

Under a field condition CO_2 gas decomposed from soil has been calculated on the basis of the CO_2 gas quantity by kilogram exposed from a hectare area for an hour (Makarov, 1977) and cellulose shattering intensity has been calculated on the basis of reduction of the linen quantity by a percentage as a result of 14-day exposition (Vostrov, 1961). The soil samples have been taken for the laboratorial analyses from sowing layer (0-25 cm) and under-sowing layer (25-50 cm) on the 3-secondaries in the dynamics. The soil mechanical composition from physical analyses has been defined with a pipette by Kachinsky method by woring with Na pyrophosphate. According to the total received method humus from chemical analyses is defined by Nessler reactive according to Tyurin, nitrogen nitrate form according to Grandval-Lyau ammoniac form according to Conev, mobile phophoris is defined by Machigin (in alkaline soils) and Mesheryakov (in acid soils) and pH potensiometric method.

Ferments activity from biological analyses was determined by F.Kh. Khaziyev (2005) (invertaza-a quantity of glucose decomposed from 1g of soil for 24 hours, ureaza-a quantity of $N\text{-}NH_3$ decomposed from shattering of urinary essence for 24 hours in soil, phosphataza-a quantity of P_20_5 decomposed from 10 g of soil for an hour, catalaza-a quantity of O_2 by cm^3 decomposed from 1 g of soil for an hour and dehydrogenaza -a quantity of trifenylformazon (TFF) by mg decomposed from 10 g of soil for 24 hours), the soil nitrification ability according to N.I. Bolotina, E. N. Abramov (1968), ammonification ability according to E. Z. Tepper, V. K. Shilnikov, G. N. Pereverzev (1972) and microorganisms quantity has been defined by (microorganisms total quantity fleshy-peptony-agaric (FPA) and starchy-ammoniac-agaric (SAA), actinomisets starchy-agaric-agaric (SAA) and microscopic fungus quantity have been defined

on Chapek agaric environment on the basis of the method received in the Institute of Microbiology of Moscow.

Integral index of the biological soil status (IBSS) has been determined on the basis of the complex biological indicators according to the K.Sh. Kazeyev S.I. Kolesnikov and V.F.Valkov's (2004) method. A maximum value of each index is received 100% and a quantity of the same index is expressed by a percentage in respect of it.

$$B1 = (Bx / Bmax) \cdot 100 \quad (1)$$

Where B1-a relative mark of the parameter, Bx-factical value of the parameter, Bmax-a maximum value of the parameter. A relative value of some parameters is divided into its number by adding because of difference of the size units of biological indices from each other and impossibility of adding their absolute mark:

$$B_m = (B1 + B2 + B3 + \ldots + Bn)/N, \quad (2).$$

Where B_m-is the mean relative value of the number of characteristics, and N is the number of characteristics.

The integral characteristic of the soil biological status is calculated similarly to Eq. (1):

$$IBSS = (B_m/B_{max}).100, \quad (3)$$

Where, B_m and B_{max} are the mean and maximum relative values of all the characteristics.

An exactness of the consequences in cameral works has been carried out according to the mathematic-dispersion analysis (Dospexov, 1979), correlative relation among the indices is fulfilled in Excel 2007 program. There wasn't a

strong difference for temperature and humidity in comparison with the long-term indices in the hospital experimental areas at the period of the research. The soils temperature is measured by Sawinov a thermometer, the field humidity is conducted by drying in 1050C of temperature by a weight method in thermostat for 5 hours, and soil volume weight is calculated according to Vasilyev drum.