

Management of Agricultural Operations and Agri-Food enterprises

Third-Year Agronomy Course (Bachelor's Level)

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Chapter 02

Production Organization

1 CRITERIA FOR CHOOSING A PRODUCTION SYSTEM

What is a Production System?

A production system is the way a farmer organizes their farm to produce crops or animals. It includes what to grow, how to grow it, and what resources to use.

1.1 Main Criteria for Selection:

a) Climate and Soil

- Climate: Temperature, rainfall, sunshine
- Soil type: Sandy, clay, loamy
- Example: Rice needs water-logged soil and warm climate. Wheat grows in cooler, drier conditions.

b) Available Resources

- Land size: Small farm (1-5 ha) vs. Large farm (>50 ha)
- Water: Rain-fed or irrigated
- Labor: Family workers or hired workers
- Capital: Money for seeds, fertilizers, machines

- **Example:** A small farmer with limited money may choose vegetable production (quick returns) instead of fruit trees (long waiting period).

c) Market Demand

- What do people want to buy?
- Where is the market? (Local, national, export)

Example: Near cities, grow vegetables (tomatoes, lettuce). In rural areas, grow staple crops (maize).

d) Technical Knowledge

- Farmer's experience and skills
- Availability of training

Example: A beginner farmer should start with simple crops like maize before trying complex systems like greenhouse production.

e) Economic Profitability

- Production costs vs. selling price
- Break-even point

Simple formula:

$$\text{Profit} = \text{Total Revenue} - \text{Total Costs}$$

Example:

- Tomato production cost: 200 000 Dz/hectare
- Revenue from sales: 500 000 Dz/hectare
- Profit: 300 000 Dz/hectare : Good choice!

2 PRODUCTION CONSTRAINTS

What are Constraints?

Constraints are problems or limitations that reduce production or make farming difficult.

a) Natural Constraints

☐ Climate problems:

- Drought (no rain)
- Floods (too much rain)
- Frost (very cold)
- Strong winds

Example: In Sahel region, drought kills crops every 3-5 years.

☐ Pests and Diseases:

- Insects eating crops
- Fungal diseases
- Weeds competing with crops

Example: Fall armyworm destroys maize fields in Africa, causing 30-50% losses.

☐ Soil problems:

- Poor fertility (lacks nutrients)
- Erosion (soil washes away)
- Salinity (too much salt)

Example: In coastal areas, salt water makes soil unsuitable for most crops.

b) Economic Constraints:

- **High input costs:** Seeds, fertilizers expensive
- **Low market prices:** Cannot sell at good price
- **Transportation costs:** Farm far from market
- **Lack of credit:** No money to borrow

Example: A farmer produces 10 tons of tomatoes but cannot transport them to the city. They rot in the field = Total loss.

c) Technical Constraints

- Old equipment or no machines
- Lack of improved seeds
- Poor storage facilities
- Limited irrigation systems

Example: Without a tractor, a farmer can only cultivate 2 hectares manually instead of 10 hectares.

d) Social Constraints

- Land ownership conflicts
- Gender inequality (women cannot own land)
- Limited education
- Migration of young workers to cities

Example: In some regions, women do 60% of farm work but own only 15% of land

How to Overcome Constraints:

Constraint	Solution
Drought	Irrigation, drought-resistant varieties
Pests	Integrated Pest Management
Poor soil	Fertilizers, compost, crop rotation
High costs	Cooperatives for bulk buying
Lack of knowledge	Training, extension services

3. LIVESTOCK MANAGEMENT

What is Livestock Management?

Managing animals (cattle, goats, sheep, chickens) for production of meat, milk, eggs, or work.

Key Aspects:

Animal Selection

Choose animals based on:

- **Production purpose:** Milk, meat, eggs, work
- **Climate adaptation:** Heat-tolerant or cold-tolerant
- **Disease resistance**
- **Feed requirements**

Example:

Dairy cow (Holstein): High milk production, needs good feed

Local cow (Brune de l'Atlas): Low milk, but survives drought better

❑ Feeding Management

Basic Nutrition Needs:

- **Energy:** From grains, grass
- **Protein:** From legumes, concentrates
- **Minerals:** Salt, calcium, phosphorus
- **Water:** Clean, unlimited access

Example Daily Ration for Dairy Cow (500 kg):

- Grass/hay: 30 kg
- Concentrates: 5 kg
- Water: 60-80 liters

❑ Housing/Shelter

Requirements:

- Protection from rain, sun, wind
- Good ventilation
- Clean and dry
- Adequate space

Example:

One cow needs 4-6 m² space

Chickens need 0.2 m² each in housing

□ Health Management

Preventive measures:

- Vaccination schedule
- Deworming (removing parasites)
- Hoof trimming
- Regular health checks

Common Diseases:

Animal	Disease	Prevention
Cattle	Foot and Mouth Disease	Vaccination
Chickens	Newcastle Disease	Vaccination
Goats	Pneumonia	Good housing

❑ Breeding Management

Key concepts:

- **Heat detection:** Knowing when female is ready to mate
- **Artificial Insemination (AI):** Using improved genetics
- **Pregnancy care:** Extra feeding, monitoring
- **Record keeping:** Birth dates, parents, performance

Example: A dairy cow should calve (give birth) every 12-13 months for maximum milk production.

❑ Record Keeping

What to record:

- Animal identification (name/number)
- Birth date
- Vaccinations
- Production (milk/eggs per day)
- Breeding dates
- Health treatments
- Costs and income

Simple Record Example:

- Cow #12 (Bessie)
- Birth: Jan 2022
- Last calving: March 2024
- Daily milk: 15 liters
- Vaccinations: ✓ FMD, ✓ Anthrax
- Cost this month: 12000 Dz (feed + health)
- Income: 50000 Dz (milk sales)

4 EQUIPMENT AND ALLOCATION

What is Farm Equipment?

Equipment = Tools and machines used for farm operations

Types of Equipment:

a) Manual Tools (Hand Tools)

Hoe: Breaking soil, weeding

Machete/Cutlass: Cutting vegetation

Rake: Leveling soil

- **Watering can:** Irrigation
- **Pruning shears:** Trimming plants

Advantages: Cheap, no fuel needed

Disadvantages: Slow, hard work, small area only

b) Animal-Drawn Equipment

- **Plough:** Turning soil with oxen/donkeys
- **Cart:** Transportation
- **Harrow:** Breaking soil clods

Advantages: Moderate cost, larger area than manual

Disadvantages: Need trained animals, moderate speed

c) Motorized Equipment

Small machines:

- Motor pump (irrigation)
- Power tiller/cultivator
- Sprayer (motorized)

Large machines:

- Tractor + implements (plough, harrow, planter)
- Combine harvester
- Grain dryer

Advantages: Fast, large areas, efficient

Disadvantages: Expensive, needs fuel, maintenance

Equipment Allocation?

Allocation = Deciding which equipment to use for which task and when.

Steps for Equipment Allocation:

Step 1: List all farm operations

Example for maize production:

- Land preparation (ploughing)
- Harrowing
- Planting
- Fertilizer application
- Weeding (2 times)
- Pest control
- Harvesting
- Transportation

❑ Step 2: Match equipment to operations

Operation	Equipment Option 1	Equipment Option 2
Ploughing	Tractor + plough	Oxen + plough
Planting	Manual	Mechanical planter
Weeding	Hoe	Herbicide sprayer
Harvesting	Manual	Combine harvester

❑ Step 3: Consider farm size and timing

Small farm (2 ha):

- Manual/animal equipment sufficient
- Labor-intensive acceptable

Large farm (50 ha):

- Must use tractors
- Need to finish operations quickly (before rains end)

□ Step 4: Calculate costs

Example: Ploughing 10 hectares

Option A: Hiring tractor

- Cost: 12000 Dz/hectare
- Total: 120 000
- Time: 1 day

Option B: Using oxen

Cost: 4000 Dz/hectare (hire oxen)

Total: 40 000 Dz

Time: 10 days

Decision factors:

If you have time and less money → Choose oxen

If timing is critical (rains starting soon) → Choose tractor

d) Equipment Maintenance

Why maintain equipment?

- Extends lifespan
- Prevents breakdowns during critical times
- Saves money (repairs cost more than maintenance)
- Ensures safety

Basic Maintenance Tasks:

Daily:

- Clean tools after use
- Check oil/fuel levels (machines)
- Look for damage

Weekly:

- Sharpen blades (hoes, machetes)
- Grease moving parts
- Check tire pressure

Seasonal (after harvest):

- Deep cleaning
- Repair damaged parts
- Store properly (dry place)
- Apply rust prevention

Example: A tractor that receives regular oil changes (every 100 hours) lasts 15,000 hours. Without maintenance, it fails after 5,000 hours.

5 WORK ORGANIZATION

What is Work Organization?

Work organization = Planning WHO does WHAT, WHEN, and HOW on the farm.

Why is it Important?

- Ensures all tasks are completed on time
- Avoids wasting labor
- Increases productivity
- Reduces stress and confusion

Key Elements:

a) Agricultural Calendar

A calendar showing when to do each farming activity throughout the year.

Important:

Calendar depends on:

- Climate (rainy season timing)
- Crop type (short or long season)
- Local conditions

Planning involves thinking ahead and making crucial farm decisions. **Production planning** addresses what crops or livestock to produce, quantities,

Month	Activity
January	Land preparation, soil testing
February	Planting (start of rains)
March	First weeding, fertilizer application
April	Second weeding, pest control
May	Monitoring, disease control
June	Harvesting begins
July	Post-harvest processing, storage
August – December	Marketing, land preparation for next season

b) Labor Planning

Labor = Workers (people) needed for farm tasks

Types of labor:

- Family labor: Farmer and family members (free but limited)
- Permanent workers: Full-time employees (steady but costly)
- Seasonal workers: Hired during peak times (flexible)
- Exchange labor: Neighbors help each other (common in small farms)

Labor Requirements Example (per hectare):

Crop	Person-days needed/ha/season
Maize (manual)	80-100 days
Rice (manual)	120-150 days
Vegetables	200-250 days

■ Planning steps:

➤ Calculate total labor needed

Example: 5 hectares of maize

- $5 \text{ ha} \times 90 \text{ person-days/ha} = 450 \text{ person-days total}$

➤ Identify available labor

- Family: $3 \text{ people} \times 250 \text{ working days/year} = 750 \text{ person-days}$
- Enough for 5 ha maize ✓

➤ Allocate labor to tasks

Peak labor periods:

- Planting (must finish in 2-3 weeks)
- Harvesting (must finish before rains)

During peak times, hire extra workers.

c) Task Scheduling

Scheduling = Making a detailed timetable for tasks

Example Weekly Schedule (Small Mixed Farm):

Day	Morning (6-12)
Monday	Irrigate vegetables
Tuesday	Feed animals
Wednesday	Apply fertilizer
Thursday	/
Friday	Irrigate vegetables
Saturday	General farm cleanup
Sunday	Minimal work

Some tasks **MUST** happen before others:

Land preparation → Planting → Weeding → Harvesting (Week 1) (Week 2) (Week 5) (Week 12)

You cannot weed before planting! Sequence matters.

d) Supervision and Monitoring

Supervision = Checking that work is done correctly and on time

Good supervision includes:

- Clear instructions before work starts
- Regular checking during work
- Quality control after completion
- Feedback to workers

Example: When supervising planting:

- Check seed spacing (30 cm apart?)
- Check planting depth (3-5 cm?)
- Check row straightness
- Count plants per row

e) Record Keeping for Work

What to record:

- Tasks completed each day
- Hours worked by each person
- Costs (wages paid)
- Problems encountered
- Weather conditions

Simple Daily Work Record:

- **Date:** March 15, 2024
- **Task:** Planted 2 hectares of maize
- **Workers:** 8 people
- **Hours:** 6 hours each (48 person-hours total)
- **Seed used:** 50 kg
- **Weather:** Sunny, good soil moisture
- **Issues:** None
- **Completed:** Yes, on schedule

f) Work Efficiency

Efficiency = Getting maximum output from minimum input

Ways to improve efficiency:

- **Proper training:** Trained workers work 30-40% faster
- **Right tools:** Good hoe weeds faster than broken hoe
- **Timely operations:** Weeding early (small weeds) is easier than late (big weeds)
- **Motivation:** Pay fair wages, provide breaks, good treatment

Example:

- Untrained worker weeds 0.1 ha/day
- Trained worker weeds 0.25 ha/day
- With proper tools: 0.3 ha/day

Result: Same person, 3× more productive!

End of Chapter 02