Topic 4: Technology of Establishing Subtropical Fruit Orchards.

PLAN:

1. Selecting a site for establishing an orchard.
2. Preparing the soil for planting when establishing a new orchard.
3. Selecting fruit species and varieties.
4. Methods of placing fruit trees in the orchard.
5. Planning the orchard area.

GLOSSARY (ГЛОССАРИЙ)

Term name			Meaning of the term
In Uzbek	**In English**	**In Russian**	
Subtropik o‘simliklar	Subtropical plants	Субтропические растения	A group of plants that grow naturally or are cultivated in the subtropical climate zone (mild winters, hot and often dry summers).
Kserofitlar	Xerophytes	Ксерофиты	Plants adapted to arid conditions, able to survive with little water. Widely distributed in dry subtropics (e.g., around the Mediterranean).
Introduksiya	Introduction	Интродукция	The process of moving plants from their natural range to new areas and acclimatizing them.
Fitotsenoz	Phytocoenosis	Фитоценоз	A community of plants growing together in a certain area and interacting with each other. Subtropical forests and shrublands are examples of phytocoenoses.
Agrosanoat majmuasi	Agro-industrial complex	Агропромышленный комплекс	A set of technologically interconnected branches and services subordinated to common goals, engaged in the production, preparation, processing, storage of agricultural products, and delivery of finished products to consumers.

Barg	Leaf	лист	One of the main vegetative organs of plants, performing photosynthesis, transpiration, and gas exchange.
Fotosintez	Photosynthesis	фотосинтез	The process of formation of organic substances from carbon dioxide and water under the influence of light in the cells of green plants, algae, and some microorganisms; the conversion of solar energy into chemical energy in organic substances.
Gul	Flower	цветок	The part of angiosperms serving for reproduction, consisting of pedicel, sepals, petals, stamens, and pistil.
Glyukoza	Glucose	Глюкоза	Glucose (grape sugar) is a colorless substance formed from the conversion of starch into sugar. It tastes sweet and is easily digested by the human body.
Hosil	Harvest	урожай	Grain, vegetables, etc., grown and obtained from crops, trees, and the like.
Kurtak	Germ / Bud	почка; зародыш	The organ of a plant that appears as a swelling on the body and shoots, developing into parts such as leaves, flowers, and branches; the initial organ.
Novda	Shoot	ветка	One-year-old stem.
Organik	Organic	органический	Formed from the decomposition of animals or plants; a substance obtained from the products of living organisms.
Po‘stloq	Bark	кора; корьё (дубильное)	The part covering the trunk, shoots, and roots of a plant.
Efir moylari	Essential oils	Эфирные масла	Essential oils. In fruits, essential oils are very scarce, constituting one-hundredth or one-thousandth of a percent of the wet mass of fruits.

1. SELECTING A SITE FOR ESTABLISHING AN ORCHARD.

How is a new orchard established?

Selecting a site for a newly established orchard:

- Sunny
- Protected from strong winds
- Free from accumulation of cold air and currents
- Where fruit crops have not been grown before
- The slope of the orchard area should not exceed 3–4°
- Annual precipitation not less than 800 mm
- Groundwater should be deep (below 2 m)
- Area with good drainage
- Not heavily salinized soil
- Low acidity pH (6.0–6.5)
- Free from perennial weeds

Selecting a site for persimmon

For establishing a persimmon orchard, the selected area should have good light and air movement. The persimmon tree grows well on various slopes, especially developing well on southern, southeastern, and southwestern slopes. The persimmon tree grows and develops well in medium gray soils with a deep soil layer, fertile, and with good drainage. In sandy and gravelly areas, the growth and fruiting of the persimmon tree are not very good. It is impossible to establish a persimmon orchard in salinized and marshy lands with groundwater above 2 meters. In poorly drained, heavy, structureless soils, the persimmon tree does not grow well and does not bear fruit. Soils with an alkalinity (pH) of 6.0–6.5 are considered suitable.

Selecting a site for pomegranate

Pomegranate can grow in various soils — heavy, clayey, light loamy, stony, and others. But it grows and develops well in fertile, loessial, aerated, well-draining soils with sufficient moisture. If the summer is hot, the autumn is long and dry, and regular irrigation is provided, pomegranate produces large fruits. Therefore, it is said about pomegranate: "Keep its feet in water, its head in the sun.".

Selecting a site for fig

It is not very demanding regarding soil and climatic conditions. For establishing fig orchards, flat areas that can be worked with machinery, slightly sloping, with good sunlight, provided with water, and protected from gusty winds and hot winds (garmsel) are selected. For a fig orchard, slopes facing south, southeast, or southwest are considered convenient. Fig grows and bears fruit well in medium-heavy soils with a thick fertile layer and groundwater level at a depth of 2–2.5 meters. In autumn, the selected area is leveled and plowed to a depth of 30–35 cm.

Selecting a site for jujube (unabi)

For jujube, areas exposed to the sun and protected from winds are selected. Jujube grows in various places, but areas with shallow groundwater, marshy, very wet, and heavily salinized lands are unsuitable for it. Jujube can be planted in mountain and foothill areas. In low-fertility areas, it does not yield well.

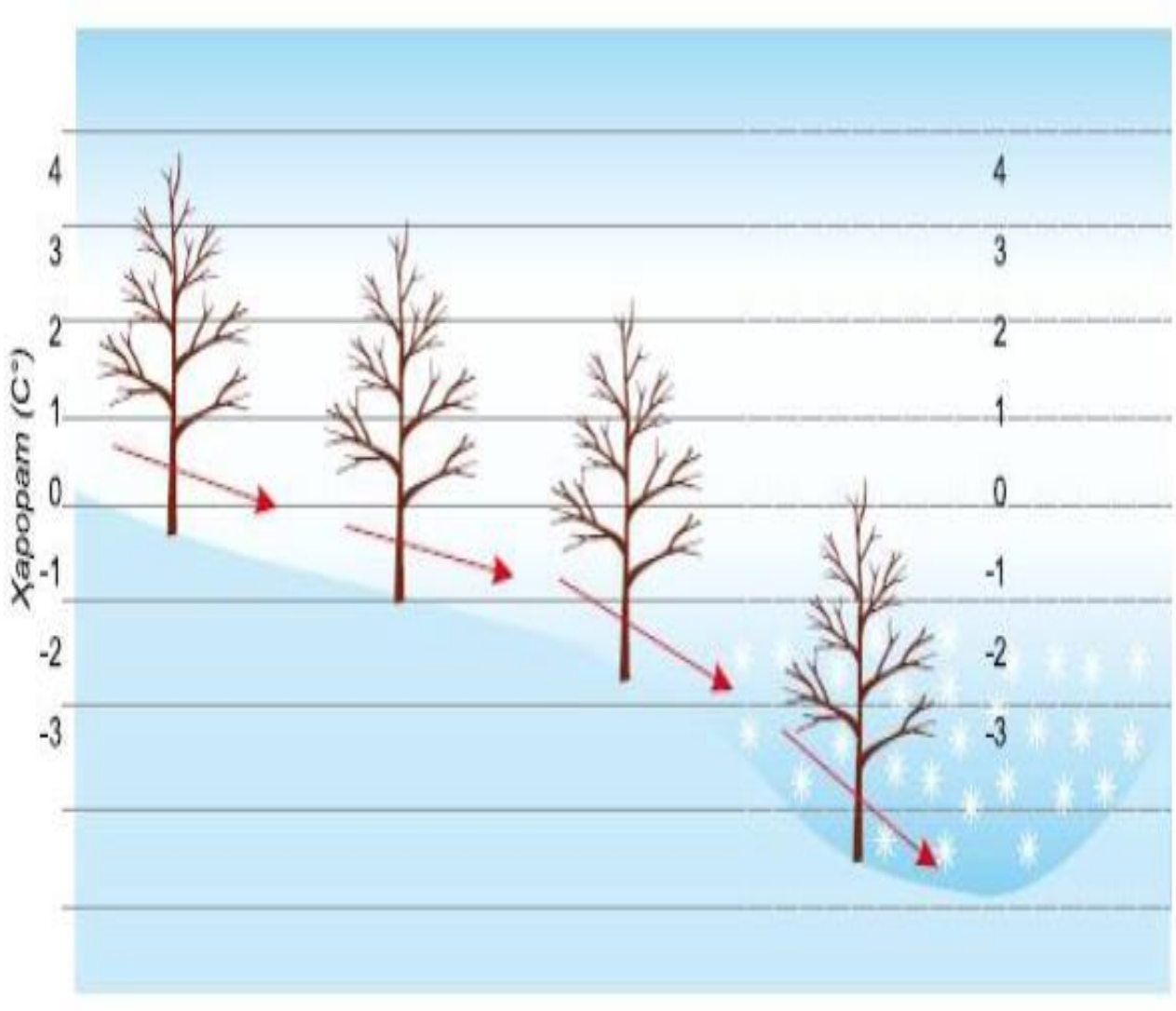


Figure 1. *Selecting a site for an orchard (based on relief example).*

2. PREPARING THE SOIL FOR PLANTING WHEN ESTABLISHING A NEW ORCHARD.

Before plowing the soil in autumn, 50–60 t of organic, 140–180 kg/ha of phosphorus, and 80–100 kg/ha of potassium fertilizers are applied in pure form.

In autumn, the area allocated for the orchard is plowed with a 50–60 cm plantation plow (PPU-50 or PP-50 PG unit).

In spring, it is plowed to a depth of 30–35 cm.

Depending on the readiness of the land, harrowing, disking, and leveling operations are carried out.

If the area of newly established orchards exceeds 10 ha, it is divided into separate quarters.

It is better if the quarters are rectangular in shape, 500–600 m long and 200 m wide.

The quarter is divided into blocks of 2 ha each, and the length should be 100 m.

At least 2 varieties ripening at the same time are planted in the quarter for good pollination.

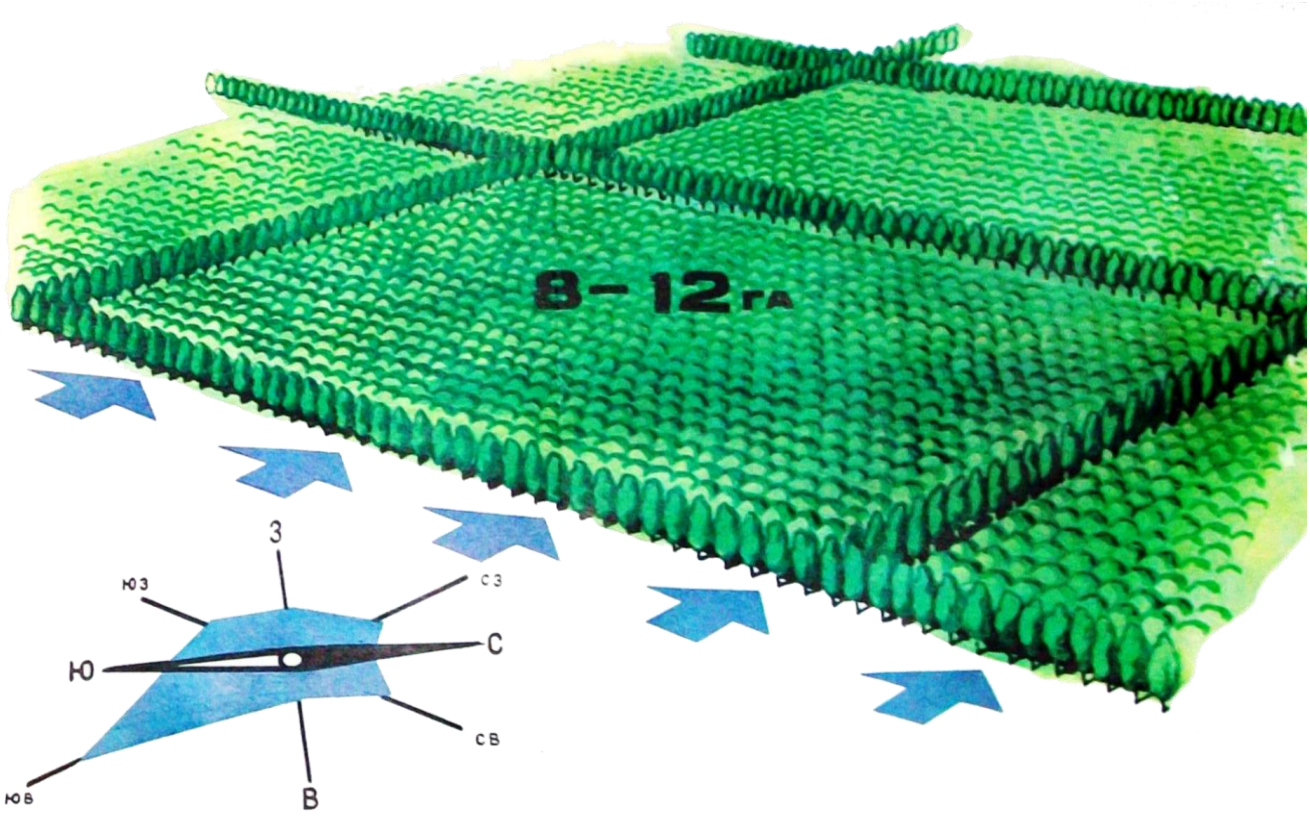


Figure 2. *Layout of orchard area and quarters.*

Usually, 2–3 varieties of the same fruit ripening at different times are planted in each quarter. Labor-intensive, perishable, and not very transport-resistant fruit types (strawberry, fig, etc.) should be planted close to populated areas.

Quarters are separated from each other by roads 10–12 m wide, which are connected to the main road. The width of roads inside quarters is 8–10 m.

3. SELECTING FRUIT SPECIES AND VARIETIES.

Each fruit tree species and variety has its own specific requirements regarding soil and climate. Based on production experience and data from scientific research institutions, species and varieties are regionalized as a percentage for each region. The species and varieties selected for each fruit-growing region are called the standard assortment, and this standard assortment is followed when establishing an orchard.

Placing species and varieties in the orchard. Each species and even each variety has different requirements for the external environment. Therefore, the agrotechnics for their care should be differentiated.To achieve this, species should be planted in separate sections and even quarters, and varieties in separate rows.

Varieties should be selected in such a way that they cross-pollinate each other and provide a uniform harvest from the orchard throughout the entire vegetation period. The main pome fruits in the orchard should consist of 3–5 varieties, stone fruits of 3–4, and others of 2–3 varieties, and they should ripen at different times. Self-pollinating varieties also give abundant and quality harvest when cross-pollinated; for their full pollination, after every 10–12 main rows, 1–2 rows of 2–3 different pollinating varieties are planted.

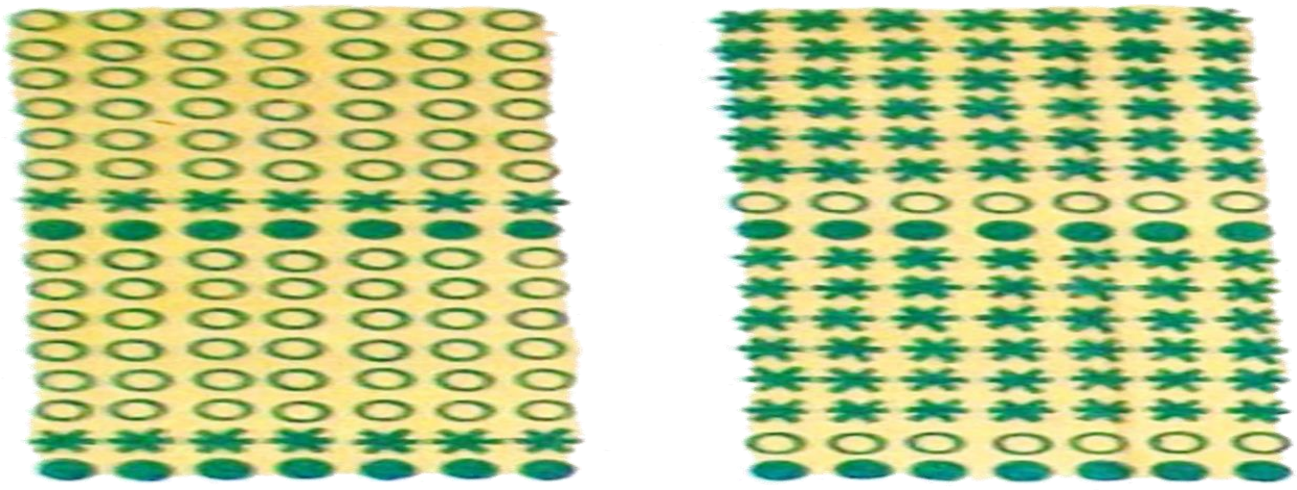
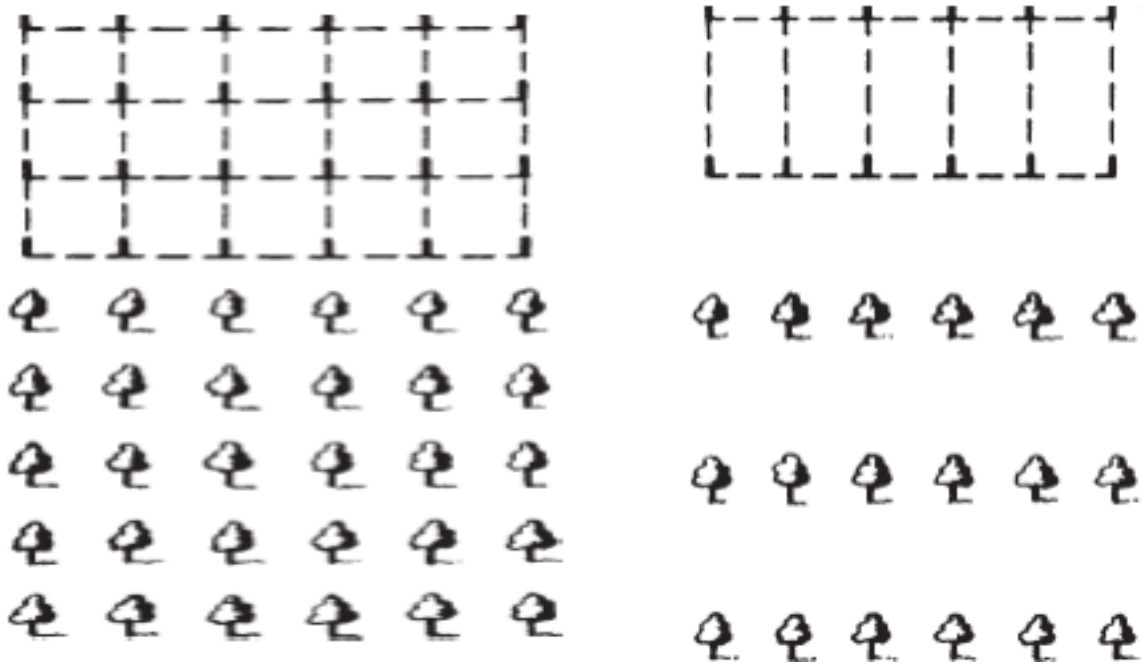


Figure 3. *Placement of fruit species and pollinating varieties***.**

4. METHODS OF PLACING FRUIT TREES IN THE ORCHARD.



Placing fruit trees using the square method

Placing fruit trees using the rectangular method

Figure 4. *Methods of placing fruit trees.*

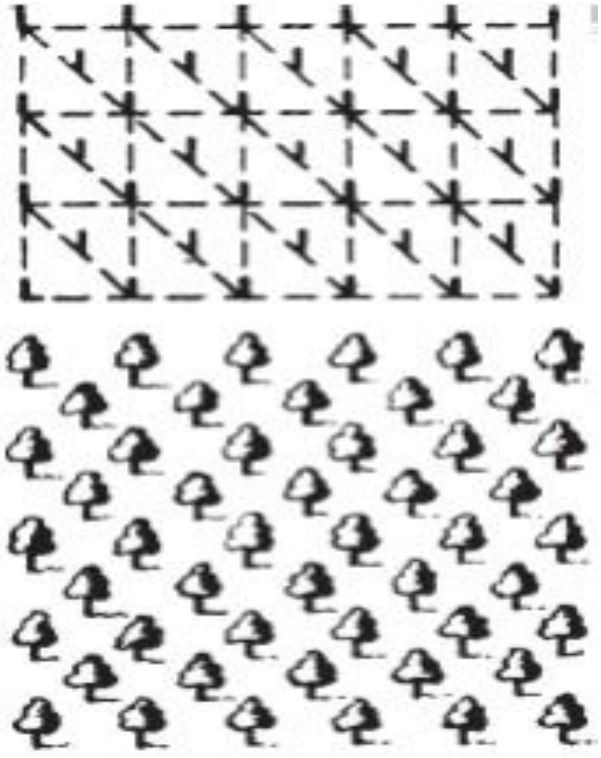


Figure 5. *Checkerboard arrangement of fruit trees*

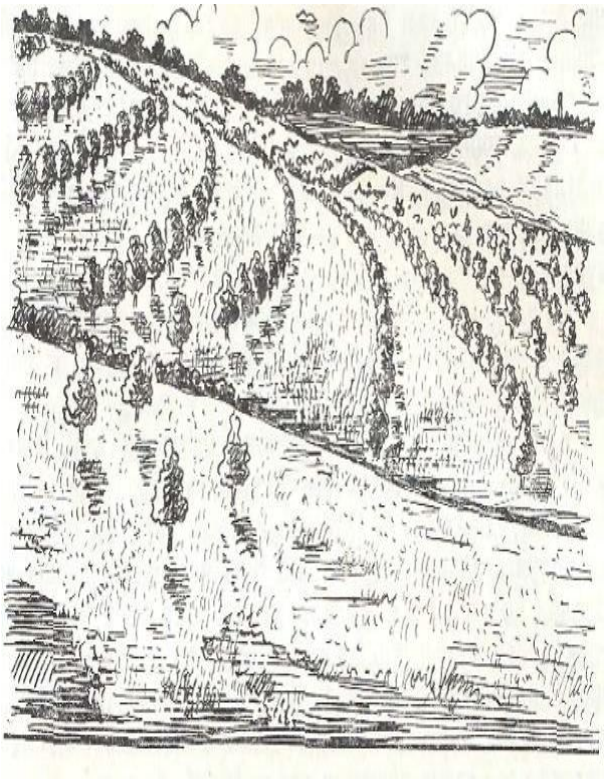
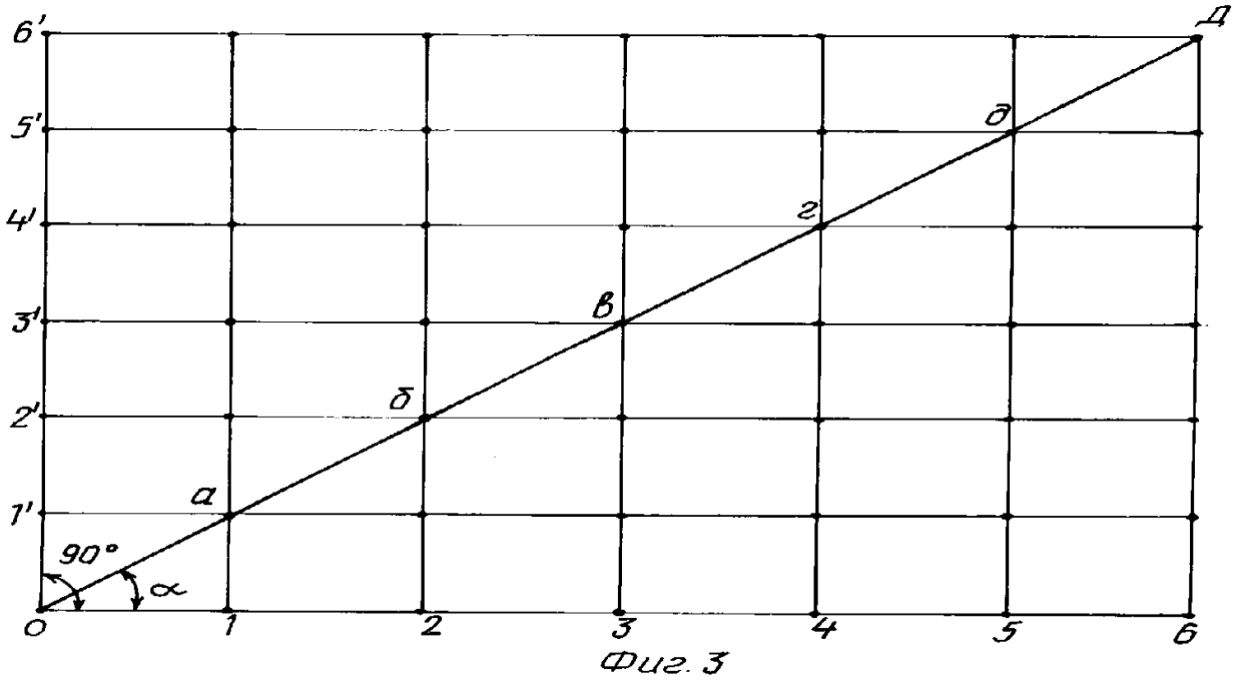


Figure 6. *Contour arrangement of fruit trees*

5. PLANNING THE ORCHARD AREA.

When establishing an orchard on large areas, the size of individual quarters, their placement, the location of relevant buildings, and the roads leading to them are determined.

At the corners of each quarter, posts with the quarter name written on them are buried. Tree rows are laid out along the most convenient slope with good water flow. Rows should preferably be oriented from east to west, and in regions with constant winds, they should be oriented toward the direction the wind blows. Windbreak trees should be planted perpendicular to the wind. The orchard is planned facing the main ditch or main road from the area.



Фиг. 3

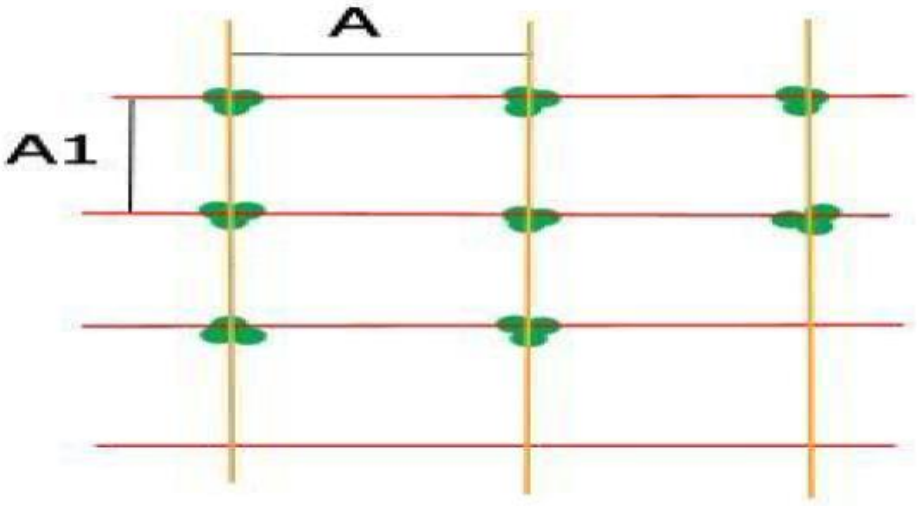


Figure 7. *Planning the orchard area.*

For planning, the following are needed:

A measuring tape or roulette, 2 cables at least 110 m long, 15–20 wooden stakes up to 3 m long with a diameter of 5–8 cm, 2 iron stakes up to 1 m long with a diameter of 2–3 cm for pulling the cable, 400 small stakes 1 m long calculated for planting per 5–10 hectares, and 2 measuring rods 24 m long.

Digging holes. In autumn, holes are dug two weeks before planting; when planting in spring, they are dug in autumn. In irrigated gray soils, their width is 60–75 cm and depth 60–70 cm; in low-fertility gravelly stony soils, the width of the holes is increased to 1.5 m.

When digging holes, to avoid losing the point where the tree is to be planted and not to break the straight-line planting, a planting board 1.5–2 m long is used.

Depending on local climatic conditions and organizational work, fruit trees are usually planted in autumn or spring. Autumn planting begins after leaf fall in early November and continues until hard frosts. In spring, before the buds open, depending on the condition of the soil, planting can be done until March 20–25 in southern regions and until April 10–15 in northern regions.

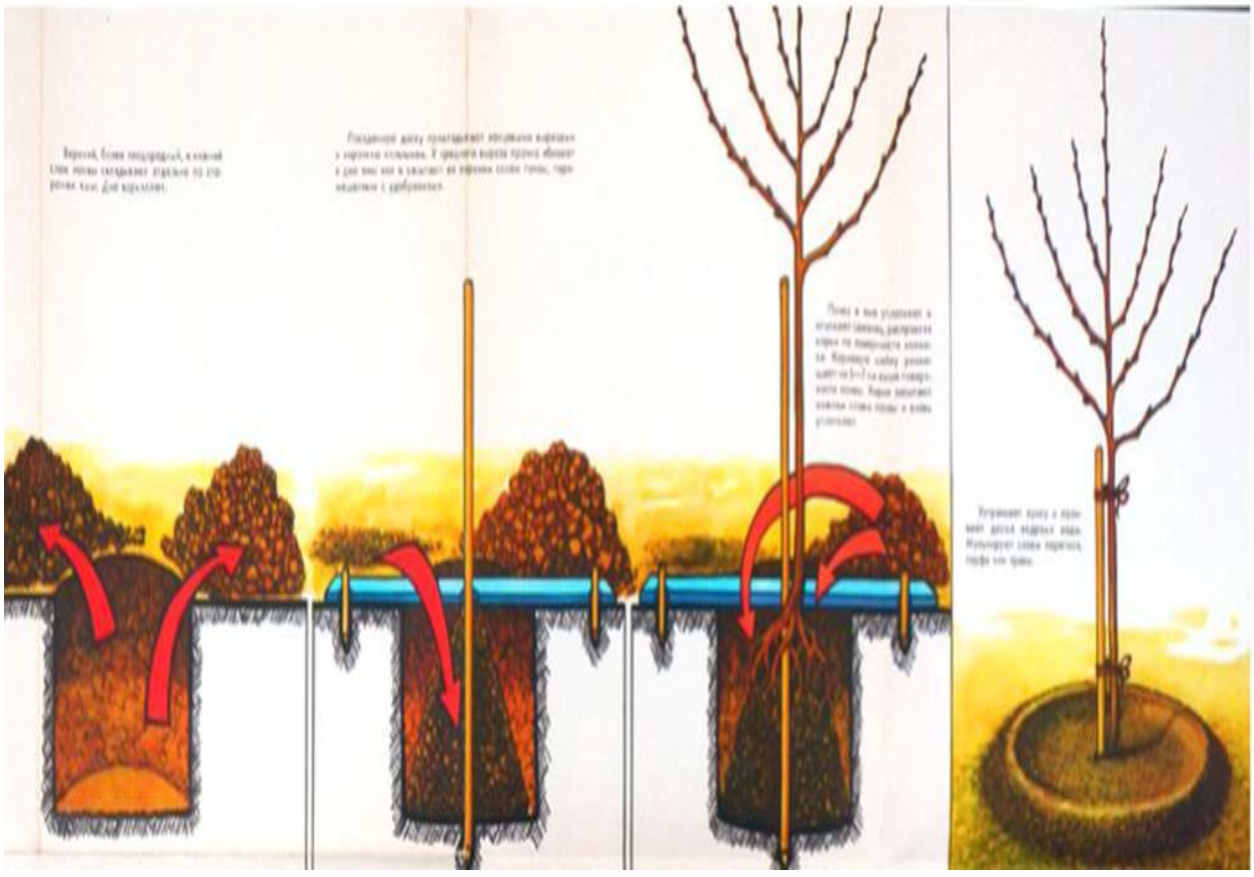


Figure 8. *Planting procedure for seedlings.*

Before planting new seedlings, the root tips are cut. Before planting, the root part is dipped in a mixture of soil and cattle manure. Before planting new seedlings, the root tips are cut. During planting, the root collar of the seedling is buried 4–5 cm above the soil surface. The lateral branches participating in crown formation are cut by ½ or 2/3. Sufficient water is poured into the trench of newly planted seedlings, and to preserve moisture, the area around the seedling is covered with plant residues, chaff, or cloth.





Figure 9. *Before planting new seedlings, the root part is dipped in a mixture of soil and cattle manure.*

Number of seedlings per hectare and planting scheme when establishing a subtropical crop orchard.

Table 1.

Fruit tree species	Planting scheme (m)	Number of trees per hectare (pieces)
Persimmon	5x5	400
	6x5	333
Pomegranate	4x3	833
	5x4	500
Fig	5x5	400
	5x4	500
Jujube	6x5	333
	6x4	417
Olive	6x5	333
	6x6	278

Planting technique. Before planting, soil is thrown into the hole to form a mound. The planting board is inserted into the control stakes, and the seedling is placed in the notch in the middle of the board.



Figure 10. *Preparing a fruit tree seedling for planting.*

The seedling is planted by two workers. One takes the seedling and spreads its roots over the soil mound. The second worker evenly throws soft soil around the hole.

When planting the seedling, the root collar should be buried 5–6 cm above the soil surface in heavy soil areas and 4–5 cm in light soil areas. After planting, the seedling is irrigated successively.

Control questions and tasks

1. What should be considered when selecting a site for establishing an orchard?
2. Explain the procedure for organizing the orchard area.
3. What is the importance of selecting fruit species and varieties?
4. Provide information about the methods of placing fruit trees in the orchard.
5. What is the procedure for planning the orchard area?
6. Write down in sequence the stages of preparing the soil for planting when establishing a new orchard.
7. If the orchard area exceeds 10 hectares, into what parts is it divided?
8. What is considered when selecting fruit species and varieties for quarters and blocks?
9. What is the "standard assortment"?
10. How are varieties placed?

MAIN CONCLUSIONS:

1. Selecting a site for establishing an orchard is one of the most important stages determining the future productivity and long-term development of the orchard. The site should be sunny, protected from strong winds, free from accumulation of cold air currents, where fruit crops have not been grown before, with a slope not exceeding 3–4°, annual precipitation not less than 800 mm, groundwater deeper than 2 m, good drainage, not heavily salinized, pH 6.0–6.5, and free from perennial weeds.
2. An individual approach is necessary for each subtropical crop. Persimmon prefers light and windy places, southern and southeastern slopes; pomegranate can

grow in various soils but develops well in fertile, loessial, aerated soils; fig requires flat, slightly sloping areas with good sunlight and protection; jujube is unsuitable for areas with shallow groundwater, marshy and heavily salinized lands.

3. Preparing the soil for planting consists of applying 50–60 t of organic, 140–180 kg/ha of phosphorus, and 80–100 kg/ha of potassium fertilizers in autumn, plowing with a 50–60 cm plantation plow, plowing to a depth of 30–35 cm in spring, followed by harrowing, disking, and leveling operations.

4. Dividing the orchard area into quarters — areas exceeding 10 hectares are divided into separate quarters. It is advisable for quarters to be rectangular in shape, 500–600 m long and 200 m wide. Each quarter is divided into 2-hectare blocks. Quarters are separated by roads 10–12 m wide, and internal roads are 8–10 m wide.

5. Selecting fruit species and varieties — a standard assortment is determined for each region and followed when establishing an orchard. Species are placed in separate sections and quarters, and varieties in separate rows. The main pome fruits should consist of 3–5 varieties, stone fruits of 3–4, and others of 2–3 varieties, ripening at different times. For cross-pollinating varieties, after every 10–12 main rows, 1–2 rows of pollinating varieties are planted.

6. Planting dates and techniques — seedlings are planted in autumn (from early November until hard frosts) or in spring (until March 20–25 in southern regions and until April 10–15 in northern regions). Before planting, root tips are cut, and the root part is dipped in a mixture of soil and cattle manure. The root collar is buried 5–6 cm higher in heavy soils and 4–5 cm in light soils. After planting, successive irrigation is carried out.

7. Planting schemes and number of seedlings — for persimmon 5x5 (400 pieces/ha) and 6x5 (333 pieces/ha); for pomegranate 4x3 (833 pieces/ha) and 5x4 (500 pieces/ha); for fig 5x5 (400 pieces/ha) and 5x4 (500 pieces/ha); for jujube 6x5 (333 pieces/ha) and 6x4 (417 pieces/ha); for olive 6x5 (333 pieces/ha) and 6x6 (278 pieces/ha) schemes are used.

8. Planning the orchard area — posts with names are buried at the corners of quarters, tree rows are laid out along the most convenient slope with good water flow. Rows should preferably be oriented from east to west, and in regions with constant

winds, oriented toward the direction the wind blows. Windbreak trees are planted perpendicular to the wind.

9. An integrated approach in establishing a subtropical crop orchard — site selection, soil preparation, selection of species and varieties, placement of seedlings, planning the area, and planting technique are closely interrelated, and the correct implementation of each stage ensures the productivity and economic efficiency of the orchard.

10. Practical significance — when planting schemes and agrotechnical measures for subtropical crops (persimmon, pomegranate, fig, jujube, olive) are correctly applied, a high and quality harvest is obtained, and the orchard's long-term service is achieved.

SIW: Methods of pruning subtropical fruit plants and the technology of its implementation.

INFORMATIONAL-METHODOLOGICAL SUPPORT:

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SELF-ASSESSMENT TESTS:

1. What should be the slope of the area selected for establishing an orchard?
A) Not exceeding 3–4°
B) 1–2°
C) 5–6°
D) 7–8°
2. What should be the annual precipitation for a new orchard?
A) Not less than 800 mm
B) Not less than 400 mm
C) Not less than 600 mm
D) Not less than 1000 mm
3. At what depth should groundwater be located?
A) Below 2 m
B) Below 1 m
C) Below 1.5 m
D) Below 3 m
4. What is the suitable pH indicator of the soil for an orchard?
A) 6.0–6.5
B) 4.0–5.0
C) 5.0–5.5
D) 7.5–8.0
5. On which slopes does the persimmon tree develop well?
A) Southern, southeastern, southwestern
B) Northern and northeastern
C) Only northern
D) Only western
6. In which areas is it impossible to establish a persimmon orchard?
A) In salinized and marshy areas with groundwater above 2 m
B) In medium gray soils
C) In areas with good drainage
D) On southern slopes
7. In which soils does pomegranate grow and develop well?
A) Fertile, loessial, aerated, well-draining
B) Salinized and marshy
C) Only sandy
D) Only stony
8. The expression "Keep its feet in water, its head in the sun" refers to which crop?
A) Pomegranate
B) Persimmon
C) Fig
D) Jujube
9. What kind of areas are selected for establishing a fig orchard?
A) Flat, slightly sloping, with good sunlight, provided with water

B) Steeply sloping, shaded
C) Marshy and salinized
D) Only mountainous
10.At what depth should groundwater be for fig?
A) 2–2.5 m
B) 1 m
C) 1.5 m
D) 4 m
11.Which areas are unsuitable for jujube (unabi)?
A) Areas with shallow groundwater, marshy, very wet, and heavily salinized
B) Mountain and foothill areas
C) Areas exposed to the sun
D) Areas protected from winds
12.How much organic fertilizer is applied per hectare before plowing the soil in autumn?
A) 50–60 t
B) 20–30 t
C) 30–40 t
D) 70–80 t
13.How much phosphorus fertilizer is applied per hectare before plowing the soil in autumn?
A) 140–180 kg
B) 50–60 kg
C) 80–100 kg
D) 200–250 kg
14.To what depth is the area allocated for the orchard plowed in spring?
A) 30–35 cm
B) 20–25 cm
C) 40–45 cm
D) 50–60 cm
15.To what depth is the area allocated for the orchard plowed in autumn?
A) 50–60 cm
B) 20–30 cm
C) 30–40 cm
D) 70–80 cm
16.What is done with orchards whose area exceeds 10 hectares?
A) Divided into separate quarters
B) Divided into blocks
C) Divided into rows
D) Nothing is done
17.What size of quarters is considered good?
A) 500–600 m long, 200 m wide
B) 100–200 m long, 50 m wide
C) 300–400 m long, 100 m wide
D) 700–800 m long, 300 m wide

18.Into how many hectares of blocks is a quarter divided?
A) 2 ha
B) 1 ha
C) 3 ha
D) 4 ha
19.By what width of roads are quarters separated from each other?
A) 10–12 m
B) 5–6 m
C) 8–10 m
D) 15–20 m
20.What is the width of roads inside quarters?
A) 8–10 m
B) 5–6 m
C) 10–12 m
D) 15–20 m
21.After how many main rows are pollinating varieties planted for full pollination of self-pollinating varieties?
A) After 10–12 rows, 1–2 rows
B) After 5–6 rows, 1 row
C) After 15–20 rows, 2–3 rows
D) After 20–25 rows, 3–4 rows
22.How many seedlings are needed per hectare for persimmon in a 5x5 scheme?
A) 400 pieces
B) 333 pieces
C) 500 pieces
D) 833 pieces
23.Which planting scheme requires the most seedlings for pomegranate?
A) 4x3
B) 5x4
C) 5x5
D) 6x5
24.How is the root collar buried in heavy soil areas before planting?
A) 5–6 cm above the soil surface
B) 2–3 cm below the soil surface
C) 10 cm above the soil surface
D) At the soil surface
25.Which answer is correct regarding planting dates?
A) Planted in autumn or spring
B) Planted only in summer
C) Planted only in winter
D) Planted only in autumn