

# A FARMER'S PRIMER ON GROWING COWPEA ON RICELAND

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International Rice Research Institute  
Los Baños, Laguna, Philippines

**A FARMER'S PRIMER  
ON GROWING  
COWPEA  
ON RICELAND**

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**International Rice Research Institute  
and  
International Institute of Tropical Agriculture**

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# Foreword

Rice and rice-based cropping systems occupy a position of overwhelming importance in global food production. Legume crops such as cowpea fit well into these systems, helping to increase productivity by yielding more food from the same land area.

Cowpea grown either before or after rice enriches the soil, helps to break the pest and disease cycle that occurs in continuous rice cropping, and adds to farm income. Nutritionally, cowpea complements rice, adding protein to largely starchy subsistence diets. Grown for centuries in the tropics, cowpea is well adapted to prevailing environmental stresses. The crop tolerates drought and can grow on poor, even acid soils. Improved short or medium duration varieties from the International Institute of Tropical Agriculture (IITA) can be profitably fitted into a wide range of cropping systems as a food, fodder, or green manure crop requiring minimum inputs.

A Farmer's Primer on Growing Cowpea on Rice Land explains the "hows" and "whys" of cowpea culture to farmers, extension workers, students, and technicians. The Primer is patterned after A Farmer's Primer on Growing Rice - which has been translated into more than 30 languages - and is similarly designed for easy translation and co-publication in developing countries. The English text has been blocked off from the line drawings. The International Rice Research Institute (IRRI) will make complimentary sets of the illustrations available to cooperators, who may translate the text, strip the translations onto the illustrations, and print a translated edition on local presses.

The cowpea Primer was made possible by a collaborative project sponsored by IRRI and IITA. A companion volume is A Farmer's Primer on Growing Soybean on Rice Land.

Ms. Vrinda Kumble of Editorial Consultants Services, New Delhi, India, edited both the cowpea and soybean Primers.

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International Institute  
of Tropical Agriculture



# The cowpea crop

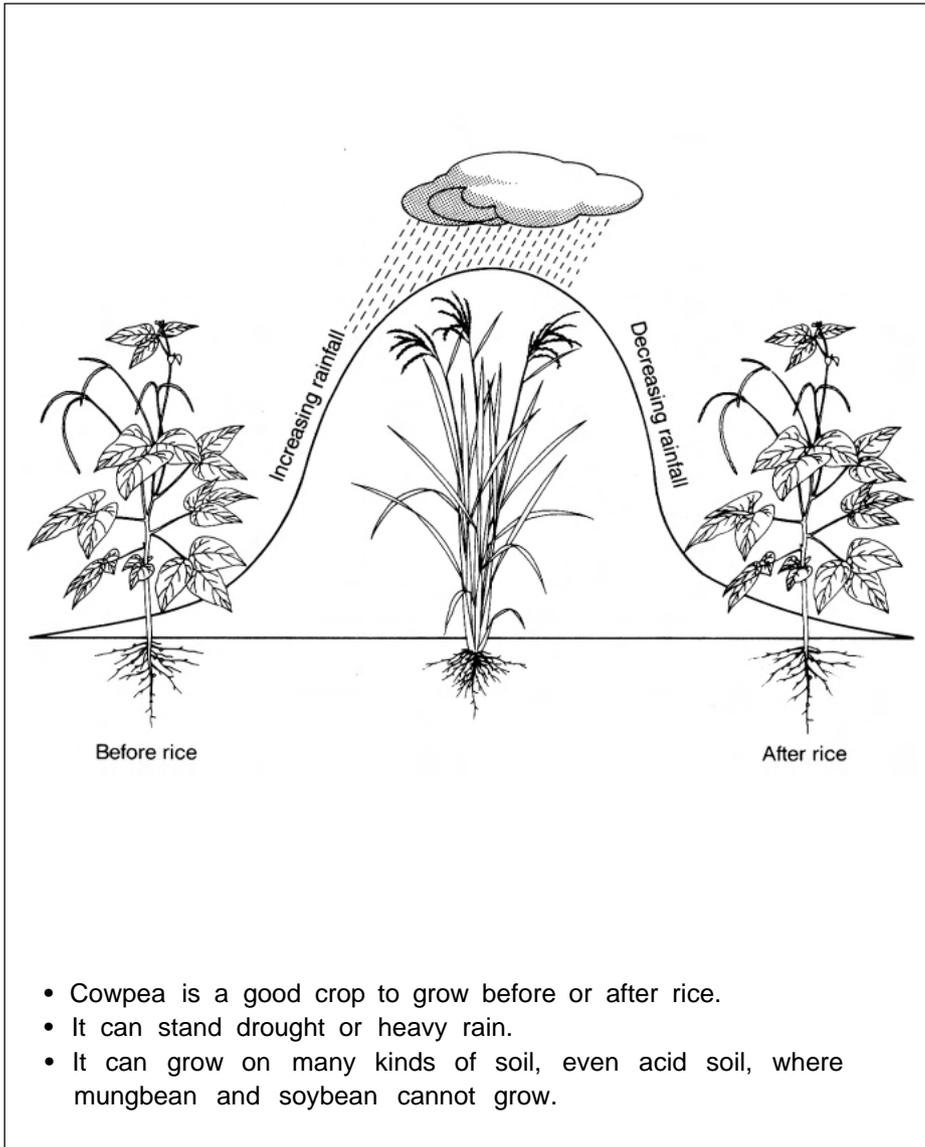


# The cowpea crop

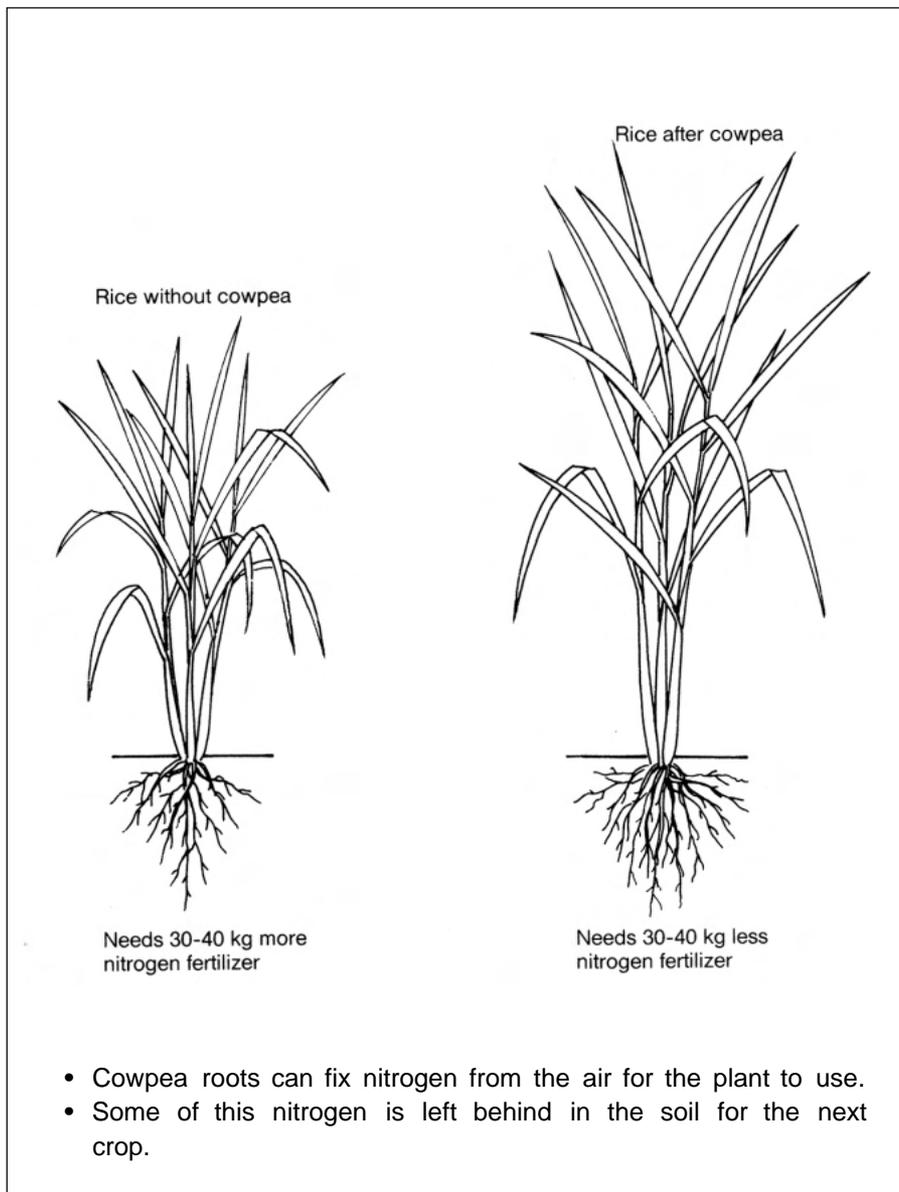
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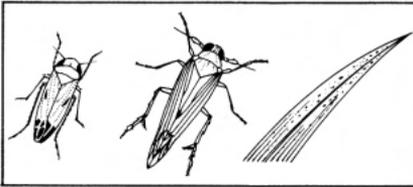
# Why grow cowpea



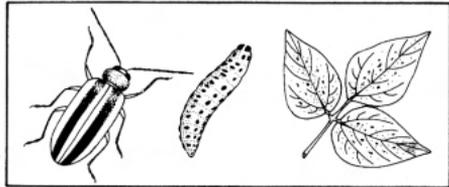
# Cowpea enriches the soil



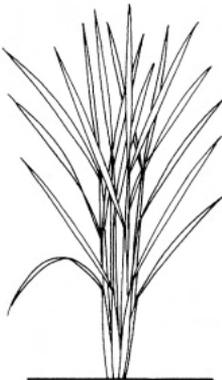
# Breaks the pest and disease cycle



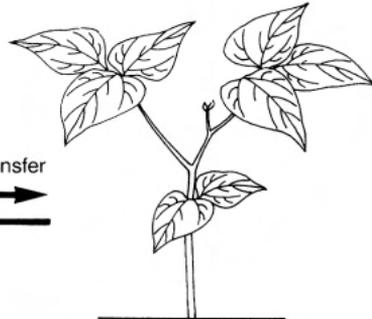
Most rice pests and diseases



Most cowpea pests and diseases

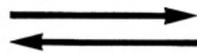


Rice



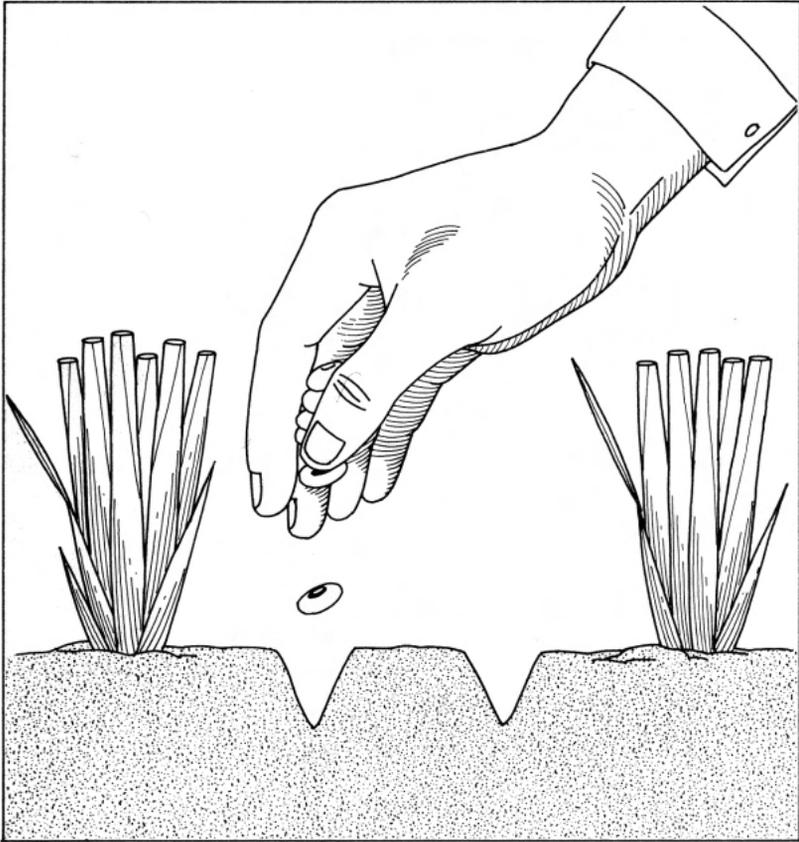
Cowpea

They do not transfer



- Growing cowpea in rotation with rice breaks the pest and disease cycle for both crops because
  - most rice pests and diseases do not transfer to cowpea
  - most cowpea pests and diseases do not transfer to rice.

# Adds to income

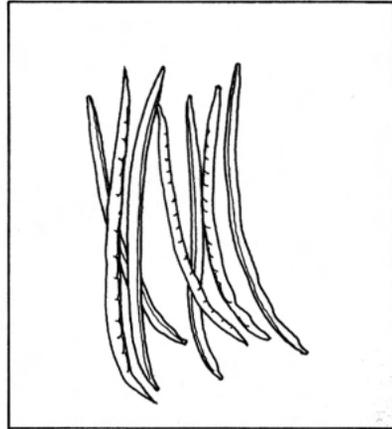


- In the off season after the rice harvest, cowpea cropping can create new jobs.

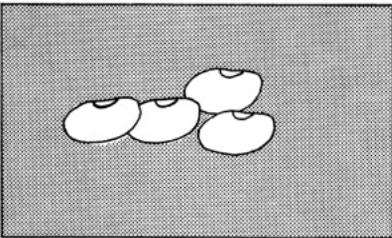
# Cowpea as human food



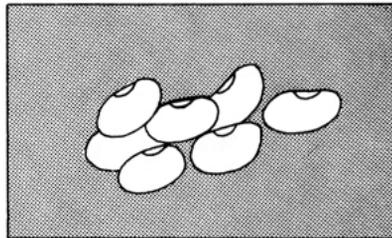
Young leaves can be eaten as greens



Tender pods used as vegetables



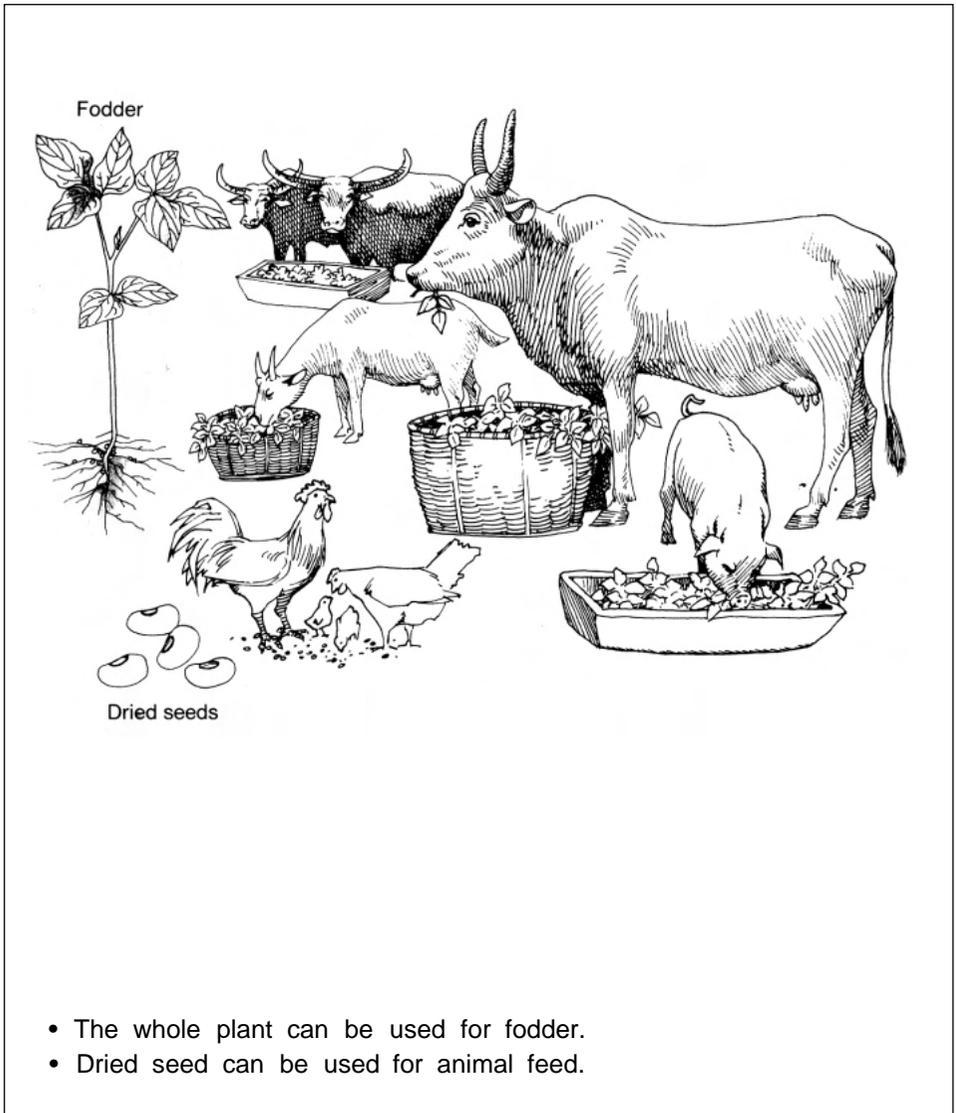
Mature seeds eaten like green peas



Dried seeds as a bean

- Cowpea can be eaten as greens, as a vegetable, and as a dried bean.
- Rice and cowpea eaten together make a balanced food. The nutrients lacking in each are supplied by the other.

# Cowpea as fodder

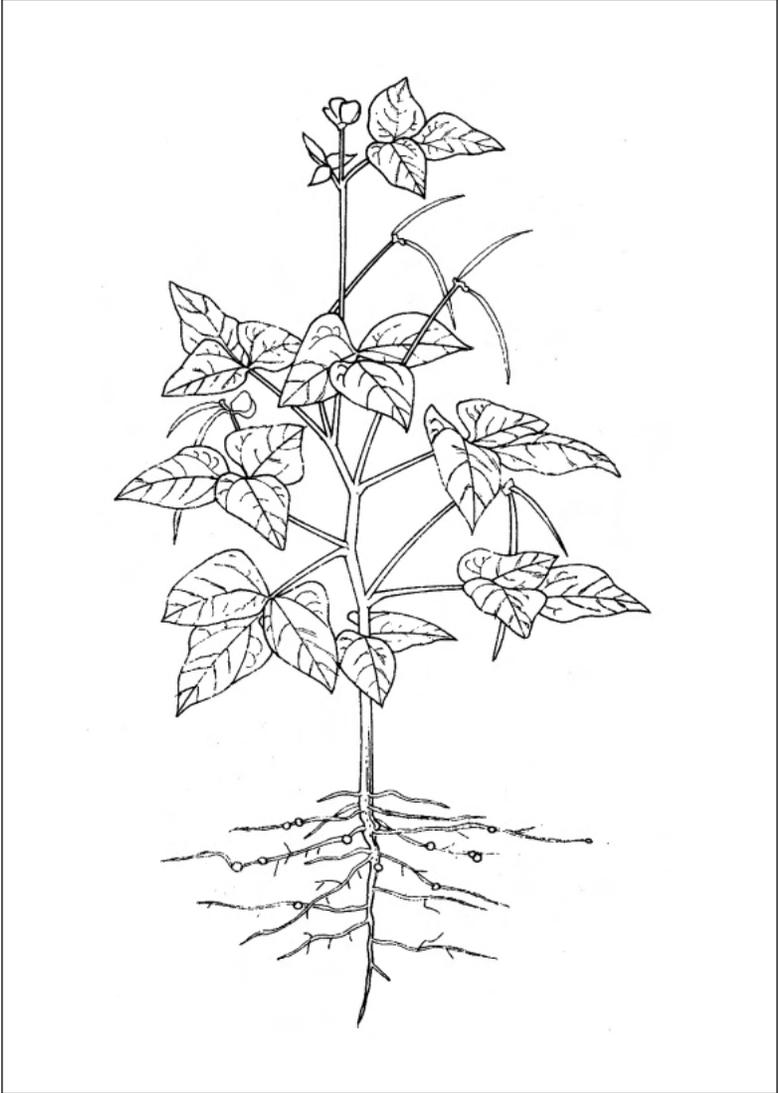


# The cowpea plant

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# The cowpea plant



# Plant types — growth habit



Erect



Climbing



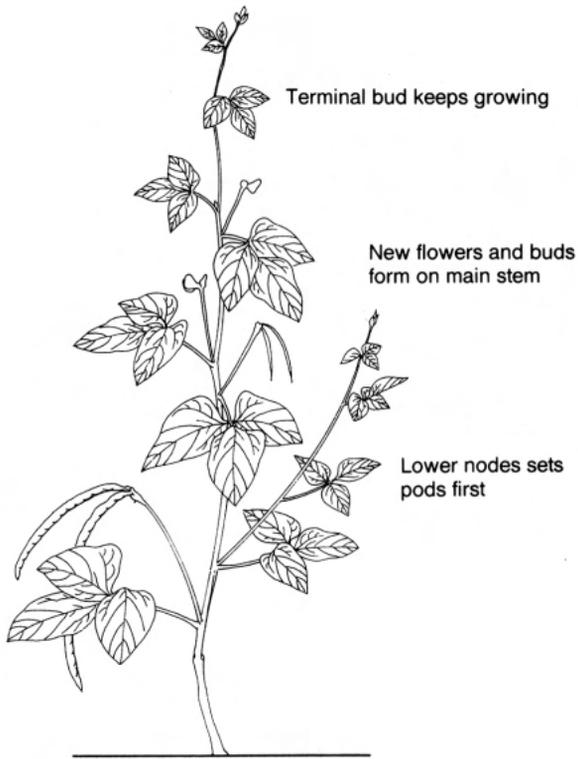
Semi-erect



Creeping

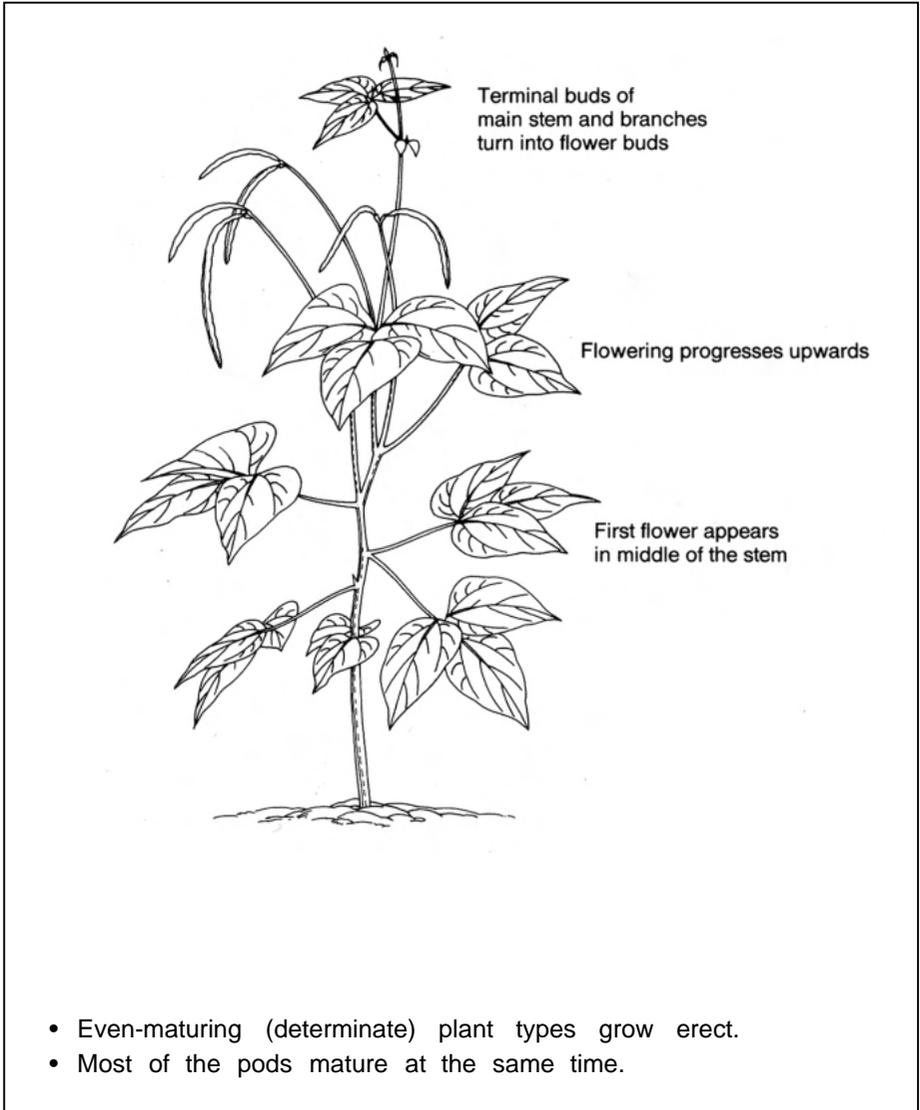
- The cowpea plant may be creeping, climbing, semi-erect, or erect.

# Plant types — uneven-maturing

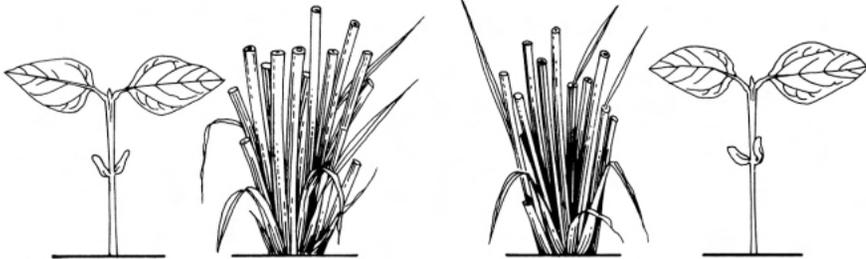


- Uneven-maturing (indeterminate) types twine or climb.
- They flower over a long period and pods do not mature at the same time.
- Rain during pod ripening may produce a new flush of flowers.

# Plant types — even-maturing

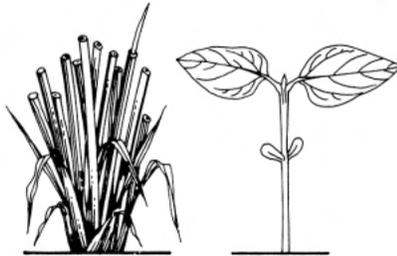


# Cowpea varieties — growth duration



Early: 60 to 65 days  
Grow before rice

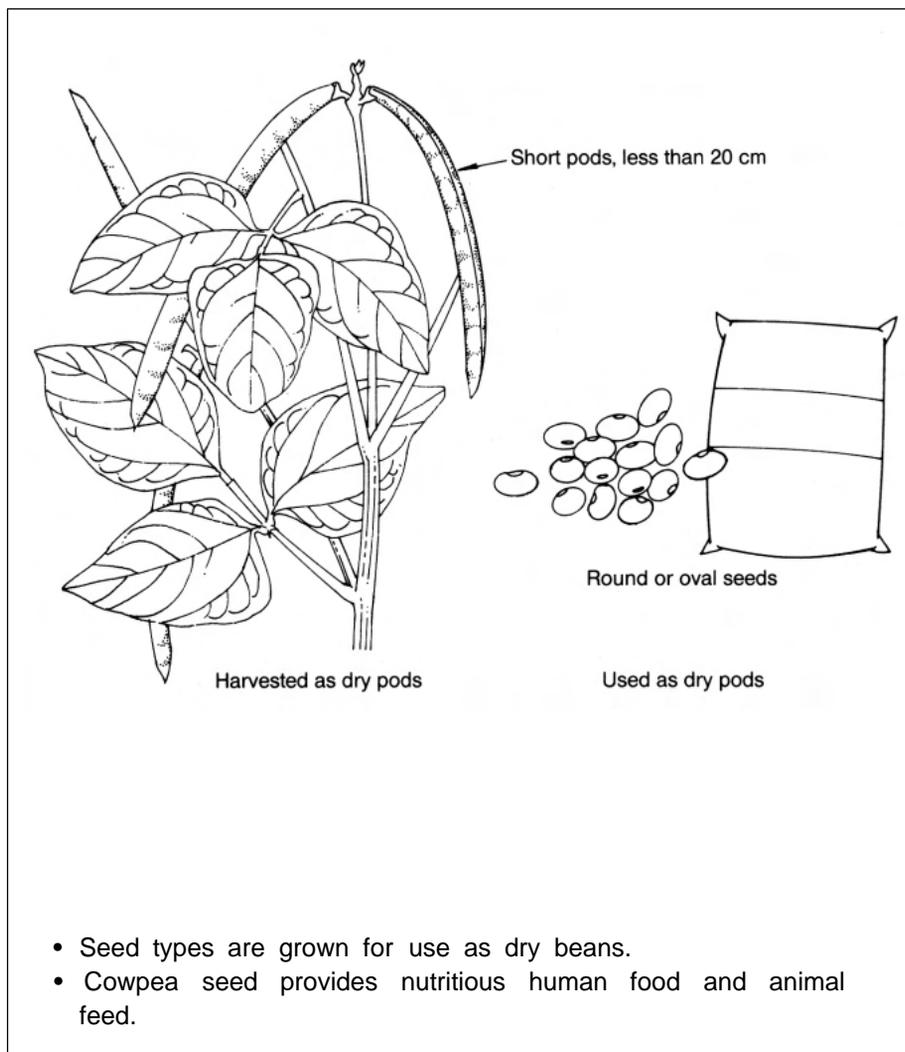
Medium: 65 to 85 days  
Grow after rice



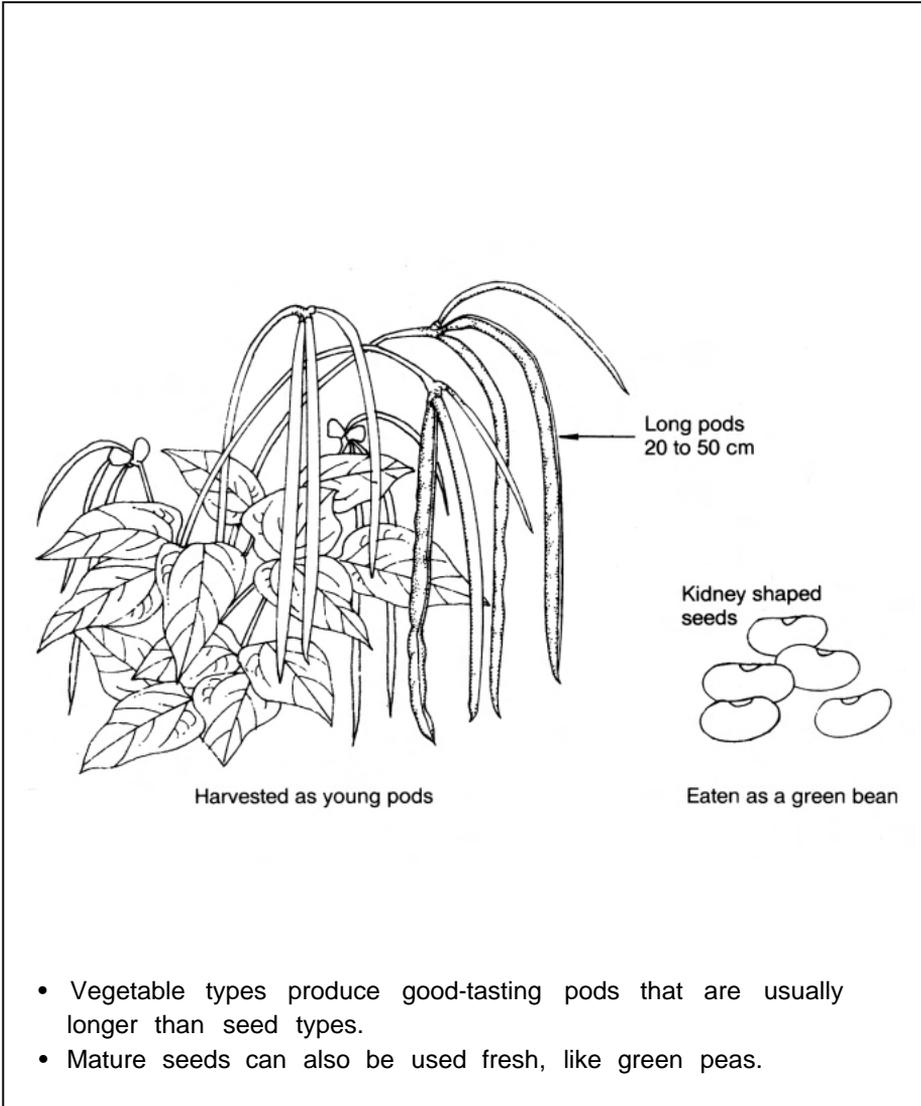
Late: 85 to 110 days  
Grow after rice in long growing season

- Cowpea varieties differ widely in growth habit and duration.
- Choosing the right variety to fit a cropping system gives good returns.

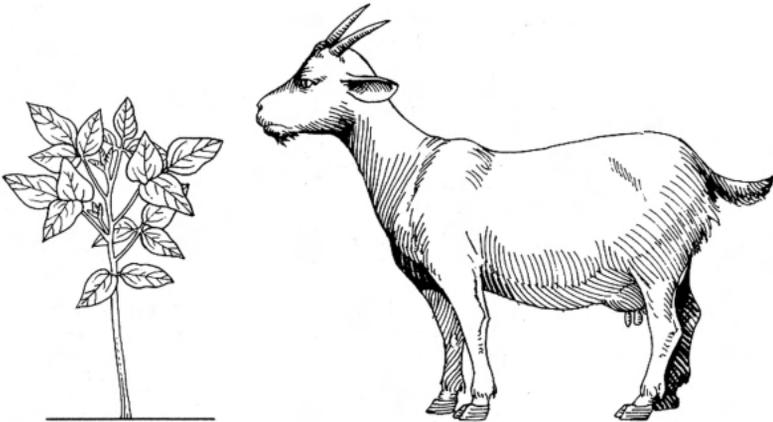
# Cowpea varieties — uses



# Vegetable types



# Fodder types



Whole plant harvested at flowering  
or after harvest of green pods or dry pods

- Fodder types have mostly leafy growth. They produce only a few pods.
- Dual types produce both seed and fodder.

# The seed

Seed types 23

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Factors affecting germination — water, air, and warmth 26

Factors affecting germination — seed quality 27



# Seed types

## Size



Small



Medium



Large

## Shape



Round



Oval



Squarish

## Texture



Smooth



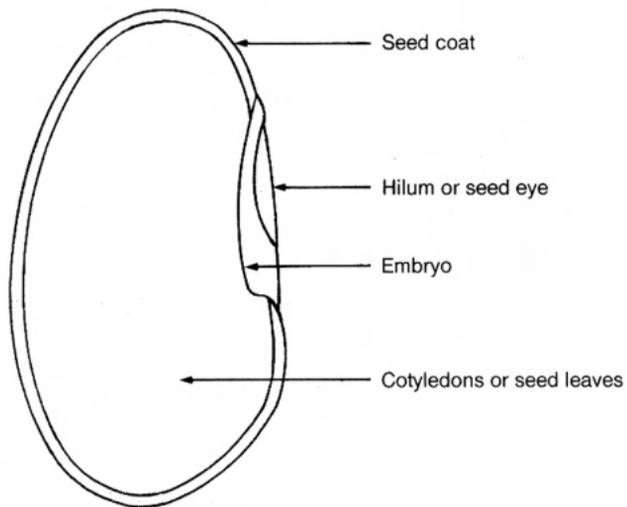
Rough



Wrinkled

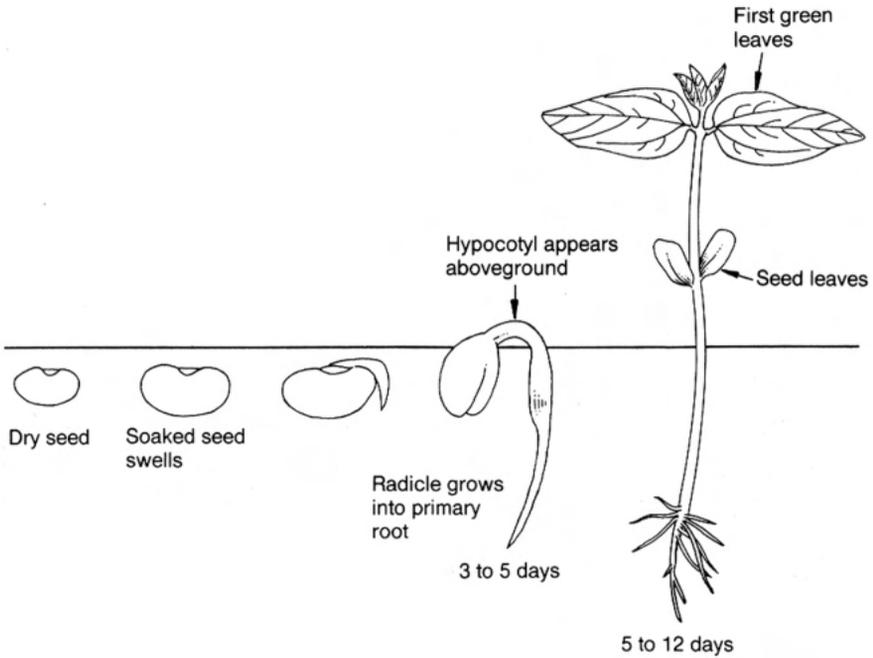
- Cowpea seeds vary in size, shape, color, and texture.
- Color may be white, black, red, or brown.

# Parts of the seed



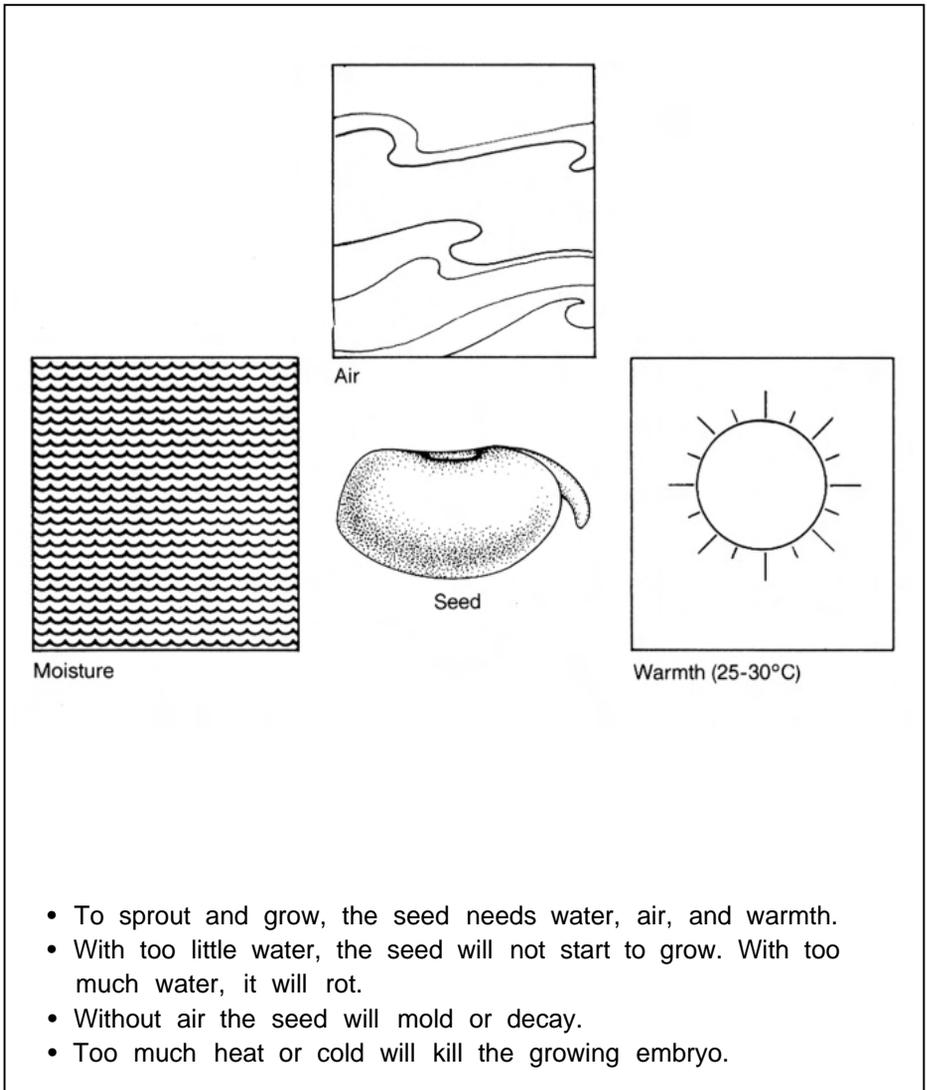
- Parts of the seed include the hilum, seed coat, cotyledons, and embryo.

# Stages of germination

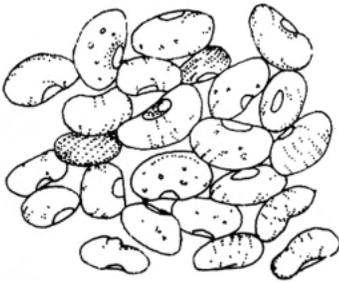


- The seed takes up water, swells, and begins to grow.
- The seed leaves supply food to the growing seedling for about one week.

# Factors affecting germination — water, air, and warmth



# Factors affecting germination — seed quality



Poor



Good

- For good germination, seed should be fresh, clean, and healthy.
- Treating seed with fungicide will help even germination.
- Seed for planting should be stored no more than 12 months.

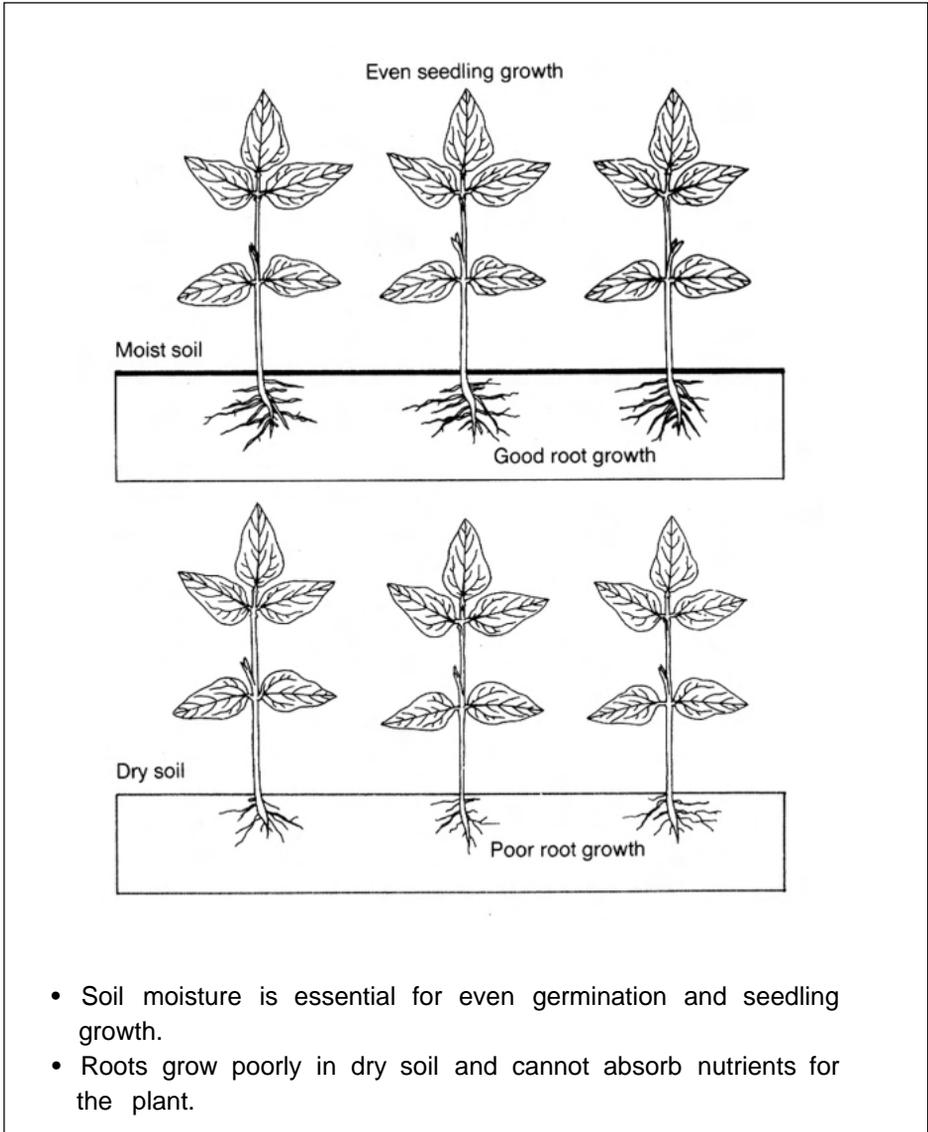


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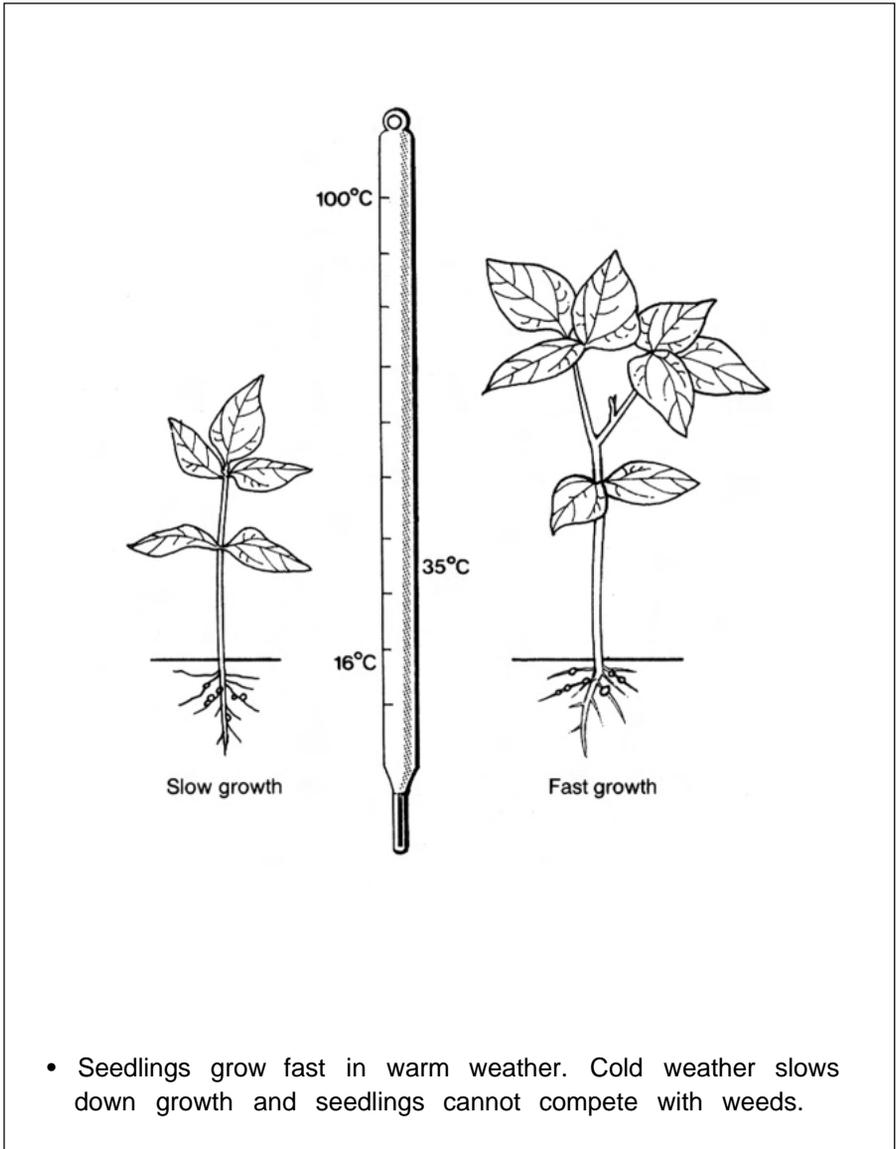


# Factors affecting seedling growth — water

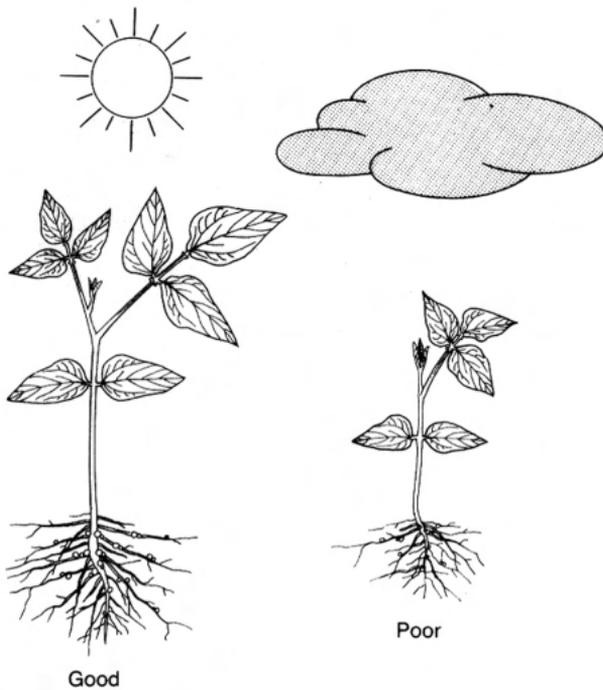


- Soil moisture is essential for even germination and seedling growth.
- Roots grow poorly in dry soil and cannot absorb nutrients for the plant.

# Factors affecting seedling growth — temperature

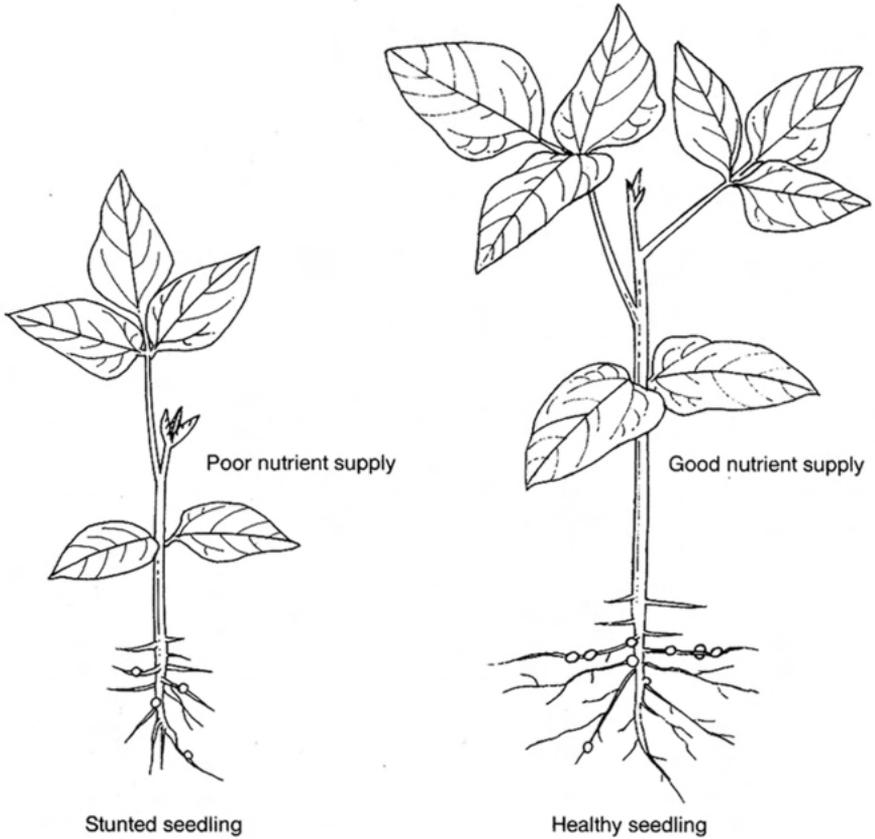


# Factors affecting seedling growth — light



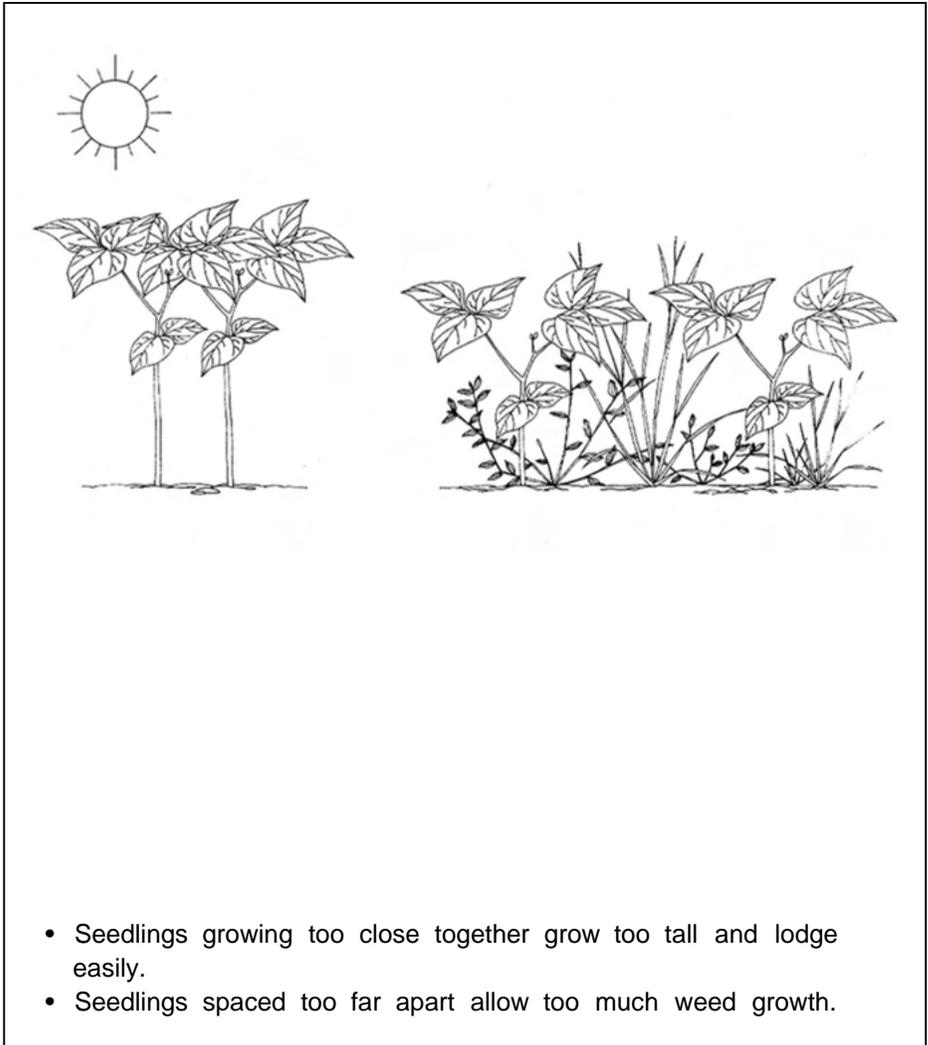
- Bright sunlight helps vigorous seedling growth. Plant cowpea in sunny areas, away from shade trees.

# Factors affecting seedling growth — nutrients

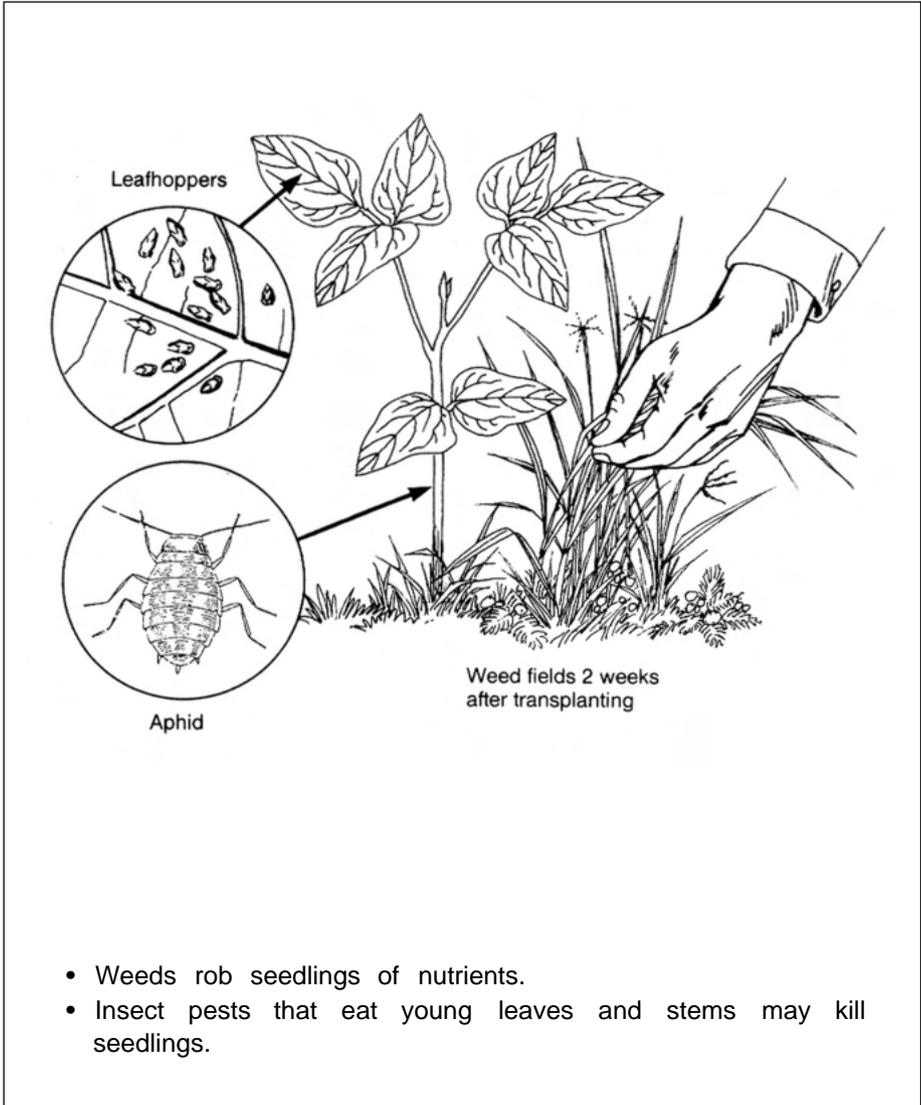


- Usually cowpea can grow on nutrients left over in the soil from the rice crop. But in poor soils, fertilizer added at planting starts rapid growth.

# Factors affecting seedling growth — plant density



# Factors affecting seedling growth — weeds and insects

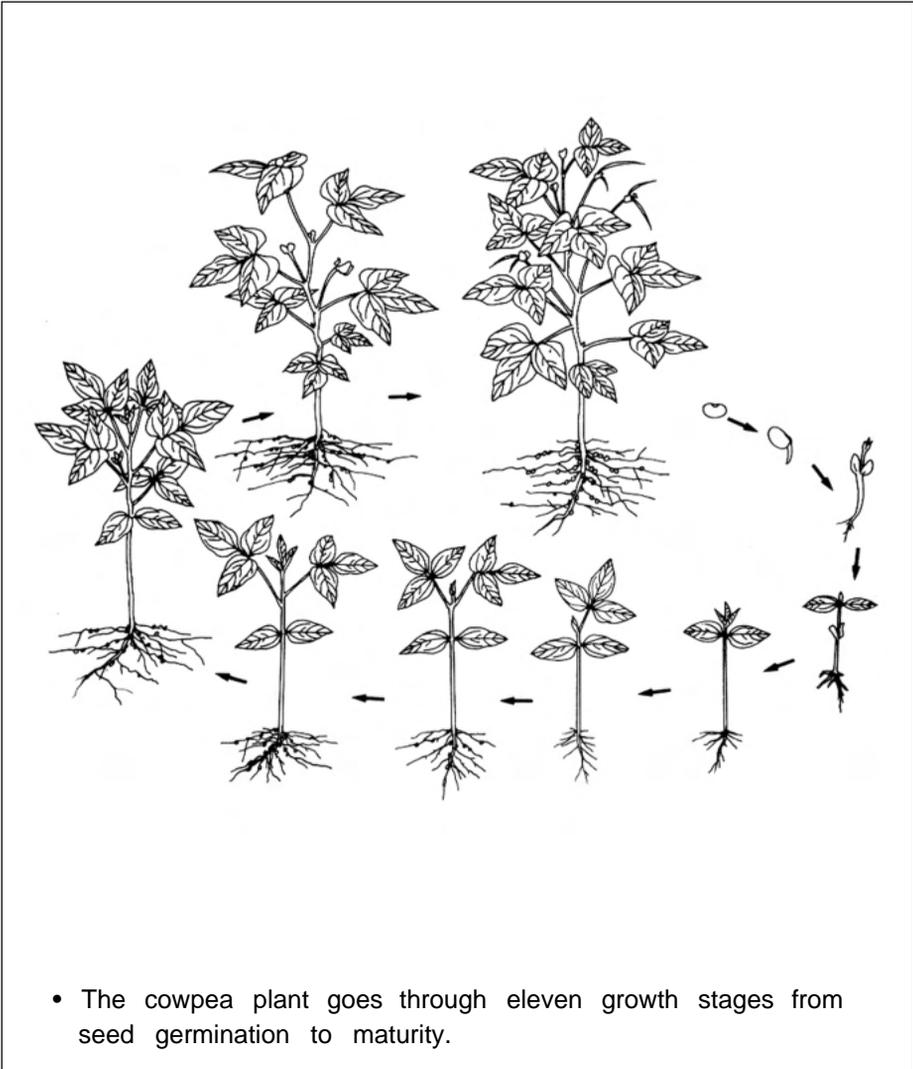


# Growth stages

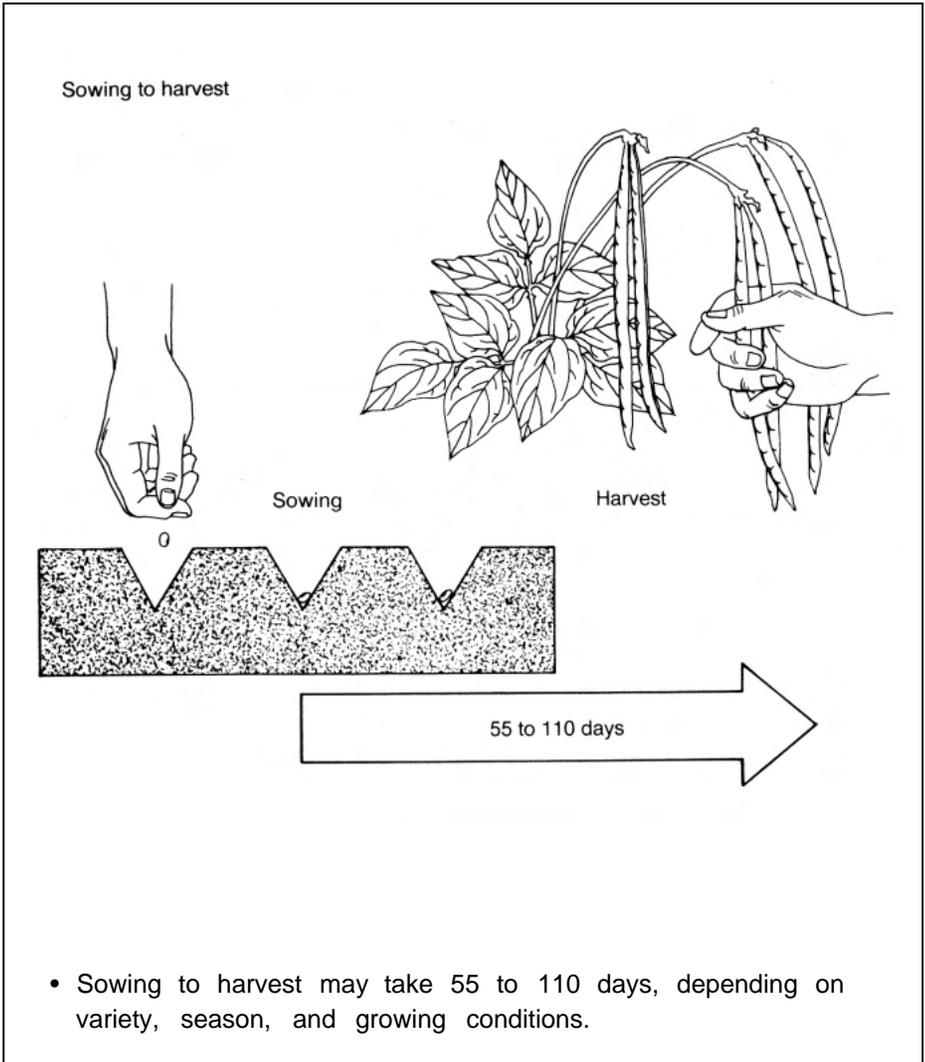
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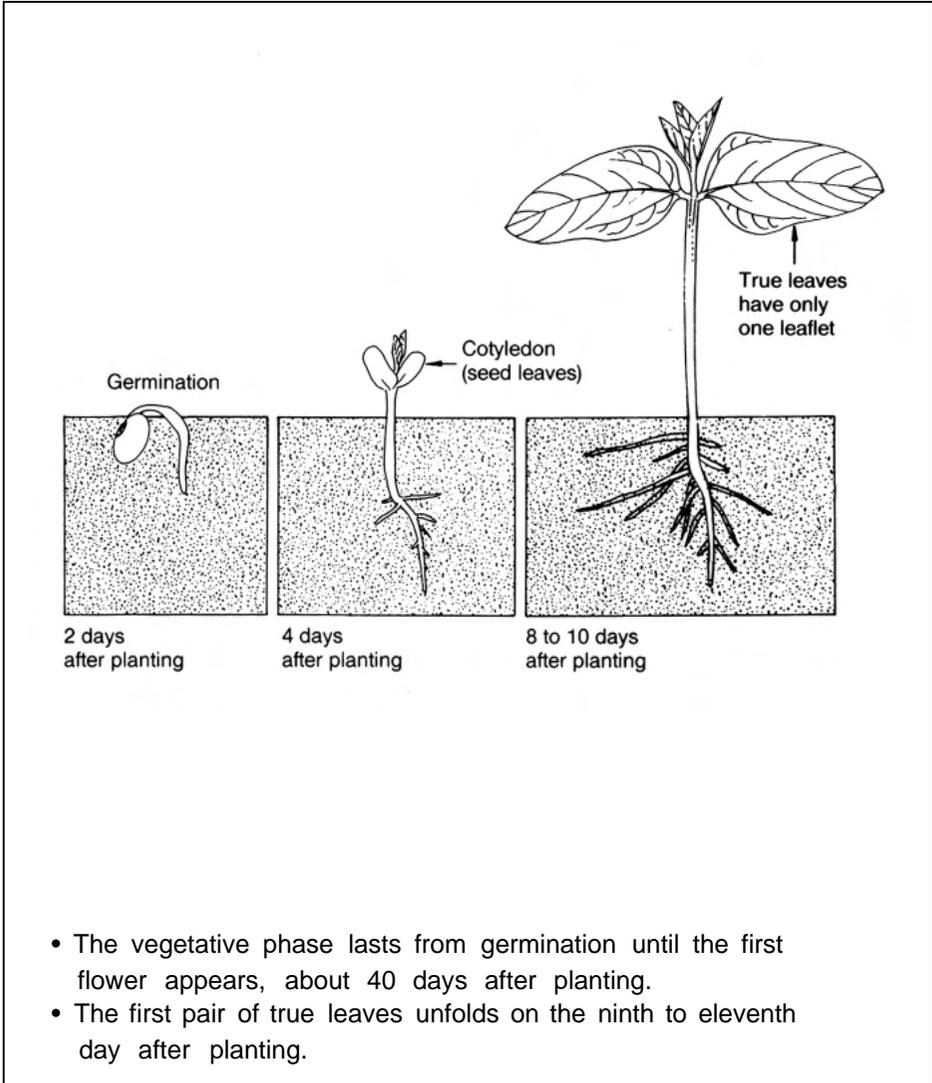
# Growth stages



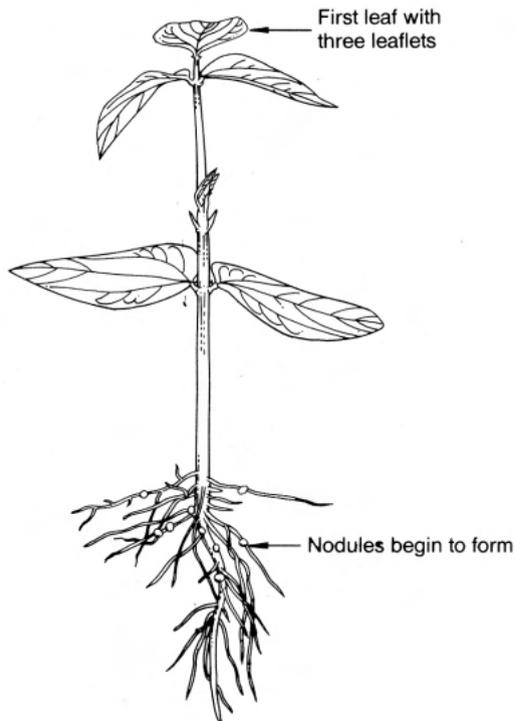
# Growth stages



# Vegetative phase

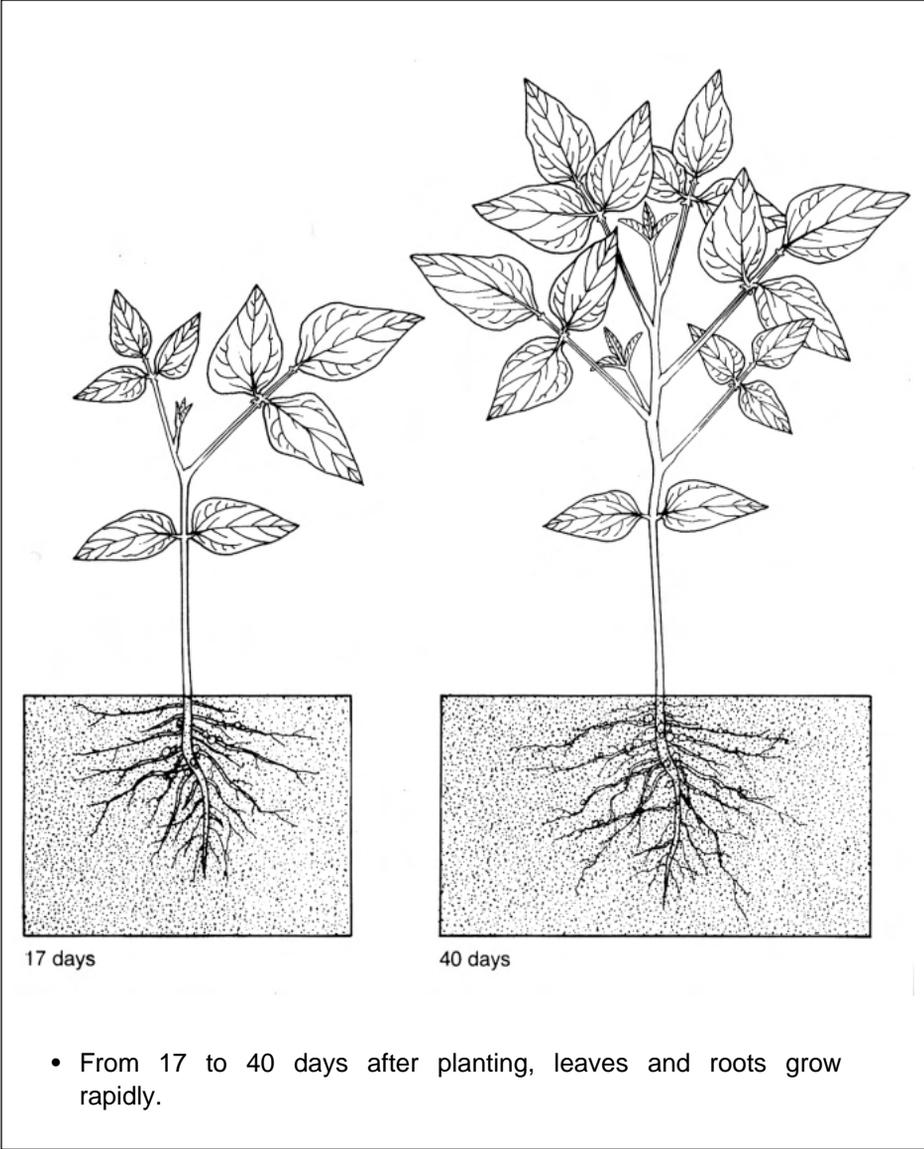


# Vegetative phase



- At 13 to 15 days after planting, the first leaf with three leaflets unrolls.
- Nodules begin to form on the roots.

# Vegetative phase

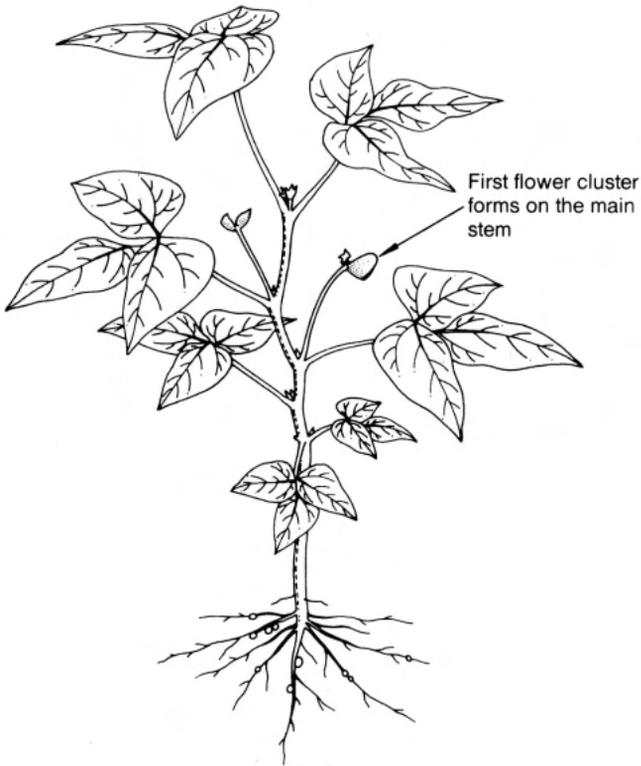


# Vegetative phase



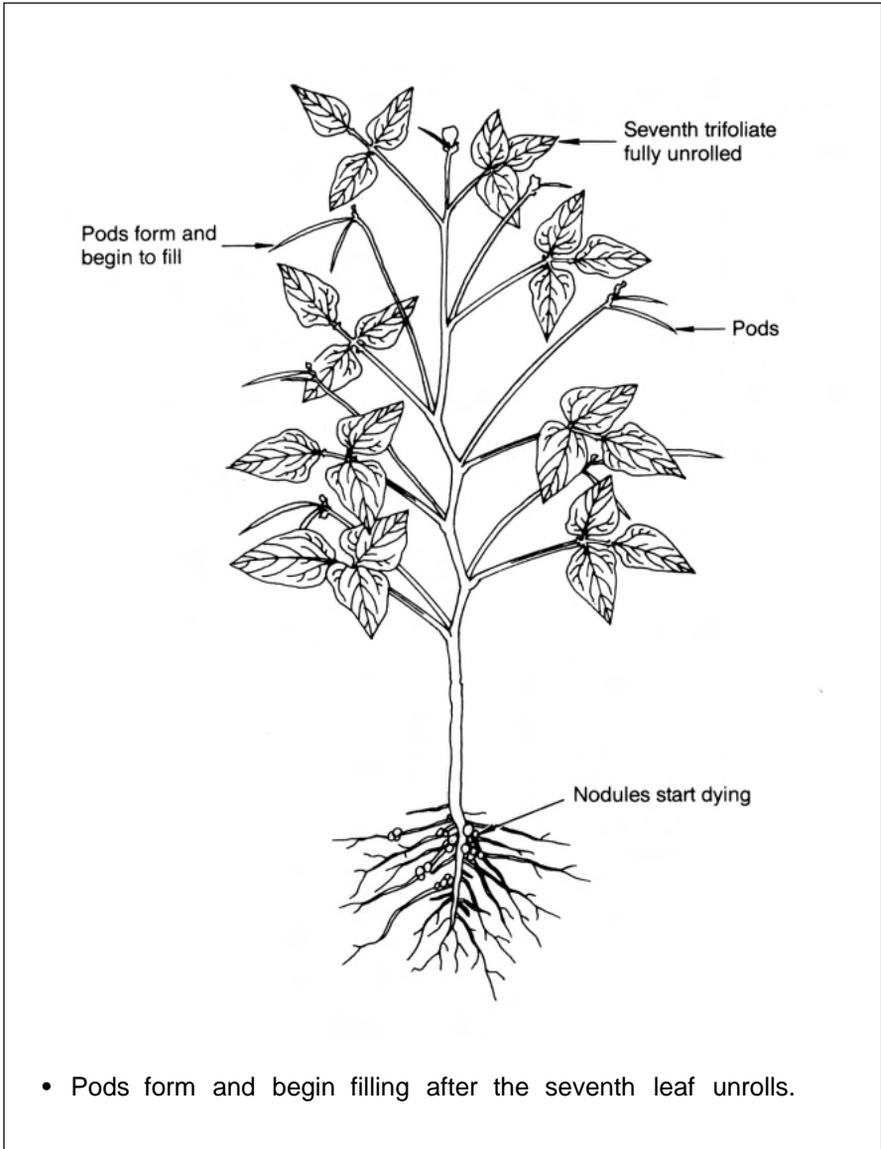
- Root nodules develop to the maximum and the plant fixes nitrogen at a high rate.

# Reproductive phase — flowering

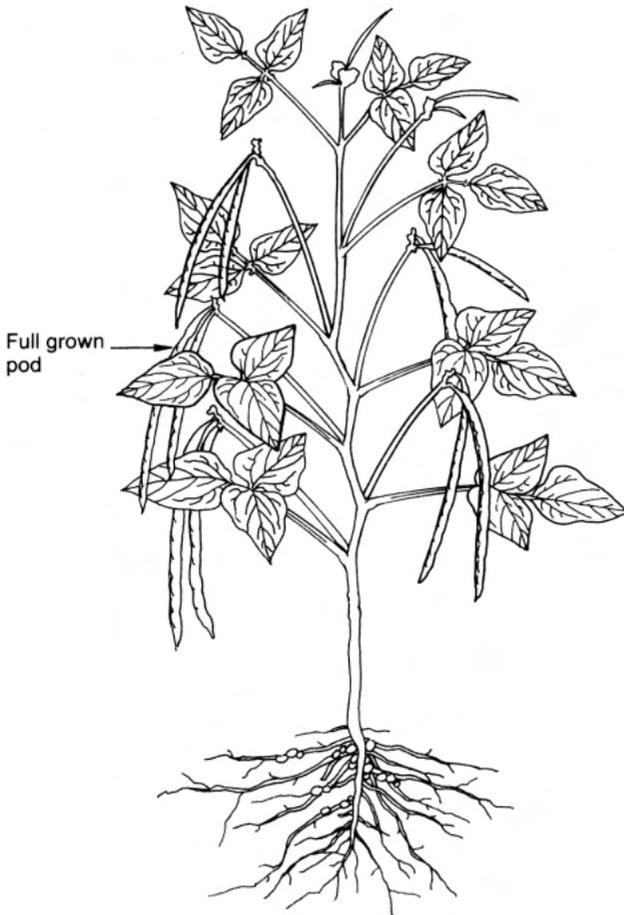


- Flowering lasts from when the first flower appears until full bloom.

# Reproductive phase — pod formation



# Reproductive phase — ripening and maturity



- Fully developed pods are dark green.
- As they ripen and mature, they change to brown, purple, or gray.



# The roots

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Functions of roots **52**

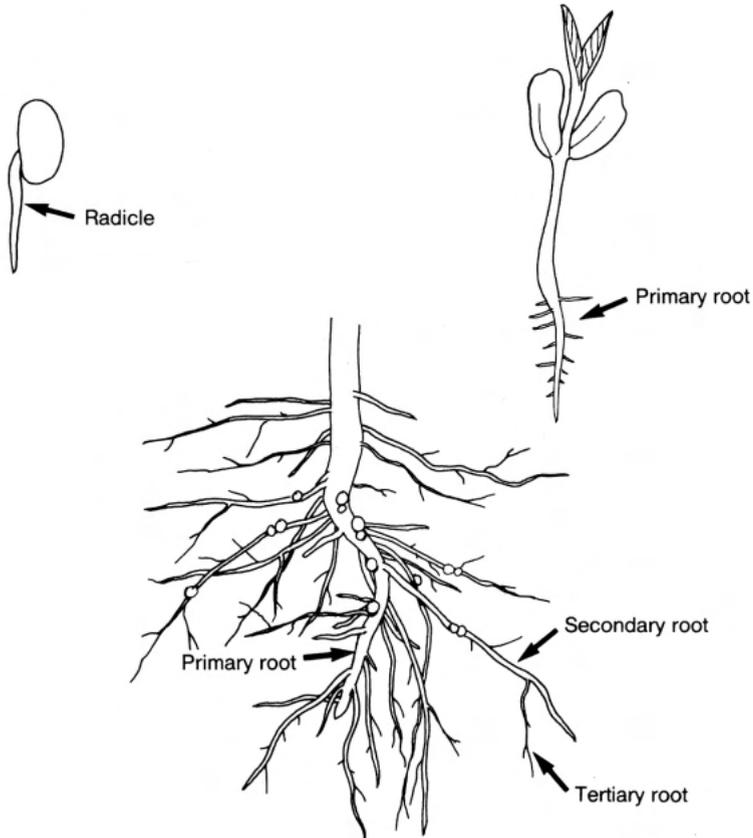
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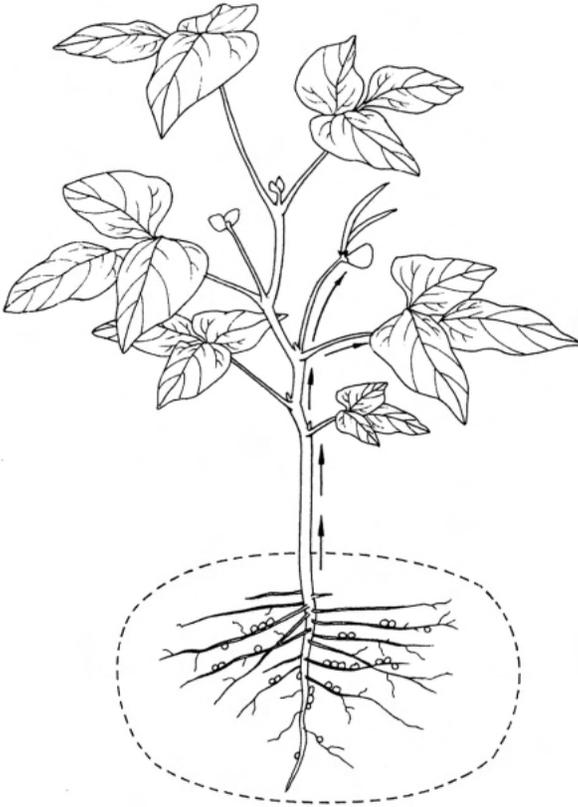


# Origin of roots



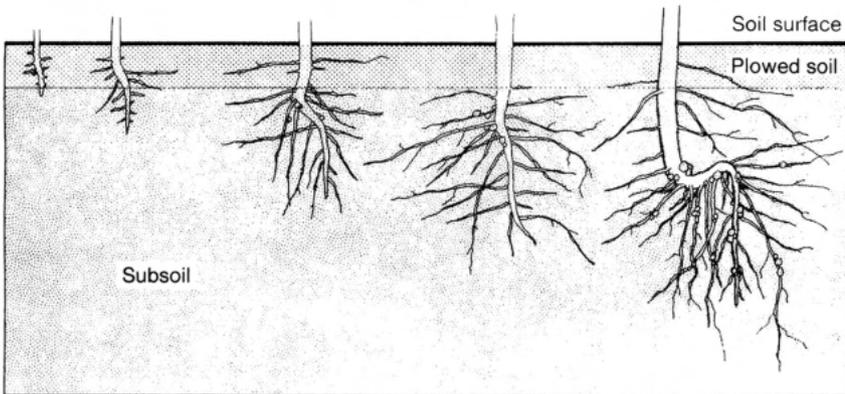
- The radicle grows into the primary root, from which other roots grow.
- The older parts of a root are brown. New and young parts are white.

# Functions of roots



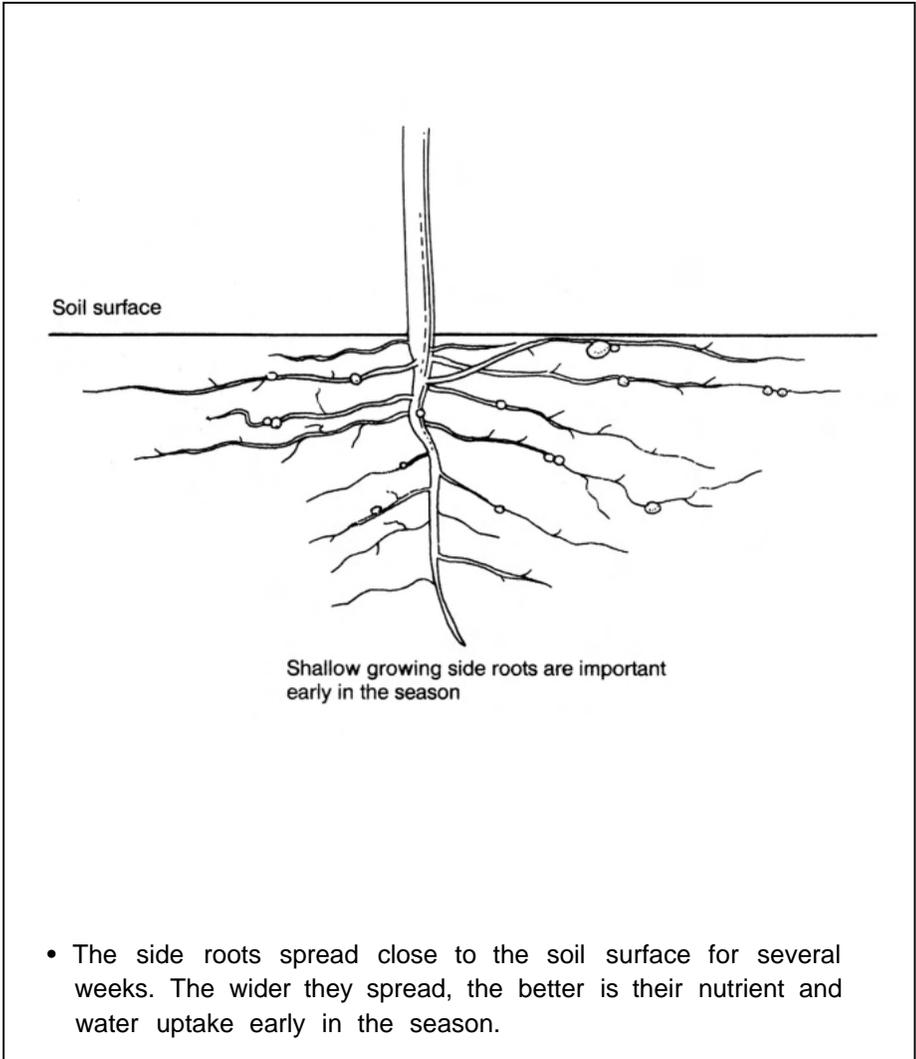
- Roots transport water and nutrients to leaves, flowers, and pods.
- They support the upper parts of the plant.
- Roots in cowpea are also sites of nitrogen fixation.

# Root distribution

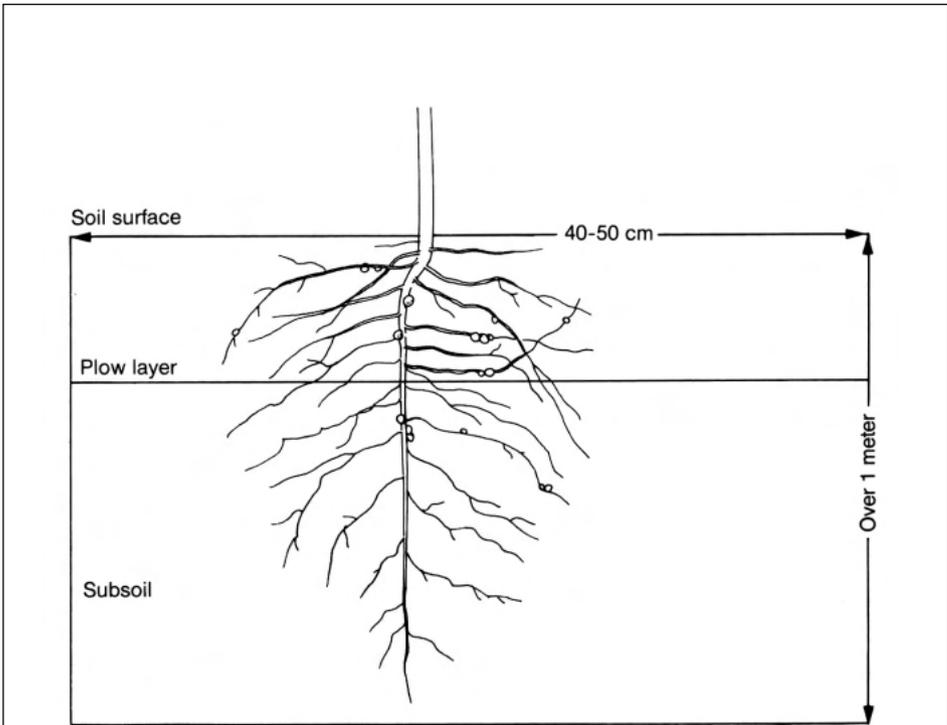


- The roots grow rapidly as soil water dries out.
- Most of the roots remain in the upper soil layer. Only a few go down into the lower layer.

# Root development — emergence to flowering



# Root development — flowering to pod ripening



- The lower roots grow deep into the subsoil as soil water dries out.
- The deeper they grow, the more water they can absorb for crop growth and yield.



# Root nodules and nitrogen fixing

Root nodules **59**

Root nodules **60**

Nitrogen fixing **61**

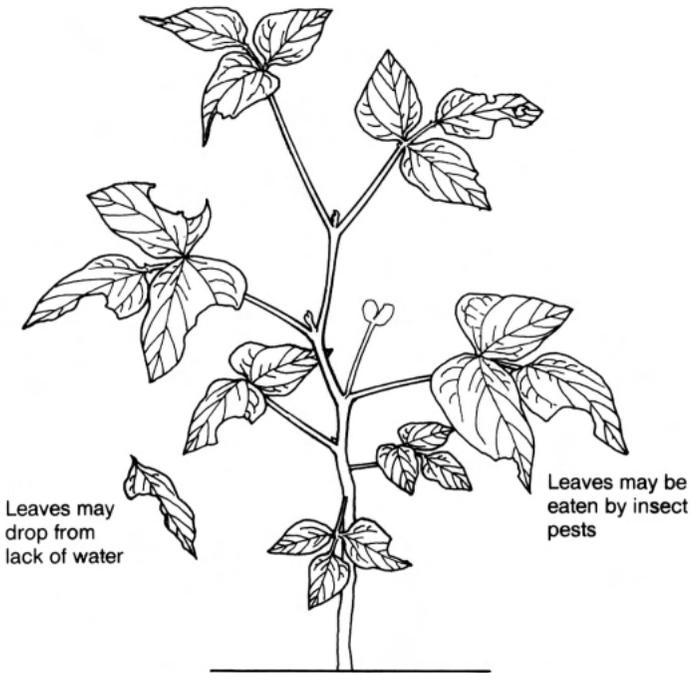
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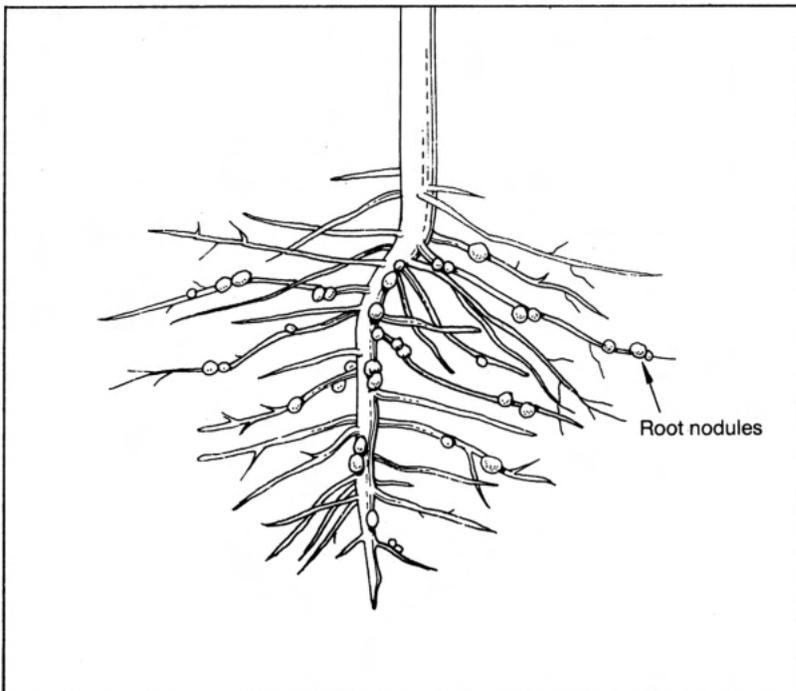


# Root nodules



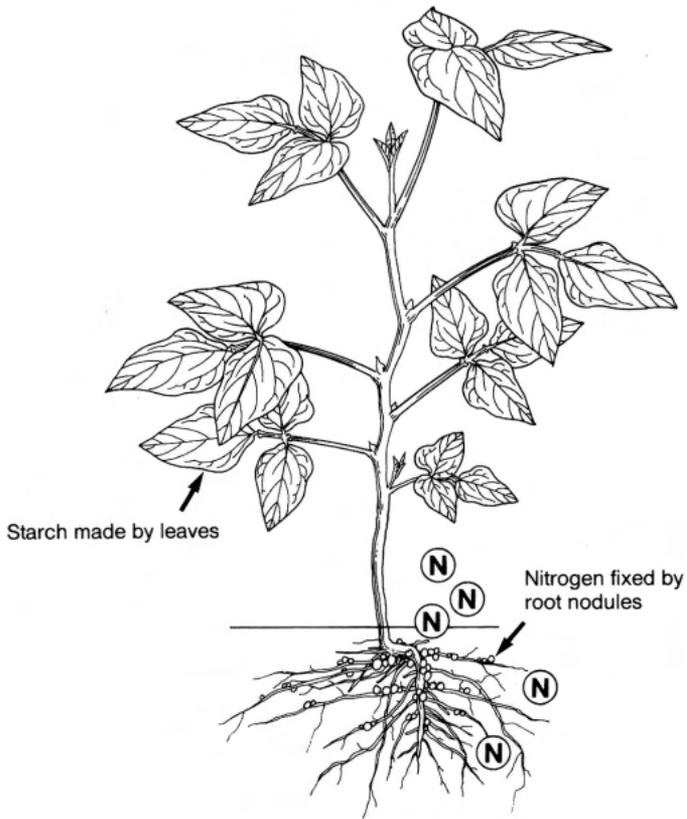
- Nodules are small lumps that grow on cowpea roots.
- Soil bacteria called rhizobia live in these nodules and fix nitrogen from the air, which the plant uses.

# Root nodules



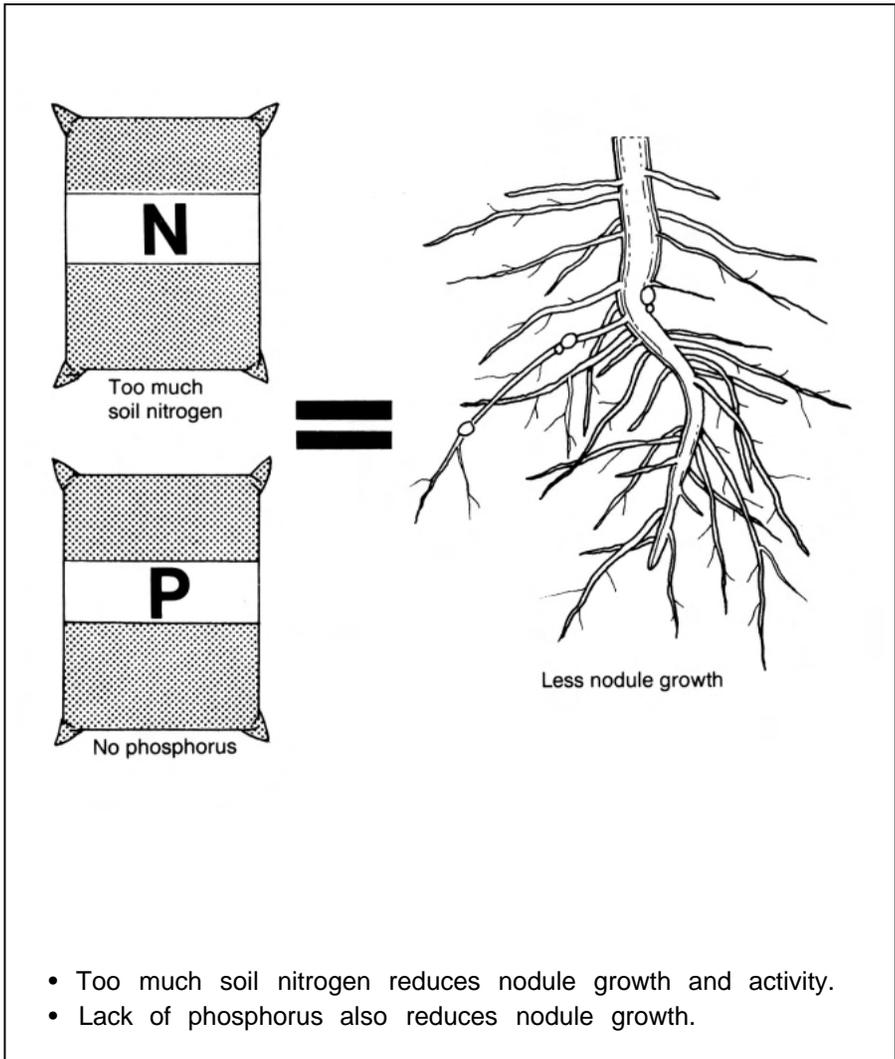
- Healthy nodules are important to good crop growth.
- Nodules appear on the roots about 15 days after seedlings emerge. Nodulation reaches a peak during flowering and early pod formation.

# Nitrogen fixing

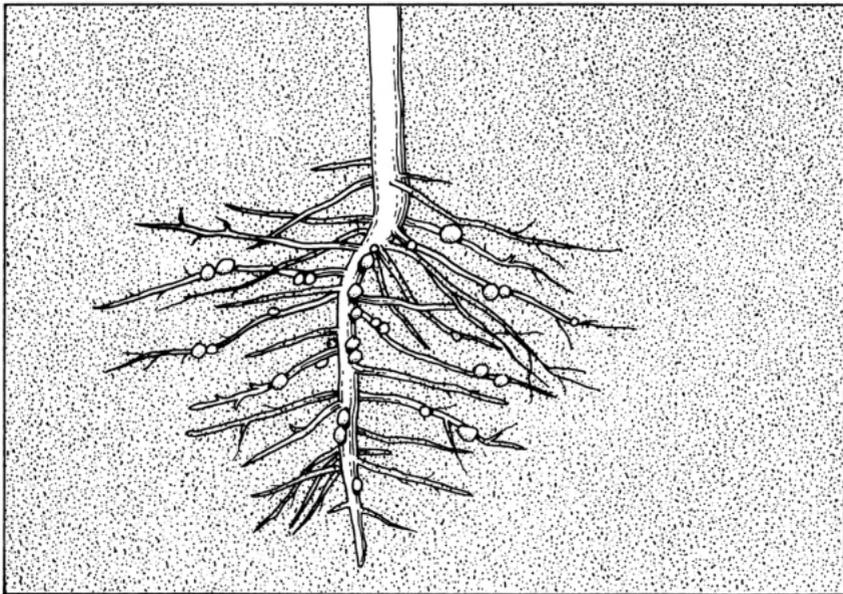


- Nitrogen fixing begins soon after nodules form. The fixing rate is highest during flowering and early pod formation.
- After this nodules begin to die and nitrogen fixing decreases.

# Conditions affecting nitrogen fixing — soil nitrogen and phosphorus

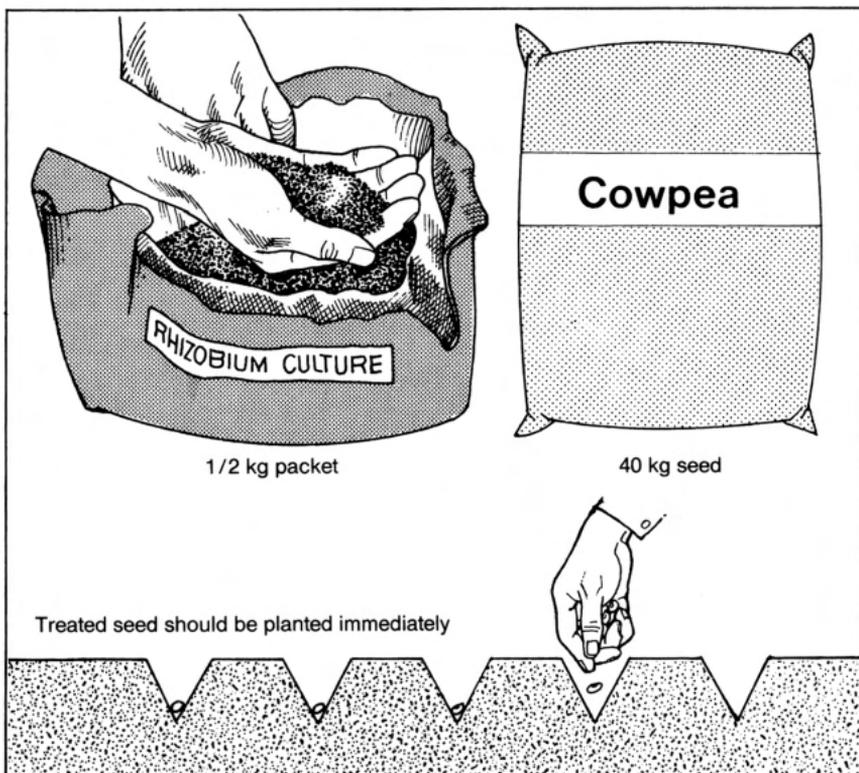


# Conditions affecting nitrogen fixing — temperature and daylength



- Warm days and cool nights increase nodule activity.
- Daylength should be less than 16 hours.

# Conditions affecting nitrogen fixing — soil rhizobia



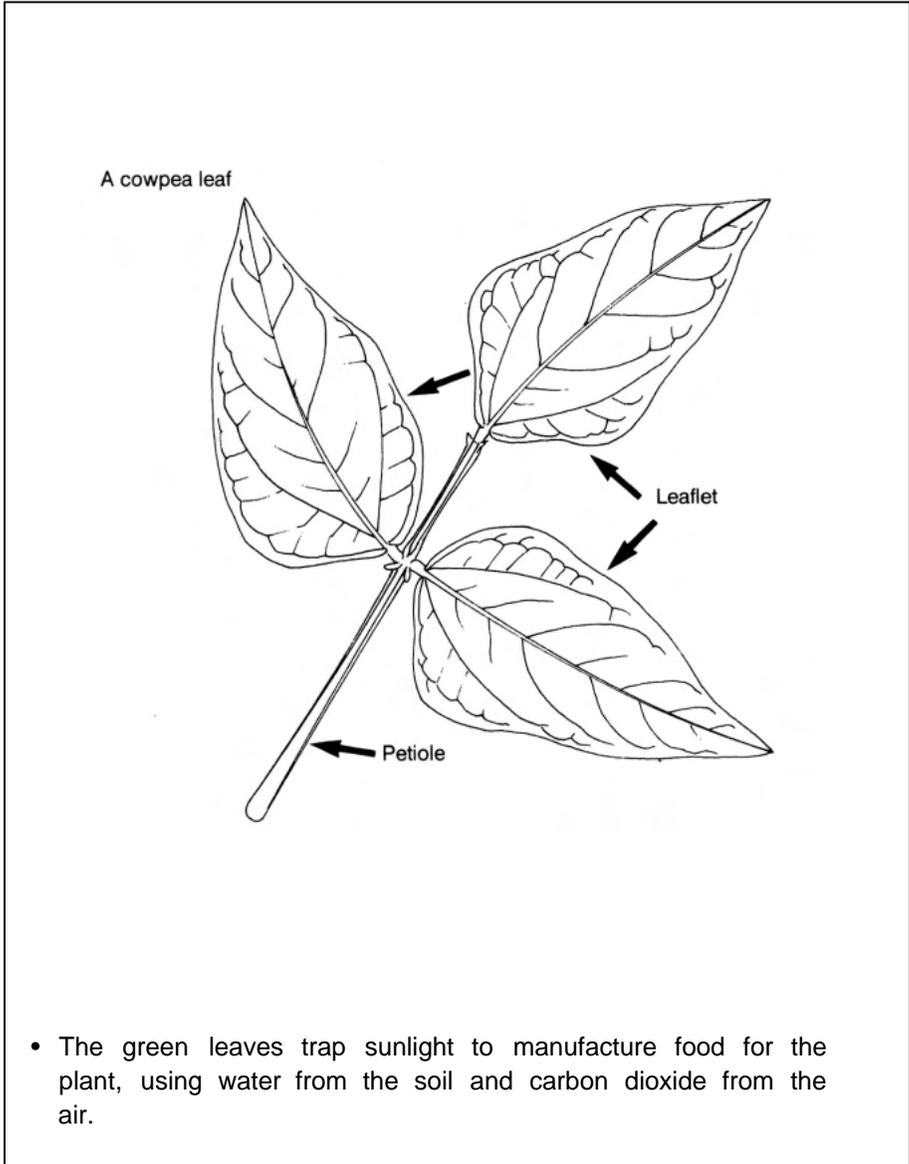
- In fields where legumes have not been grown for more than 5 years, cowpea seed must be treated with Rhizobium culture before planting.
- Culture is available in packets at farm supply centers or from extension agencies.

# The shoot — leaves and branches

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# The cowpea leaf



# Canopy development

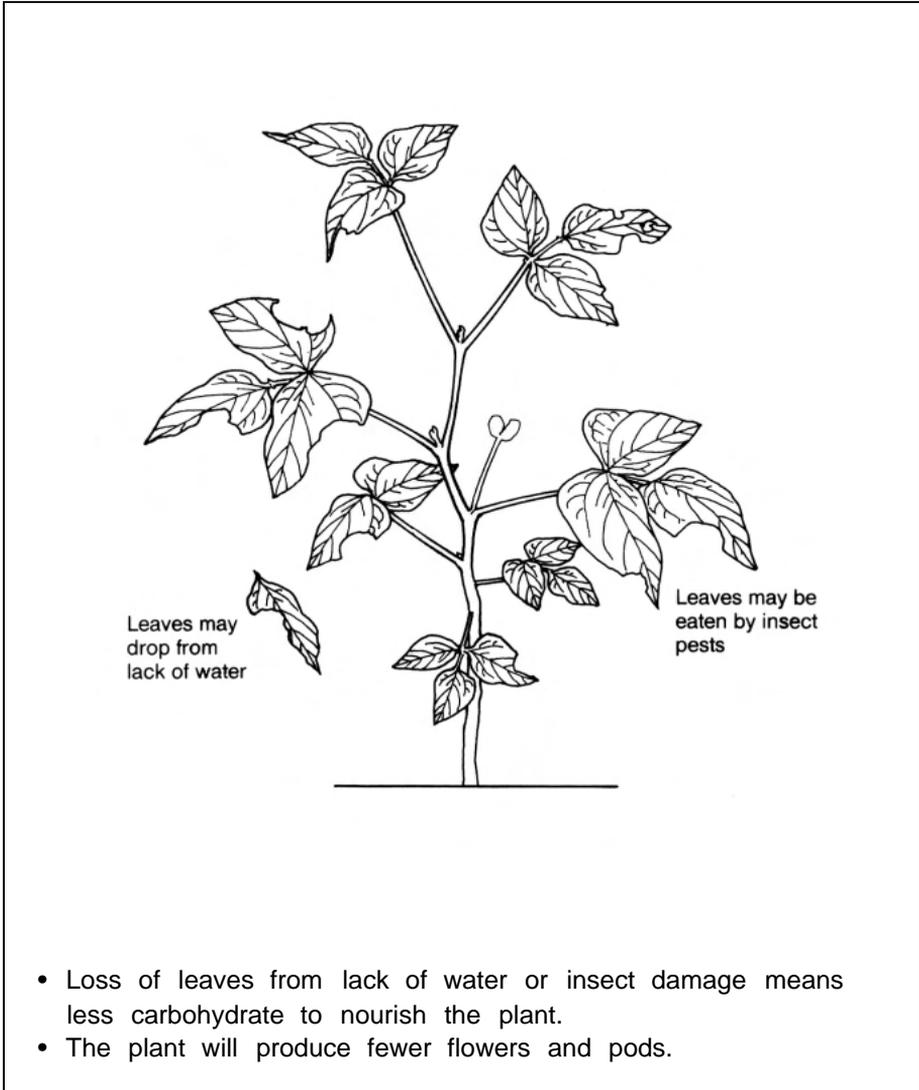


A good crop canopy

- Traps sunlight
- Shades the soil and keeps it moist
- Reduces weed growth

- In a healthy cowpea crop, the upper leaves form an umbrella, or canopy, shading the ground between rows.
- Some sunlight should get through to the lower leaves.

# Loss of leaves



# Branches



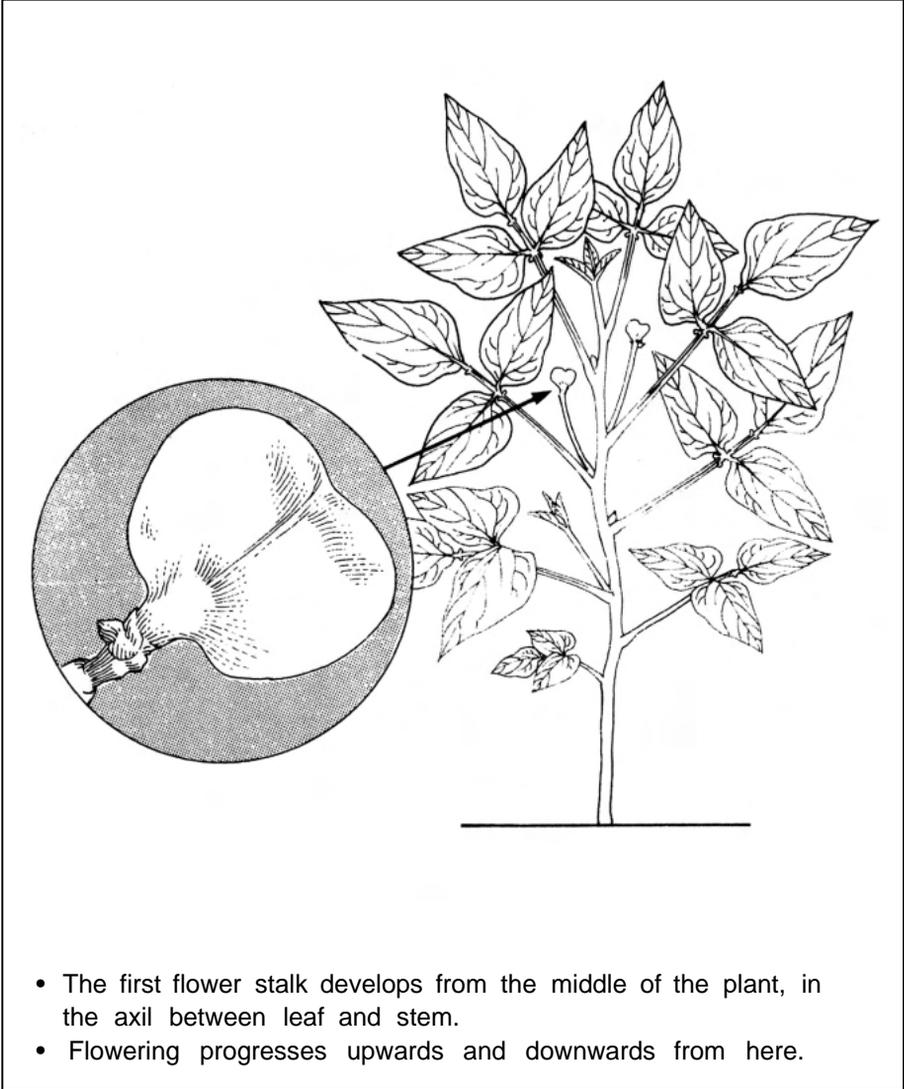
- Branching starts 2 to 3 weeks after emergence.
- Branches are useful in making up some yield where plant numbers are low. But they cannot make up for poor plant stands.

# The shoot — flowers and seed pods

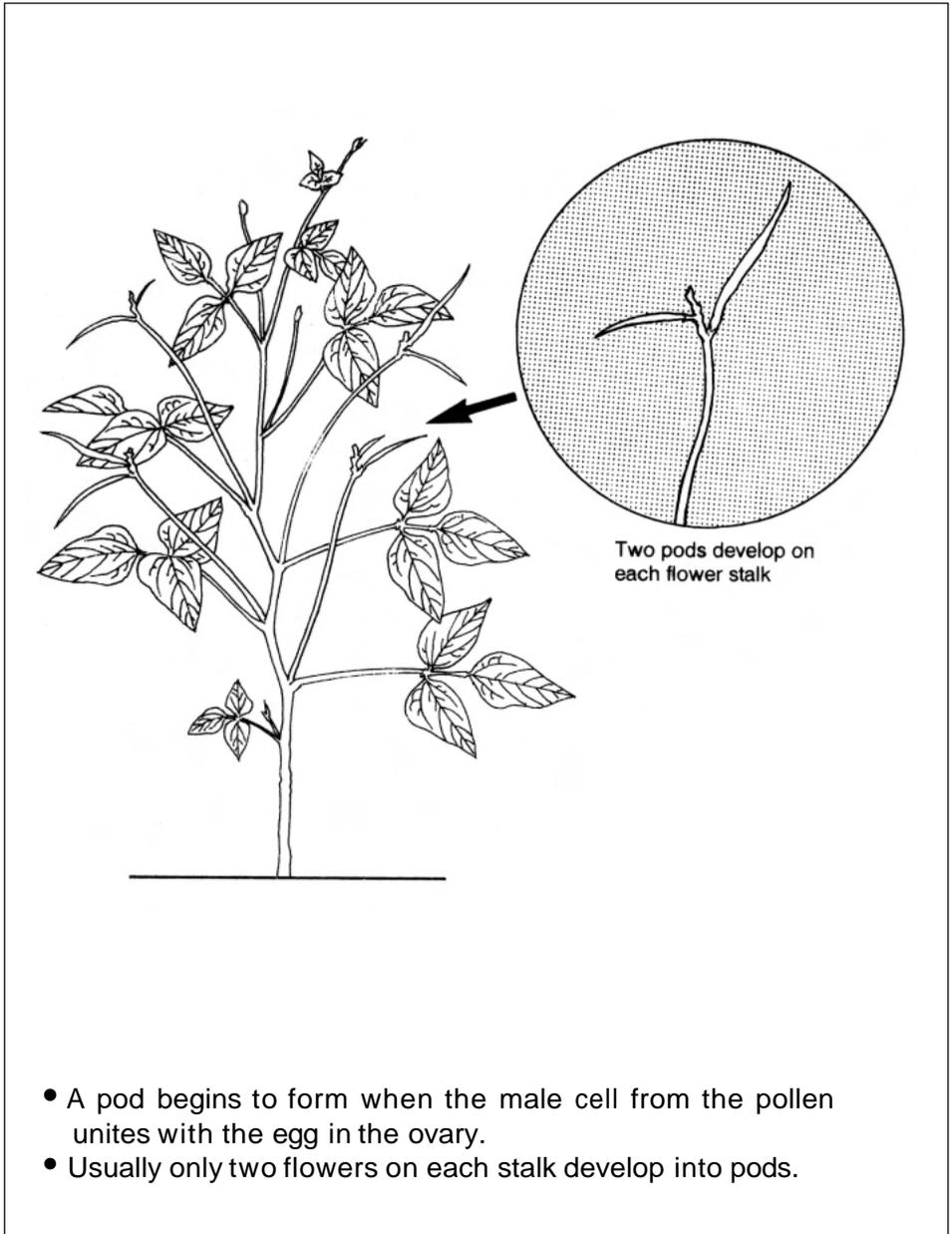
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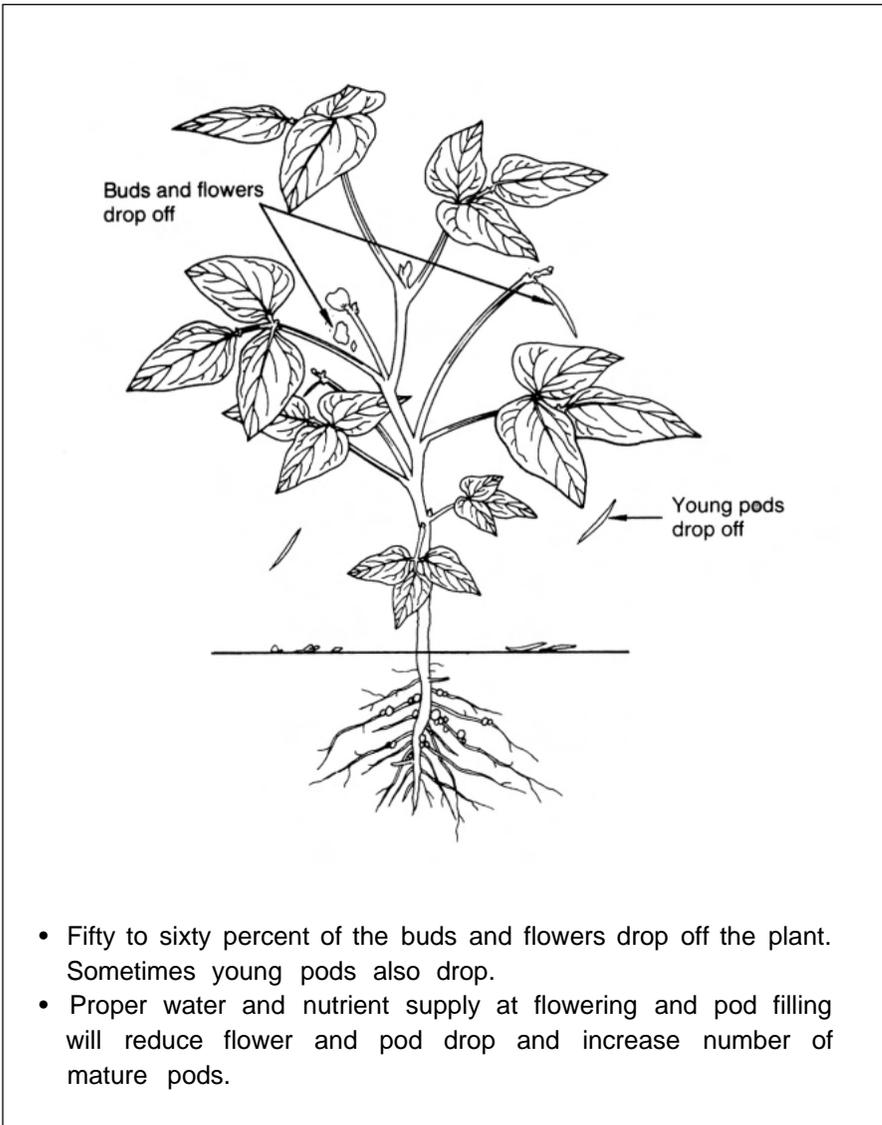
# Flowering



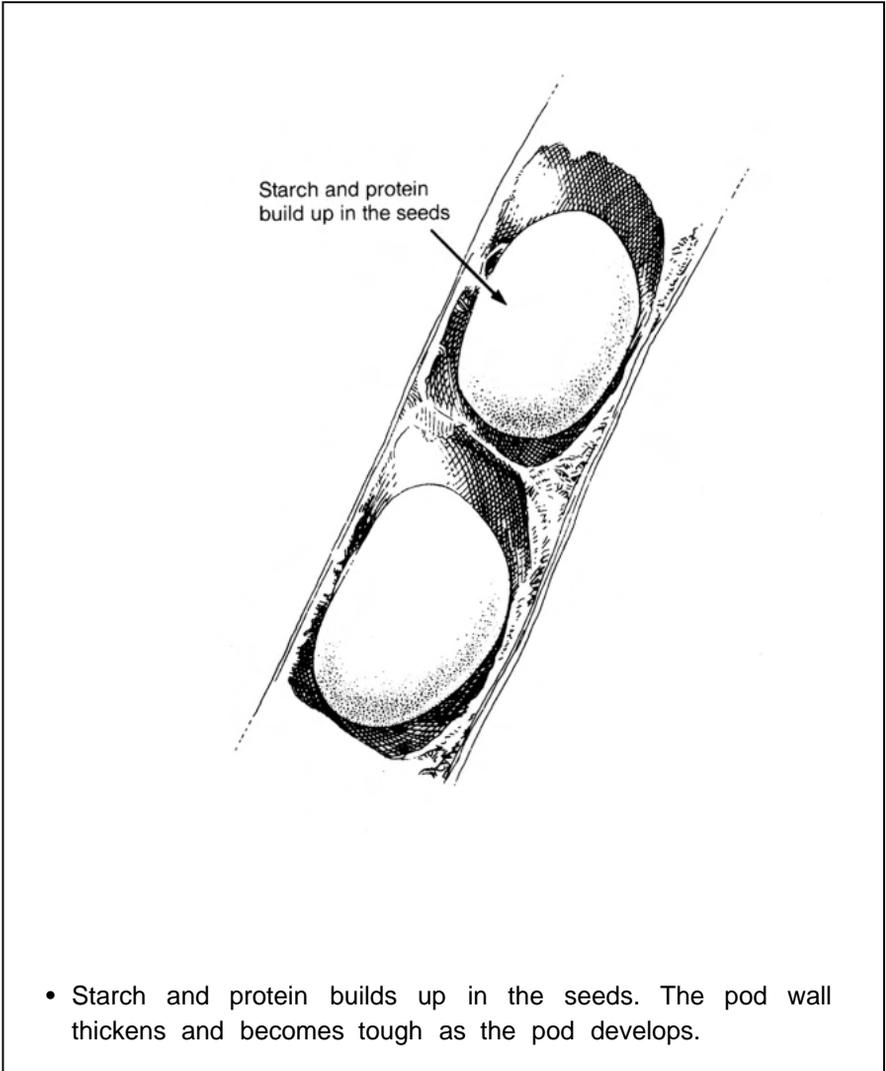
# Pod formation



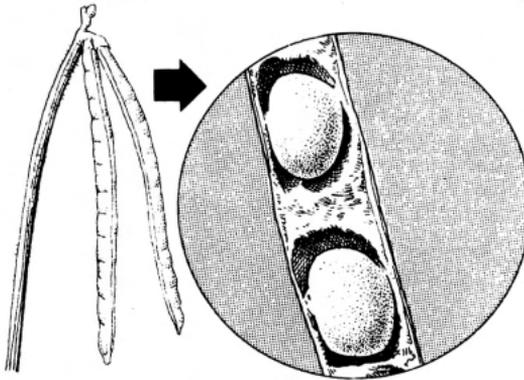
# Flower and pod drop



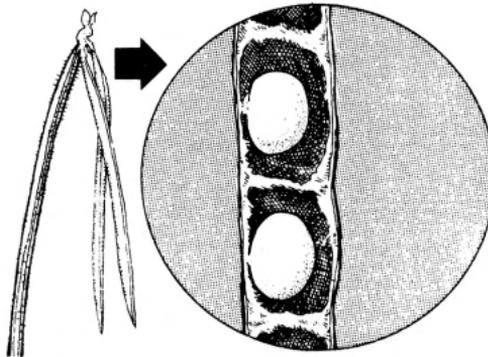
# Stages of pod filling



# Pod filling



Fully filled pod



Pod with some unfilled seed

- Seeds develop over 20 to 25 days. They fill slowly for the first few days and then rapidly.

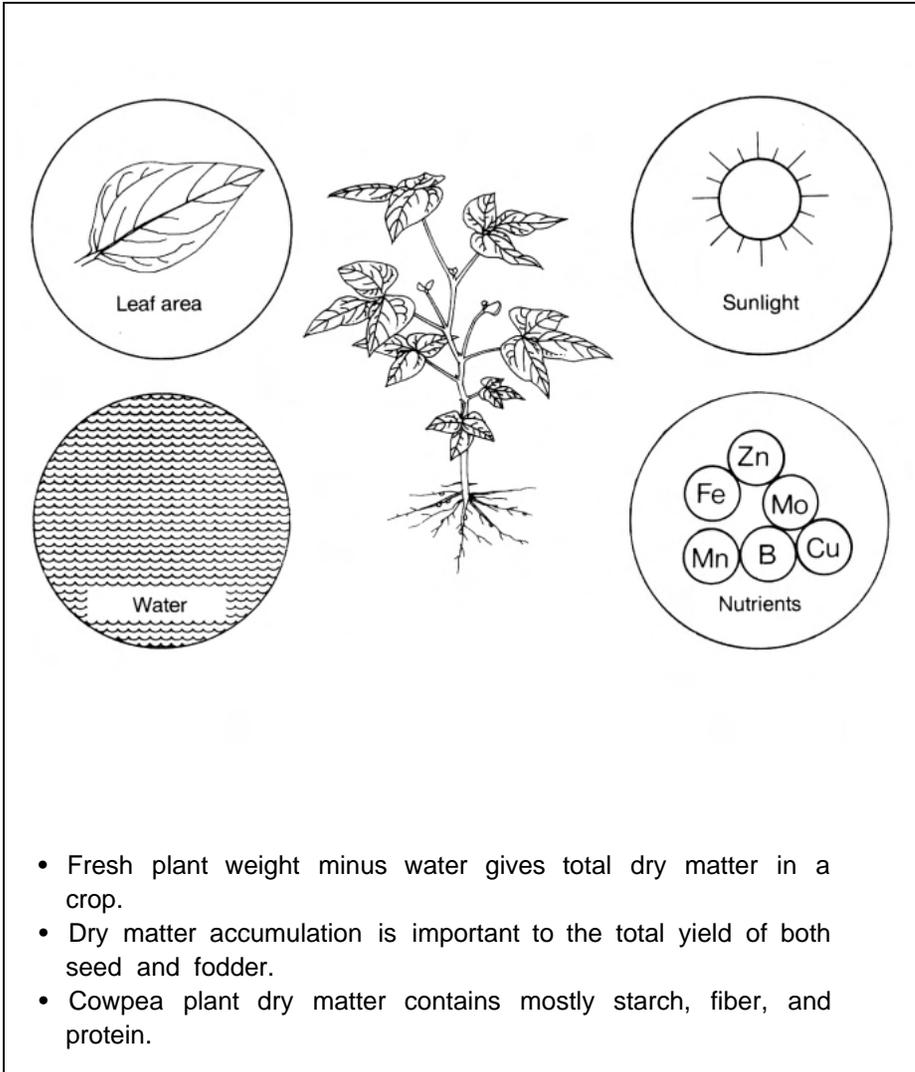


# Dry matter production

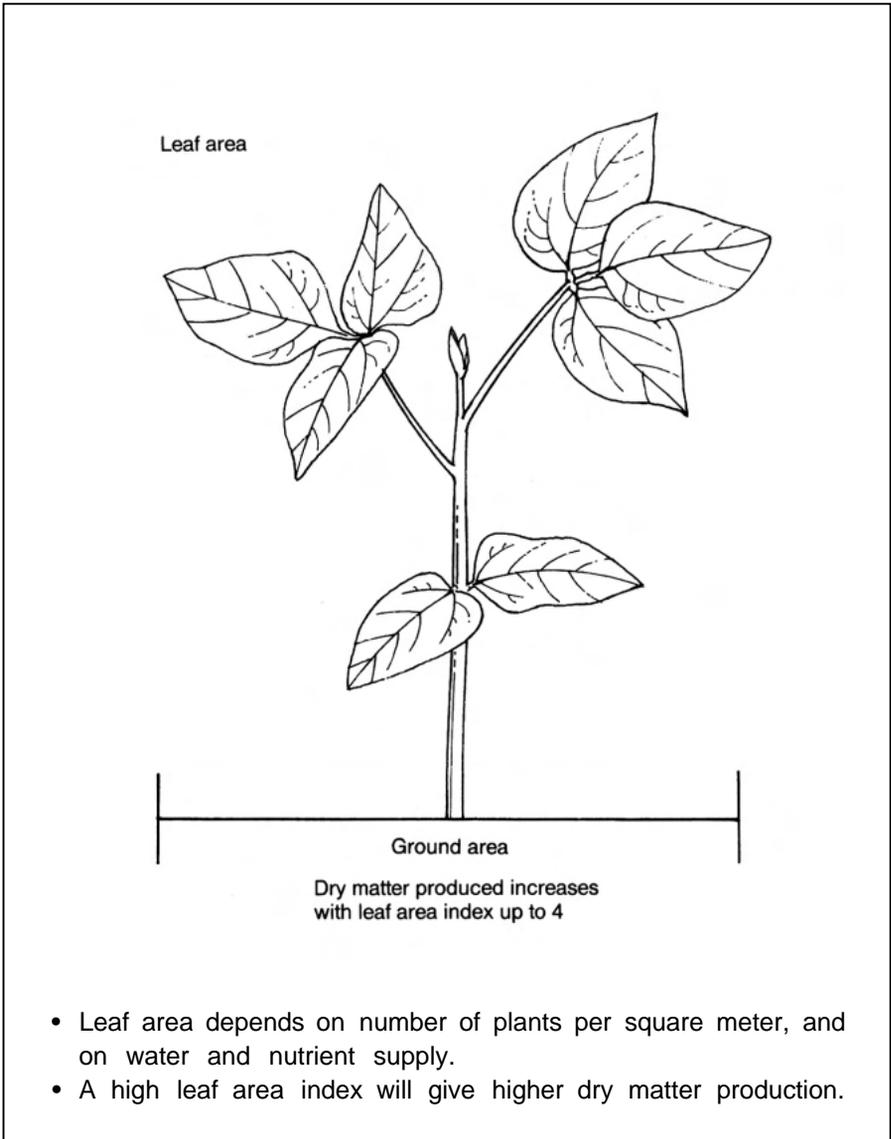
Dry matter production	<b>81</b>
Factors affecting dry matter production – leaf area	<b>82</b>
Factors affecting dry matter production – sunlight	<b>83</b>
Factors affecting dry matter production – water	<b>84</b>
Factors affecting dry matter production – nutrients	<b>85</b>



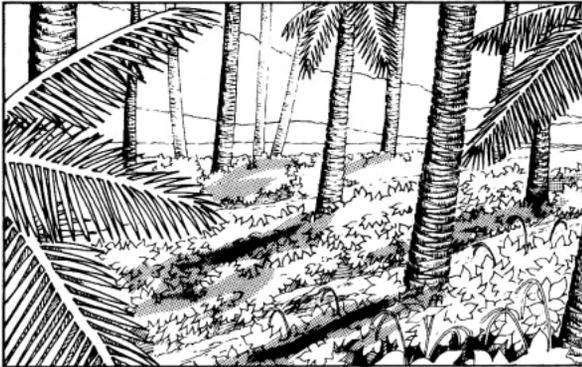
# Dry matter production



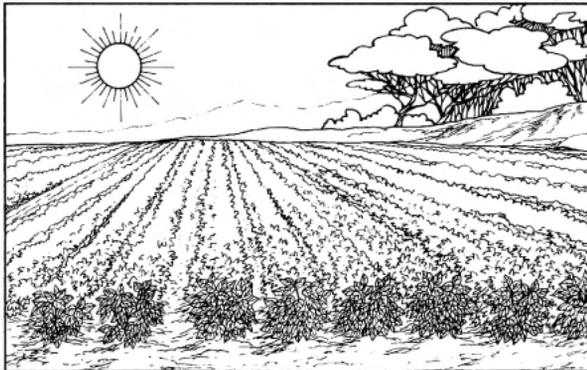
# Factors affecting dry matter production — leaf area



# Factors affecting dry matter production — sunlight



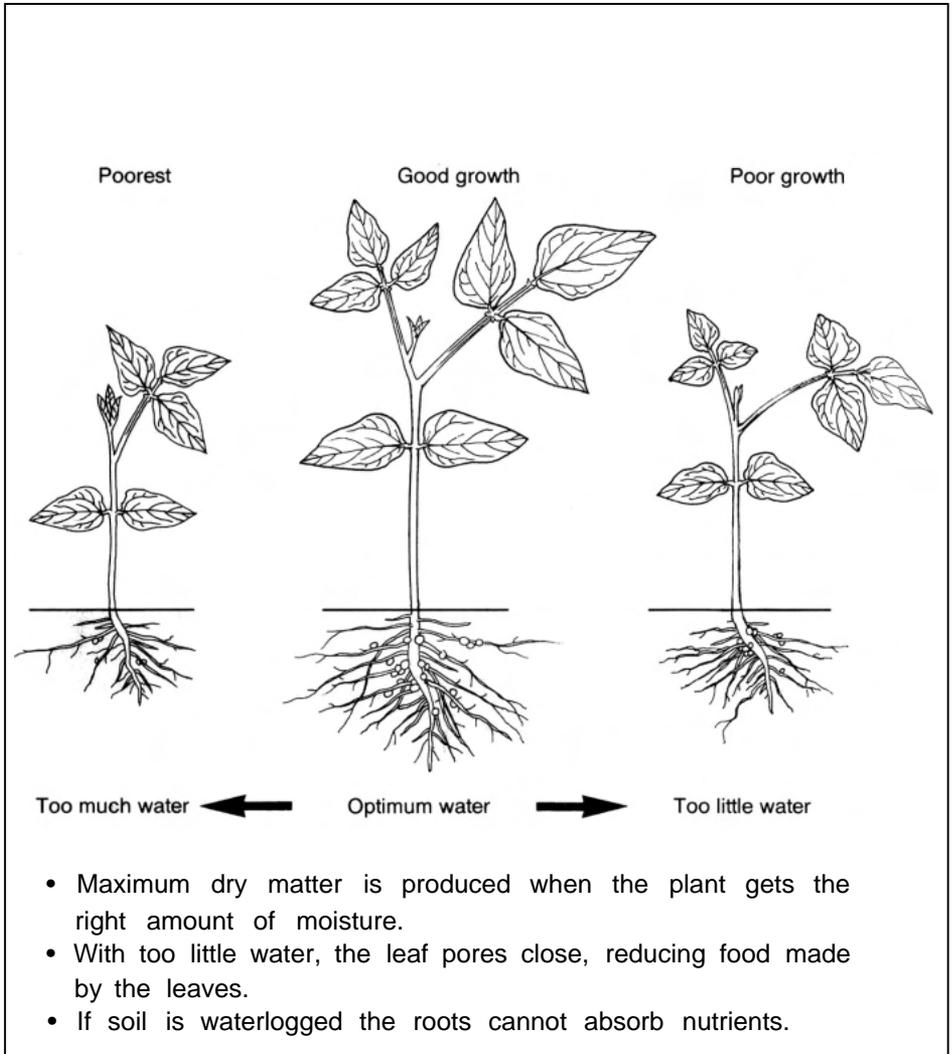
Shade reduces dry matter accumulated



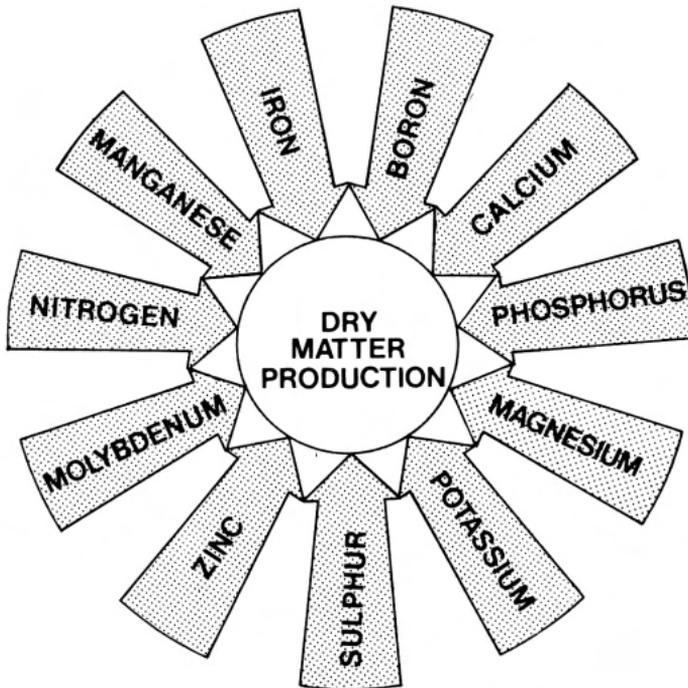
Light increases dry matter produced

- Bright sunlight increases dry matter produced.
- When cowpea is grown in shade, as on a coconut plantation, dry matter will be reduced as shade increases.

# Factors affecting dry matter production — water



# Factors affecting dry matter production — nutrients



Nutrients needed for maximum dry matter production

- For maximum dry matter production, all nutrients are needed in the right amounts.
- Lack of any nutrient will sharply reduce dry matter, even if the other nutrients are well supplied.



# Growing cowpea



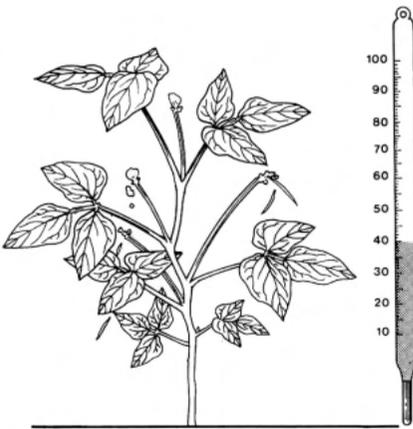


# Growing cowpea — environment

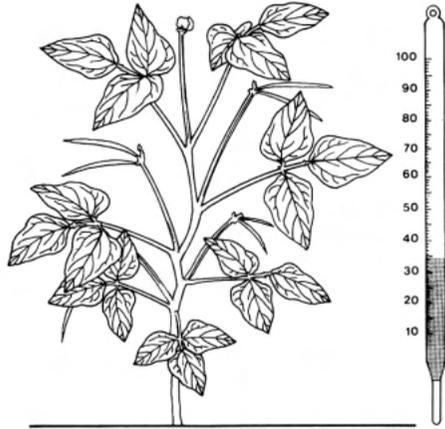
Temperature	91
Rainfall	92
Daylength	93
Light intensity	94
Soil	95



# Temperature



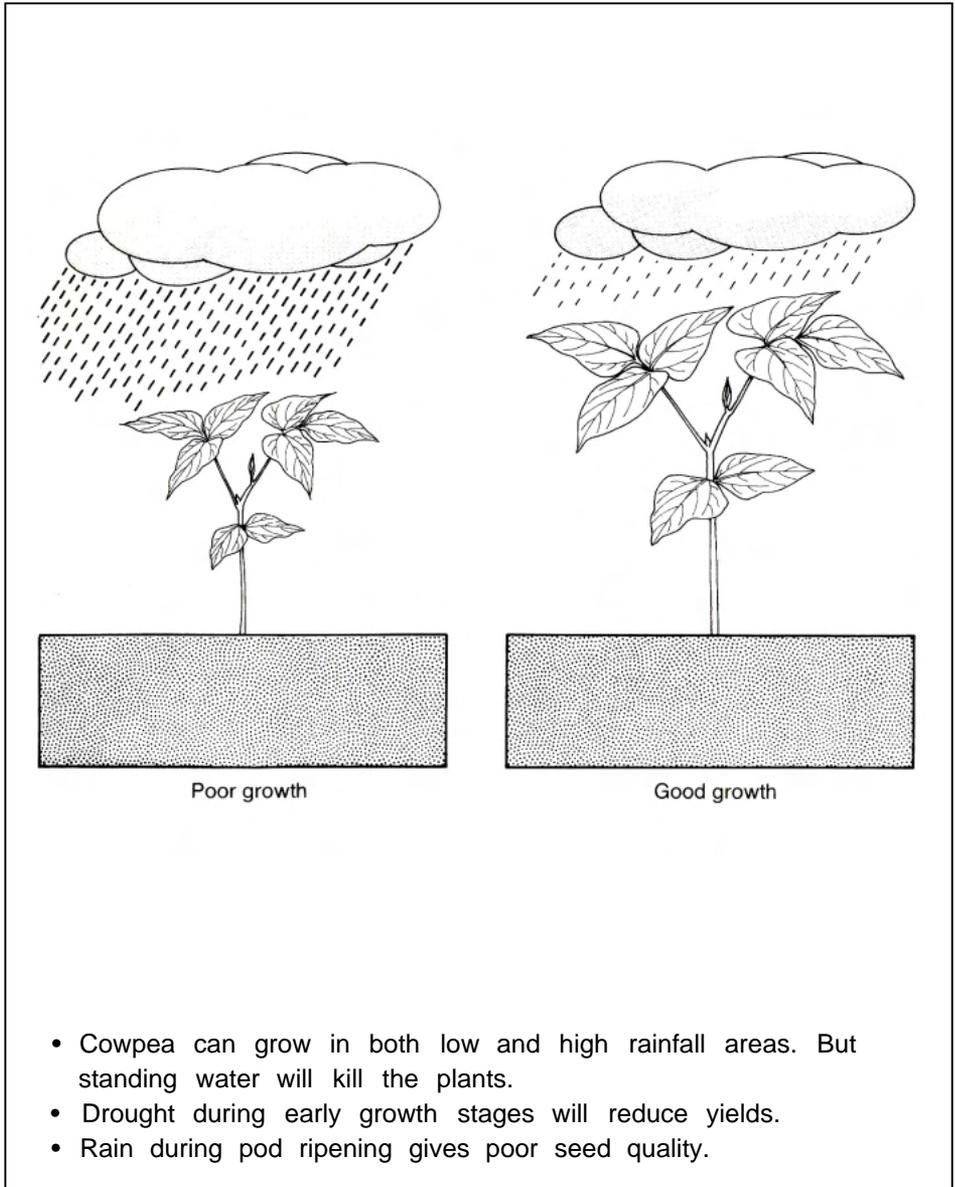
Above 38°C, flowers and pods may drop



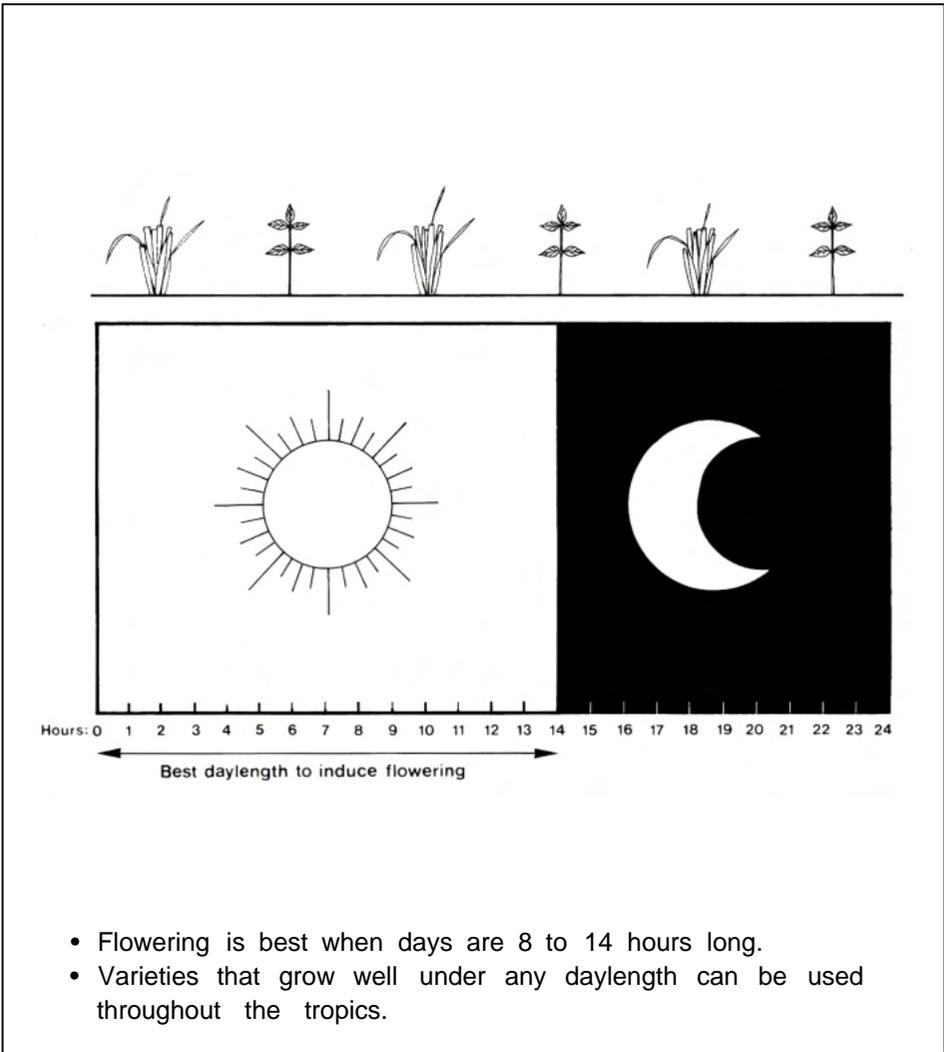
20 to 35°C best for growth

- Cowpea is a tropical crop suited to hot, humid climates and semi-dry areas.
- The best temperature for growth is 20 to 35°C.
- Cowpea can stand low temperatures, down to 15°C, but not frost.

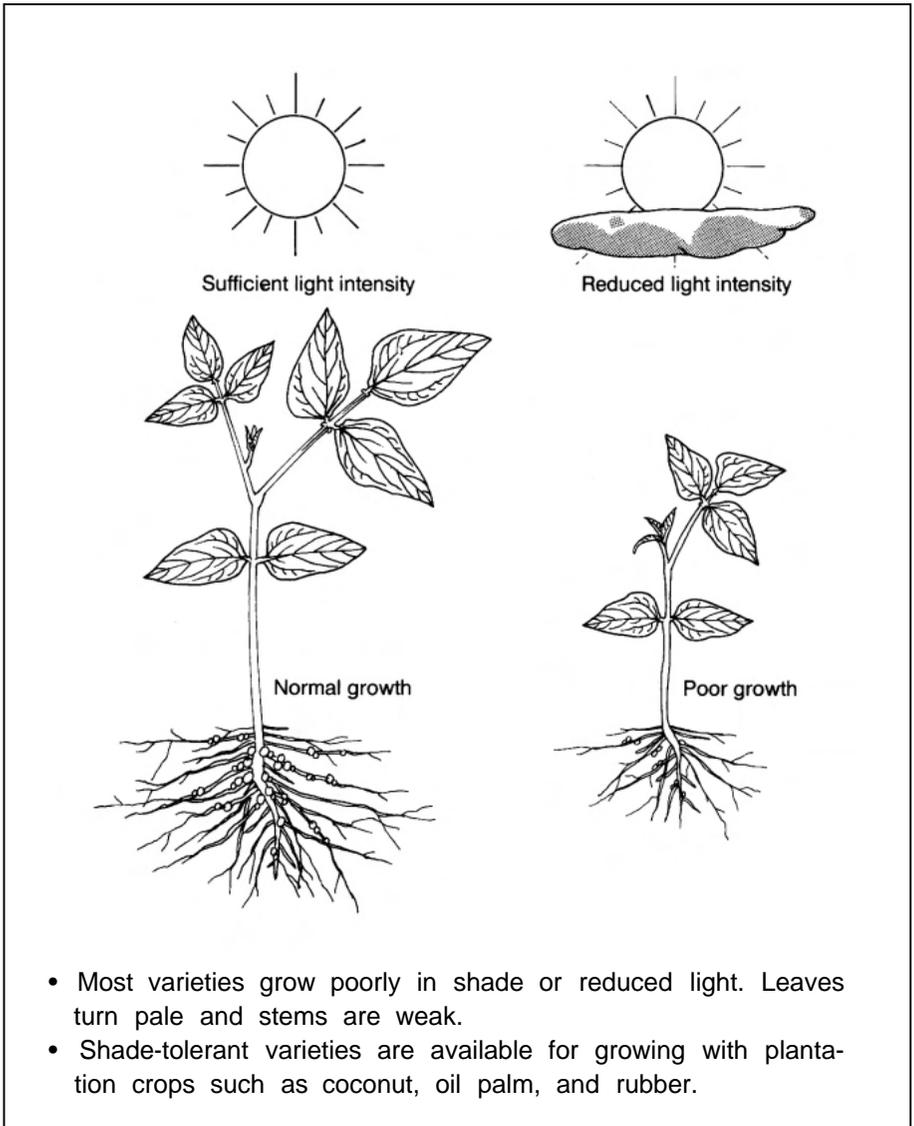
# Rainfall



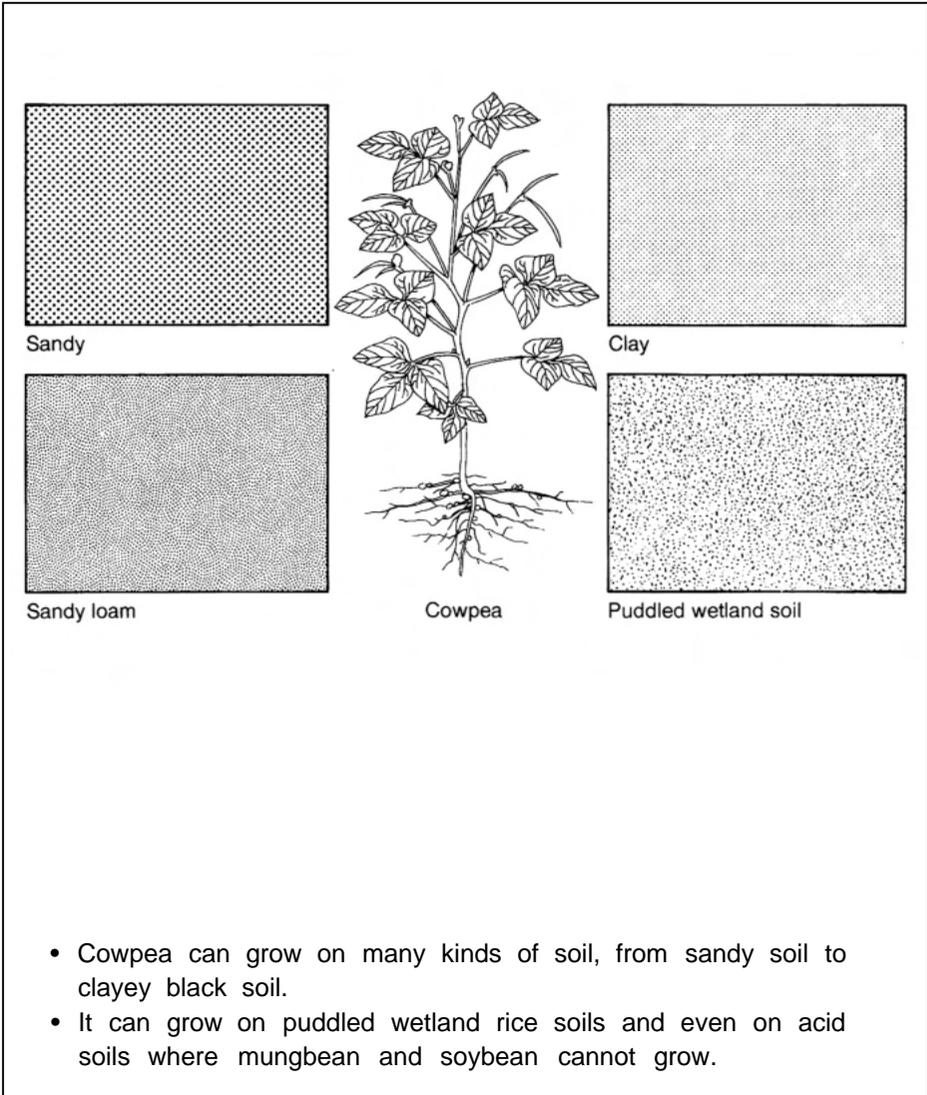
# Daylength



# Light intensity



# Soil



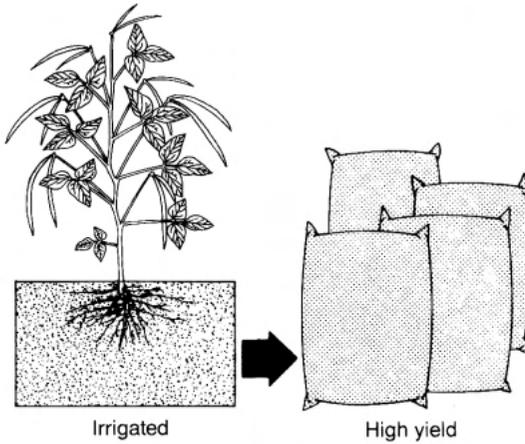
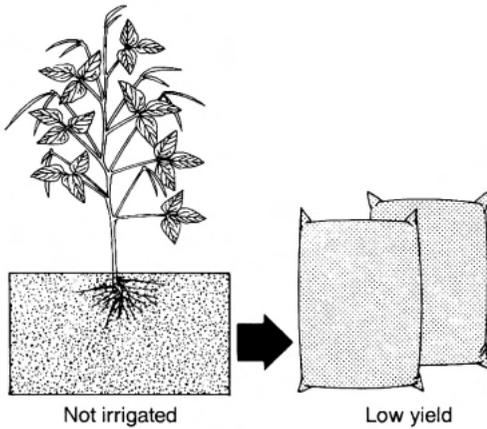


# Growing cowpea — water

Water needs	<b>99</b>
When water is most needed	<b>100</b>
Effects of drought	<b>101</b>
Effects of too much water	<b>102</b>

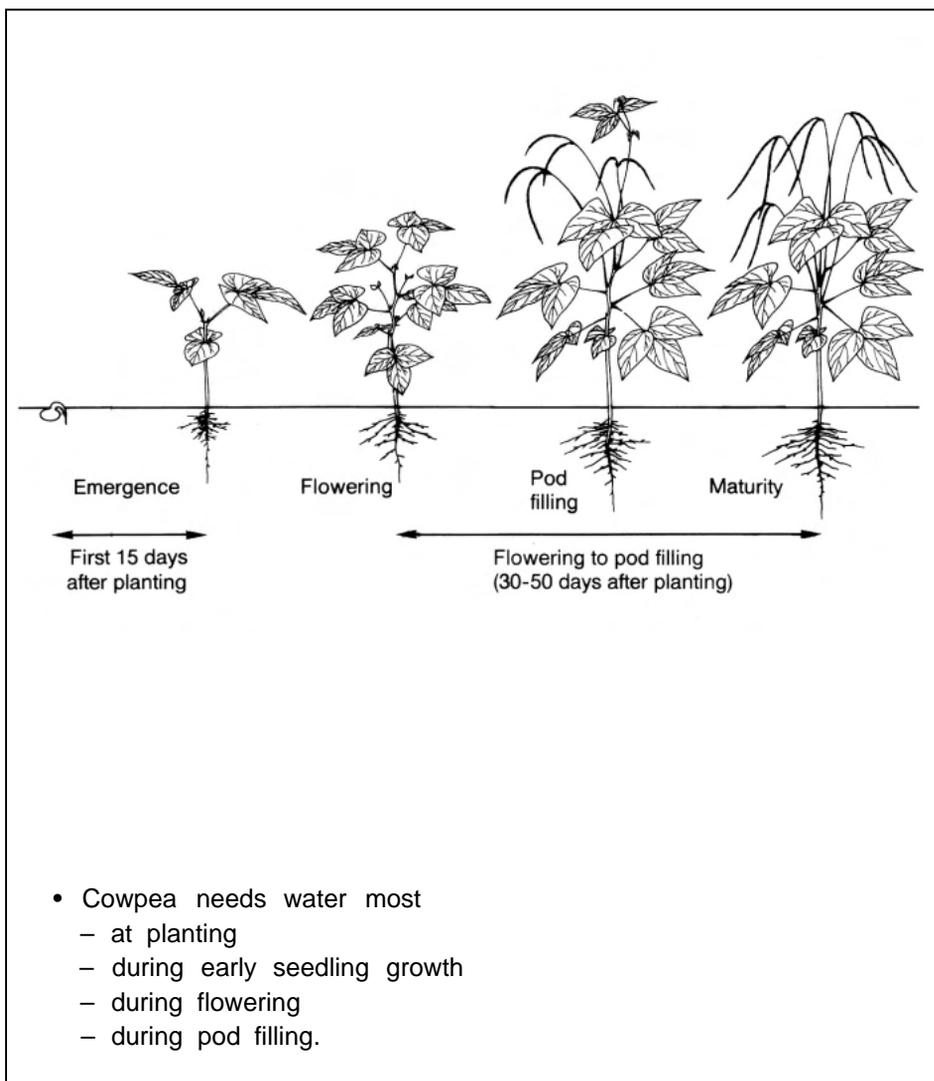


# Water needs

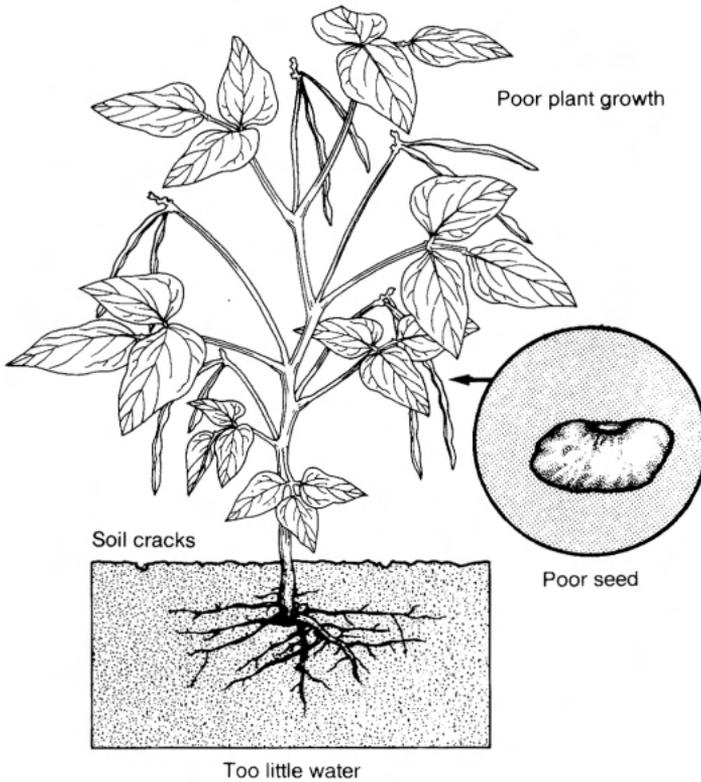


- Although cowpea can stand drought, water supplied during critical stages will give higher yields.

# When water is most needed



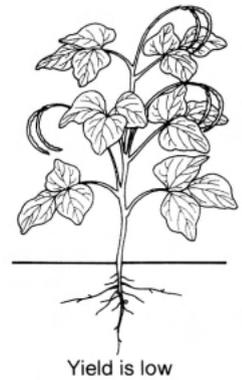
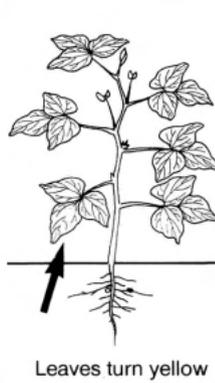
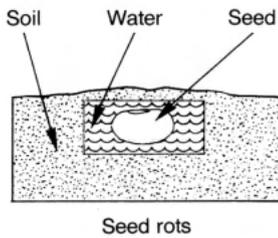
# Effects of drought



- Drought can
  - stunt plant growth
  - reduce nodulation and nitrogen fixation
  - decrease protein content of seed
  - reduce total yield.

# Effects of too much water

Cowpea dislikes too much water



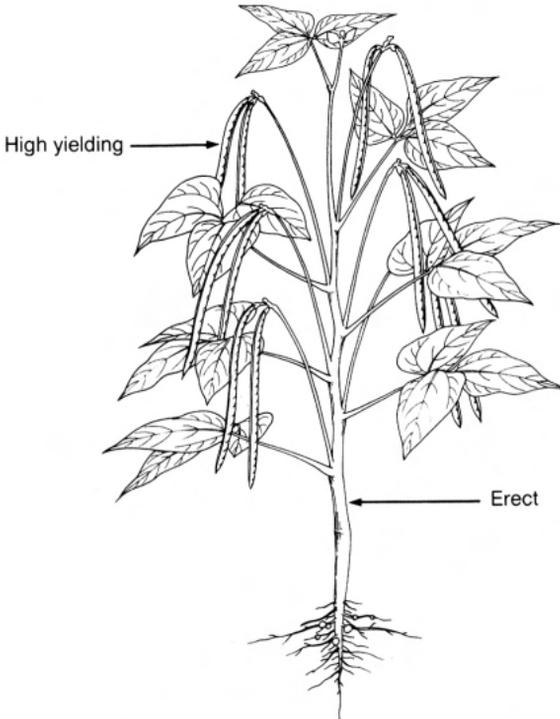
- Too much water can
  - delay germination and rot the seed
  - reduce nitrogen fixation
  - reduce total yield.

# Growing cowpea — choosing the right variety

Choosing the right variety — before rice	<b>105</b>
Choosing the right variety — after rice	<b>106</b>
Choosing the right variety — after rice	<b>107</b>
Choosing the right variety — pest and disease resistance	<b>108</b>



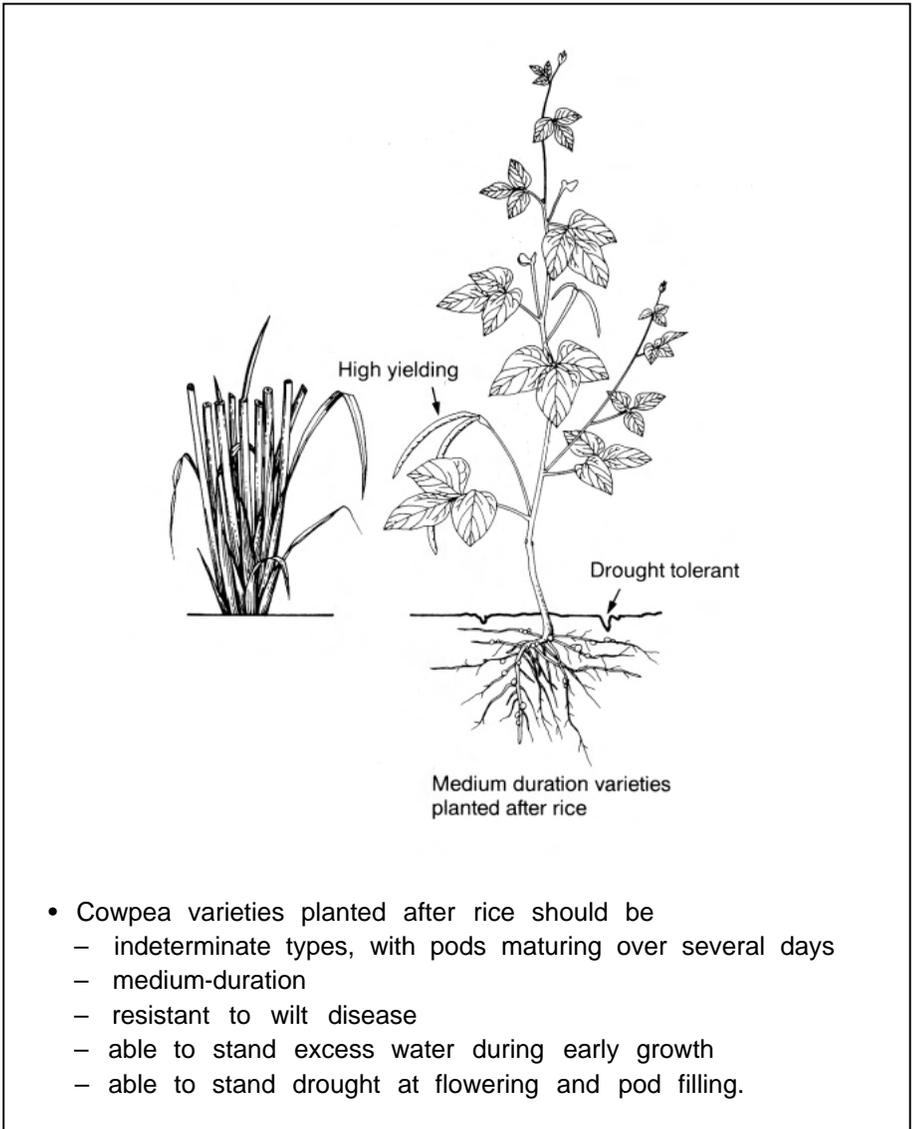
# Choosing the right variety — before rice



Early varieties planted before rice

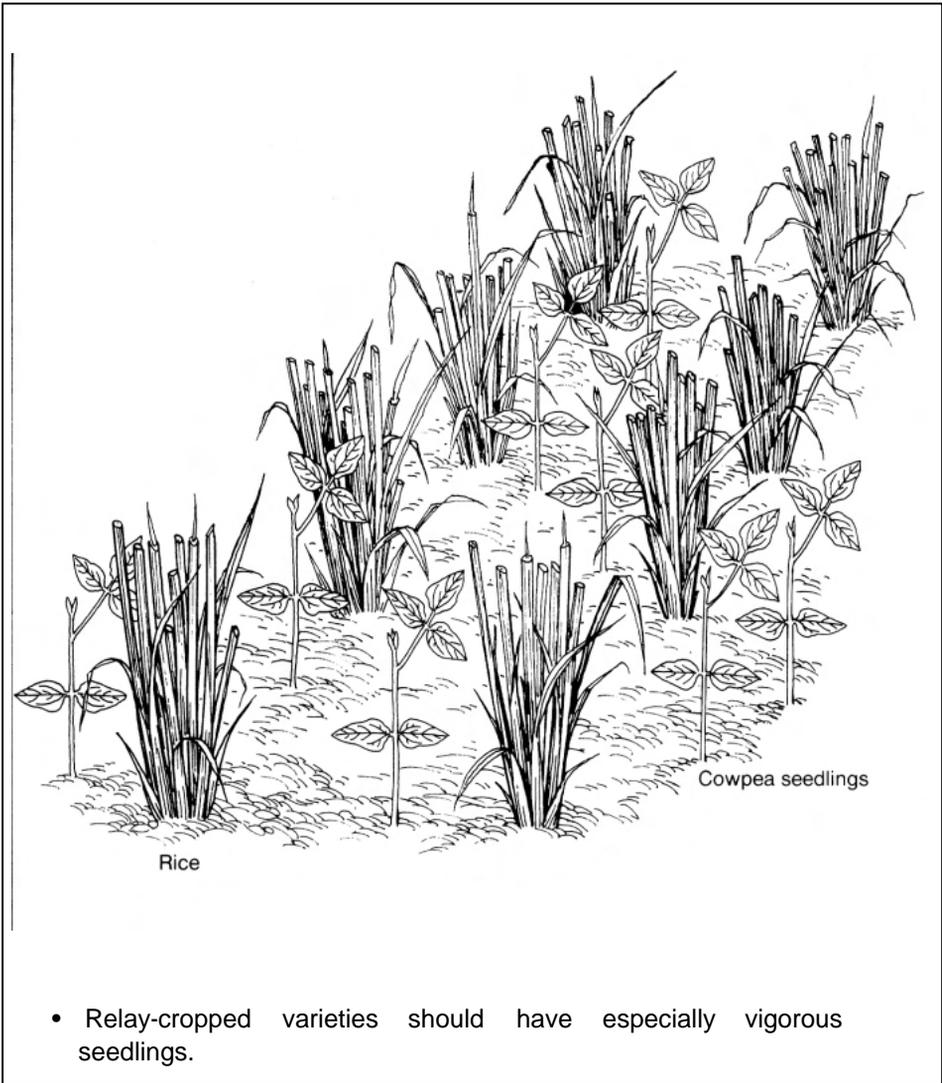
- Cowpea varieties planted before rice should be
  - erect growing, with most pods maturing at the same time
  - early-maturing
  - able to stand drought during early growth stages
  - able to stand excess water during flowering and pod filling.

# Choosing the right variety — after rice



- Cowpea varieties planted after rice should be
  - indeterminate types, with pods maturing over several days
  - medium-duration
  - resistant to wilt disease
  - able to stand excess water during early growth
  - able to stand drought at flowering and pod filling.

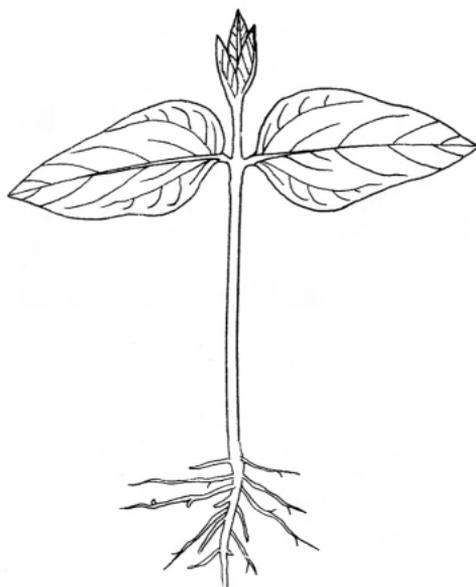
# Choosing the right variety — after rice



# Choosing the right variety — pest and disease resistance



Not resistant



Resistant

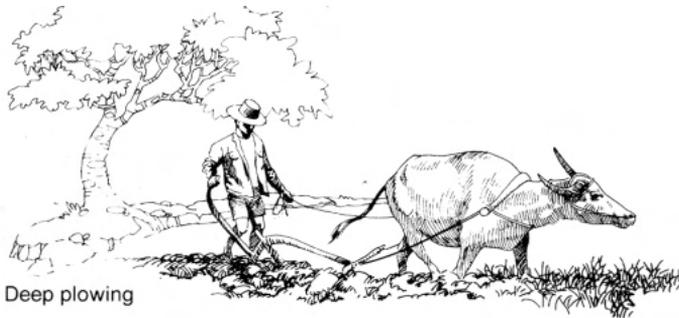
- Some cowpea varieties resist insect and disease damage better than others.
- Choose varieties that are least damaged by the major pests and diseases in your area.

# Growing cowpea – tillage and planting

Preparing the land – high tillage	111
Preparing the land – zero tillage	112
Planting system	113
When to plant as a sole crop	114
When to plant as a relay crop	115
Row spacing – sole crop	116
Row spacing – intercrop	117
Mixed intercropping	118
Planting method	119
Planting depth	120
Seeding rate	121
Plant density	122



# Preparing the land — high tillage



Deep plowing

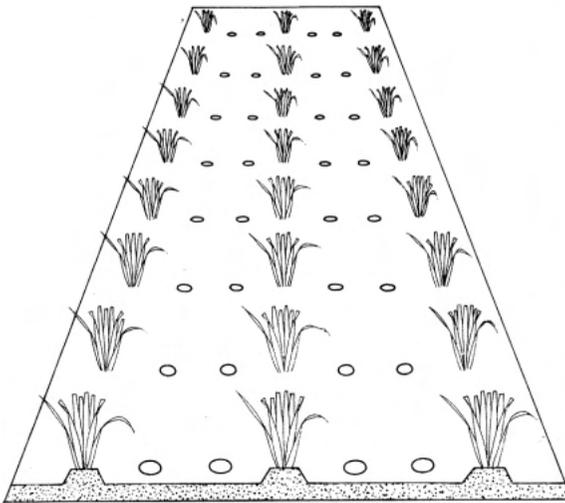


Cross harrowing

- High tillage is common in irrigated areas where water is easily available.
- High tillage
  - airs the soil
  - help seeds germinate and roots grow deep
  - controls weeds.
- But high tillage
  - is costly
  - delays planting
  - dries out the soil.

# Preparing the land — zero tillage

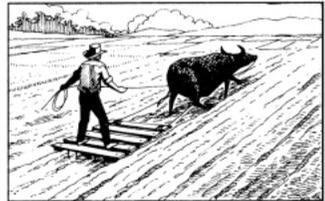
Cowpea seeds drilled or dibbled in holes  
between rice stubble rows



Zero tillage



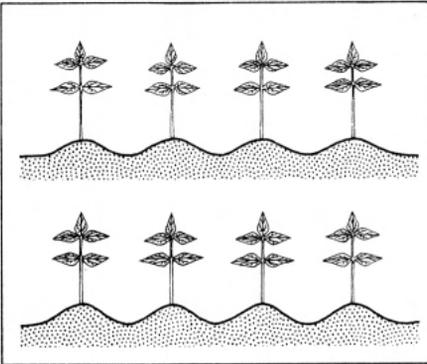
No plowing



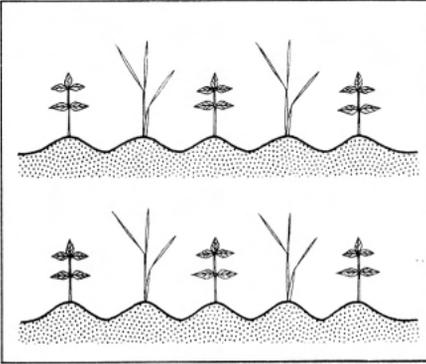
No harrowing

- Zero tillage is common in rainfed areas, especially after lowland rice.
- Zero tillage
  - saves labor and costs
  - allows planting at once
  - makes full use of soil moisture.
- But zero tillage
  - does not air the soil
  - lets weeds grow
  - does not help roots grow deep.

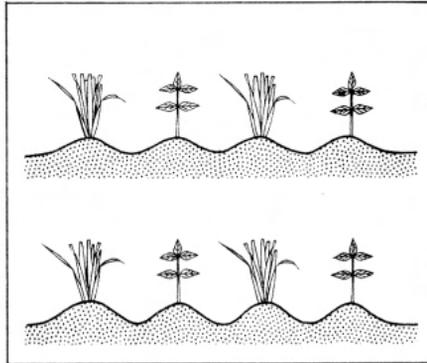
# Planting system



Sole cropping  
before or after rice



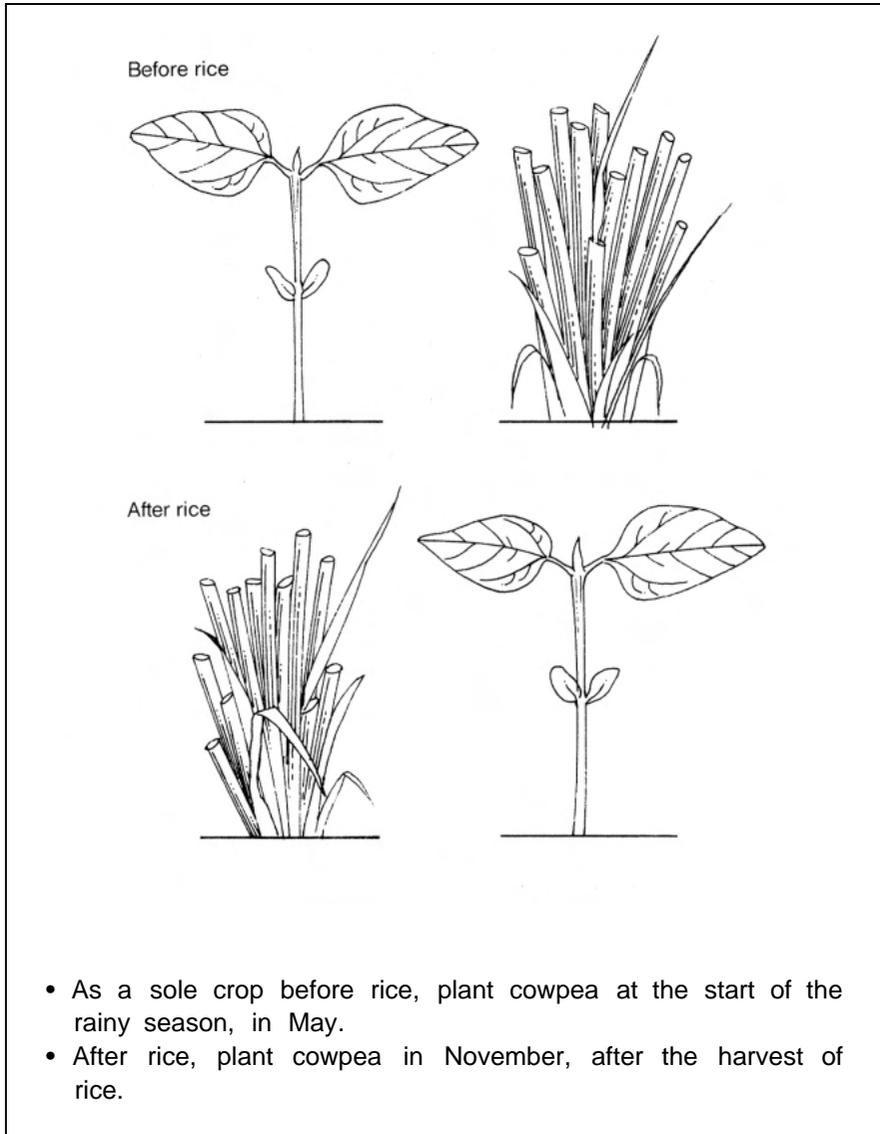
Intercrop with  
upland rice



Relay crop  
in standing water

- Cowpea can be planted as a sole crop before or after rice.
- It can also be relay cropped or intercropped with upland rice.

# When to plant as a sole crop



- As a sole crop before rice, plant cowpea at the start of the rainy season, in May.
- After rice, plant cowpea in November, after the harvest of rice.

# When to plant as a relay crop

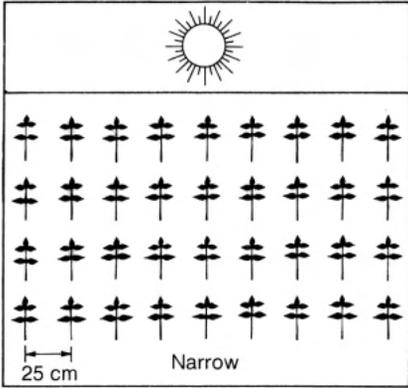
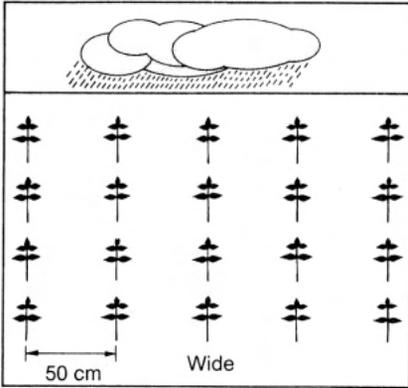
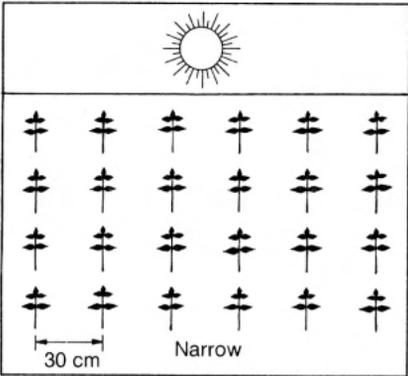
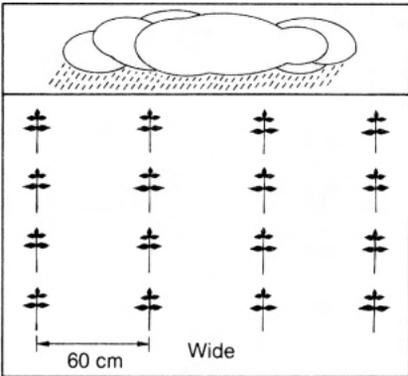


Cowpea seedlings  
10 days old

Rice almost  
to be harvested

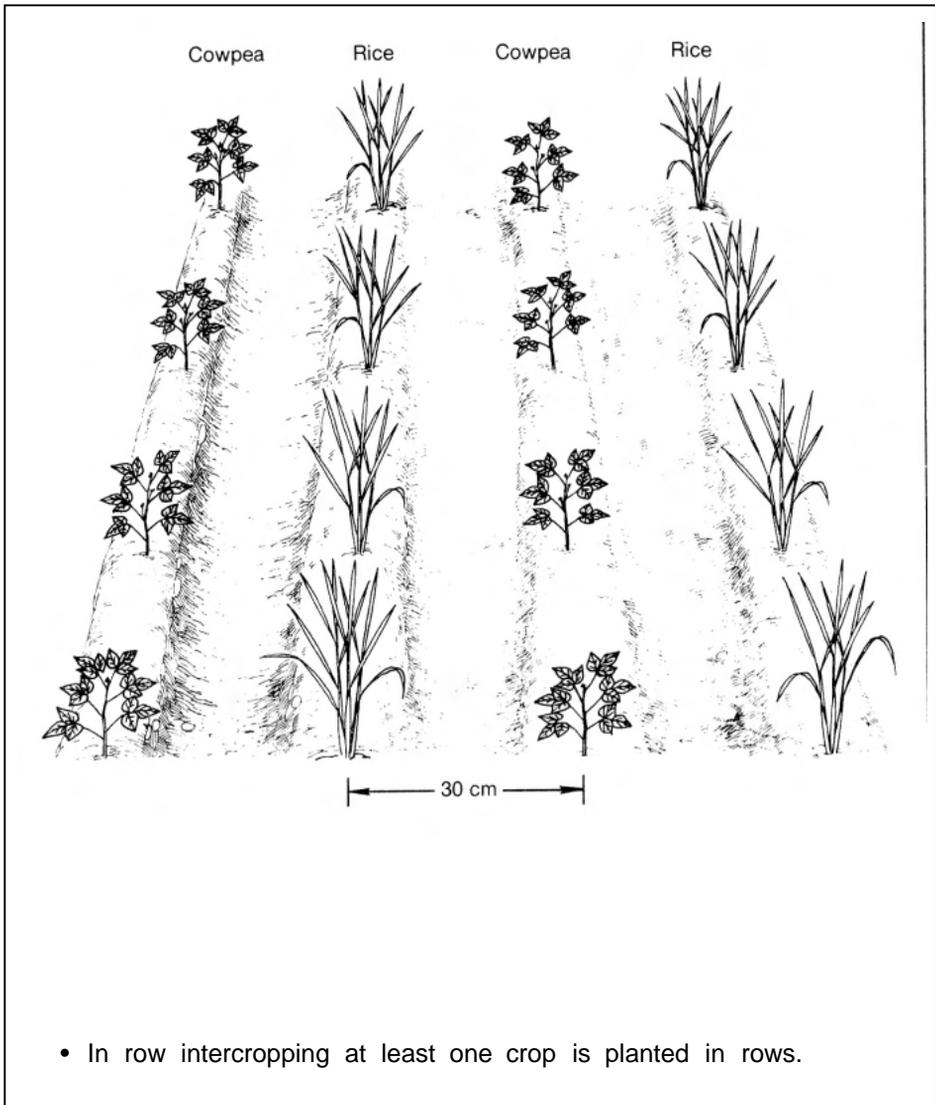
- For a relay crop, plant cowpea in standing rice, about 10 days before the rice harvest.

# Row spacing — sole crop

<p>Determinate type</p>  <p>25 cm</p> <p>Narrow</p>	<p>Determinate type</p>  <p>50 cm</p> <p>Wide</p>
<p>Indeterminate type</p>  <p>30 cm</p> <p>Narrow</p>	<p>Indeterminate type</p>  <p>60 cm</p> <p>Wide</p>

- Space between rows varies with plant type and season.
- Use narrow row spacing for determinate types and in the dry season.
- Use wide row spacing for indeterminate types and in the wet season.

# Row spacing — intercrop

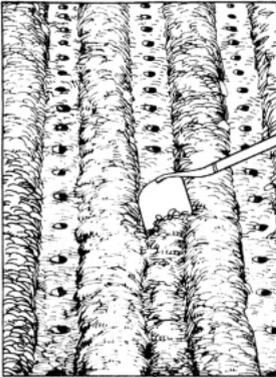


# Mixed intercropping



- Mixed intercropping uses no distinct row arrangement or row spacing.
- As a fodder crop, cowpea is often mixed intercropped with cereal crops.

# Planting method



Drill in rows



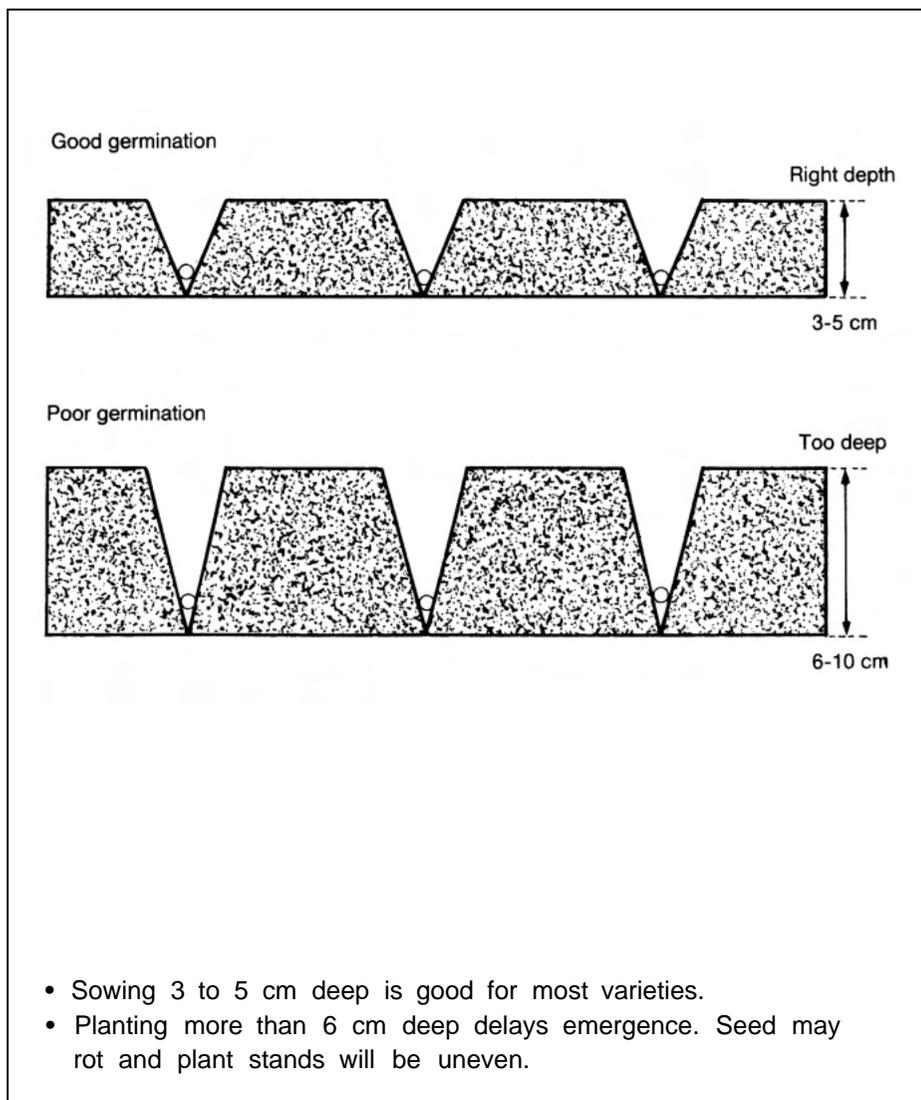
Broadcast



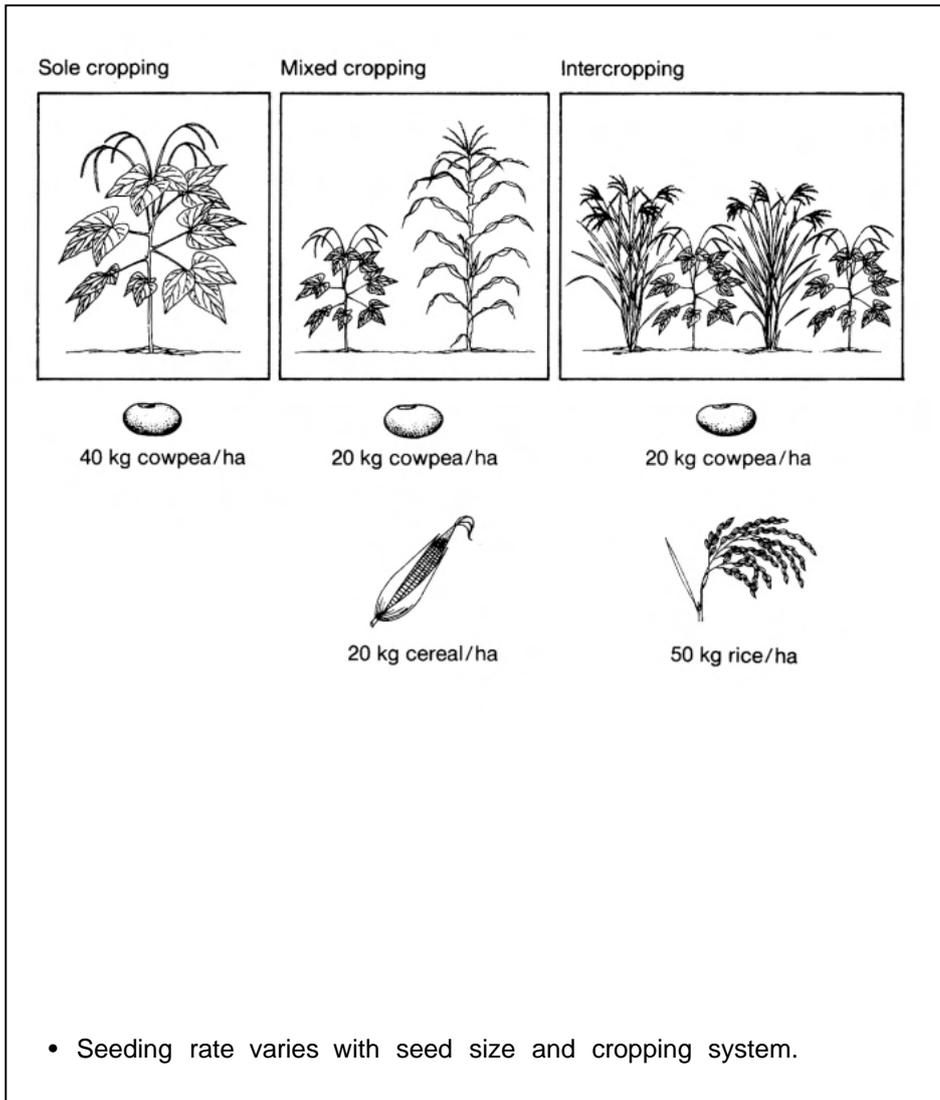
Dibble in rows

- Drill seed in rows by hand or by animal-drawn seeder.
- Dibble seed at the base of rice stubble after rice harvest.
- For mixed or relay crops, broadcast seed in tilled fields and cover with soil. Or broadcast without tilling, directly in wet fields.

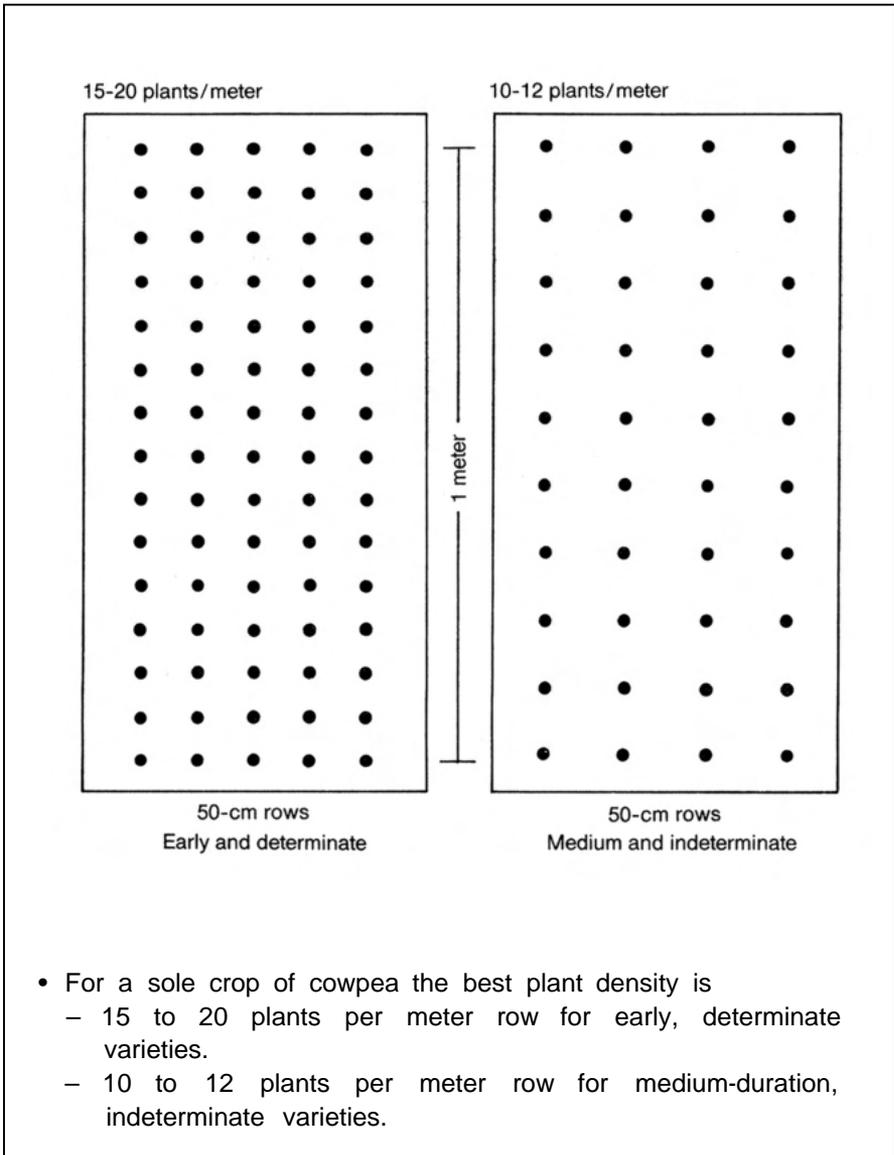
# Planting depth



# Seeding rate



# Plant density

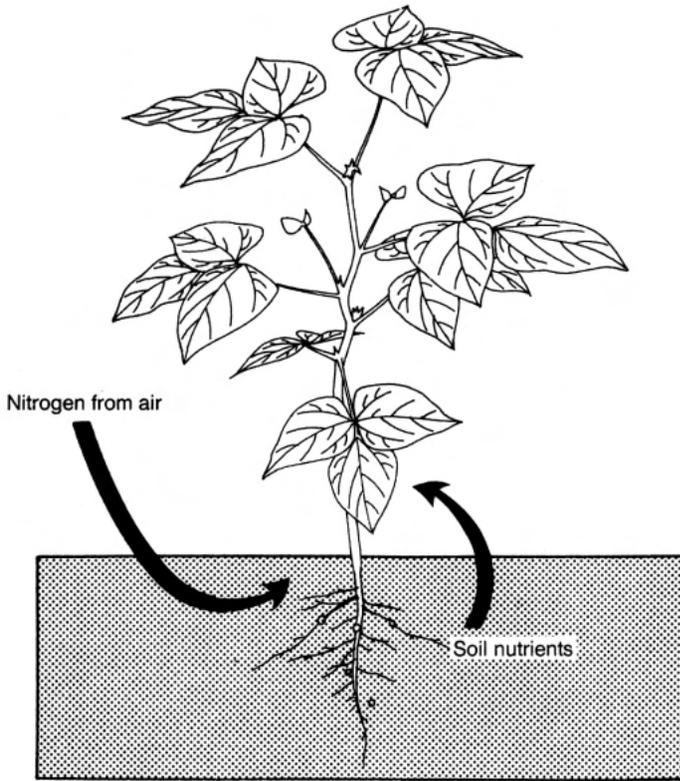


# Fertilizer and lime

Fertilizer needs	125
Organic fertilizer	126
Fertilizer – nitrogen	127
Fertilizer – phosphorus	128
Fertilizer – potassium	129
Fertilizer – micronutrients	130
Lime	131



# Fertilizer needs



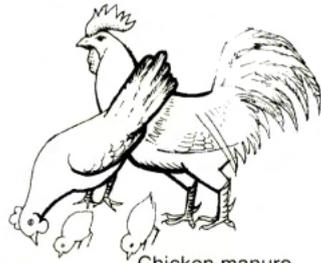
- The cowpea crop usually does not need fertilizer. It uses nitrogen from the air and other nutrients left in the soil from the previous crop.
- In poor soils, however, adding fertilizer will improve yields.

# Organic fertilizer

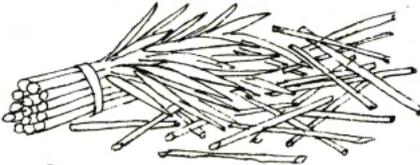
Made of farmyard manure like:



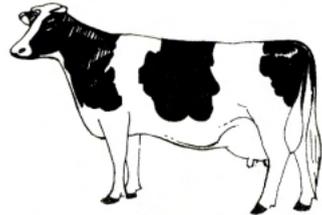
Dry leaves



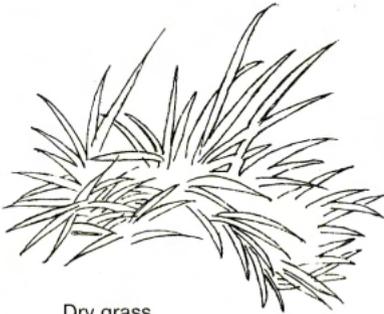
Chicken manure



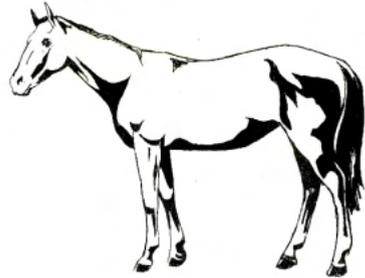
Straw



Cow manure



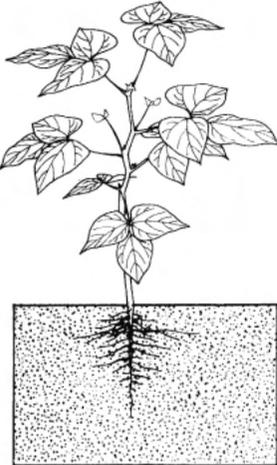
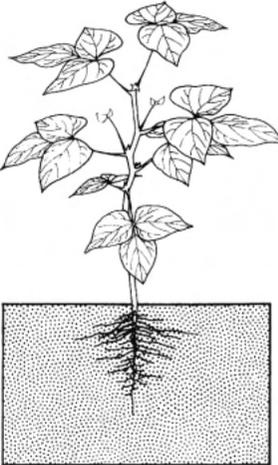
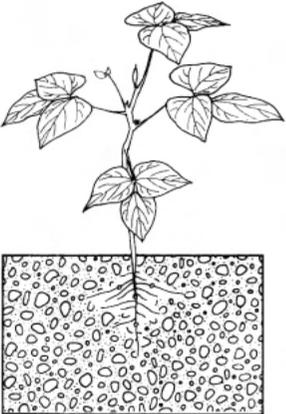
Dry grass



Horse manure

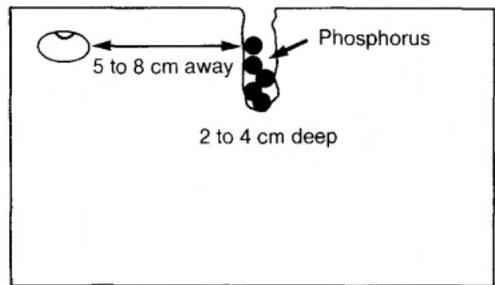
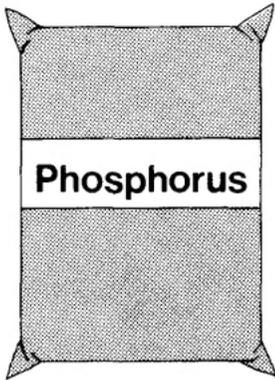
- Add organic fertilizer in any amount possible.
- Large amounts are needed to improve yields significantly.
- But even smaller amounts improve soil structure and help plant growth.

# Fertilizer — nitrogen

Ordinary soil No added nitrogen	Very poor soil Add 30 kg urea/ha	Too much soil nitrogen reduces nodule activity
		
<ul style="list-style-type: none"><li>• Healthy plant</li><li>• Normal nodule growth</li></ul>	<ul style="list-style-type: none"><li>• Healthy plant</li><li>• Normal nodule growth</li></ul>	<ul style="list-style-type: none"><li>• Unhealthy plant</li><li>• Nodule activity reduced</li></ul>

- Cowpea needs no added nitrogen fertilizer.
- In very poor soils, add 30 kg urea per hectare at planting to help start the crop.

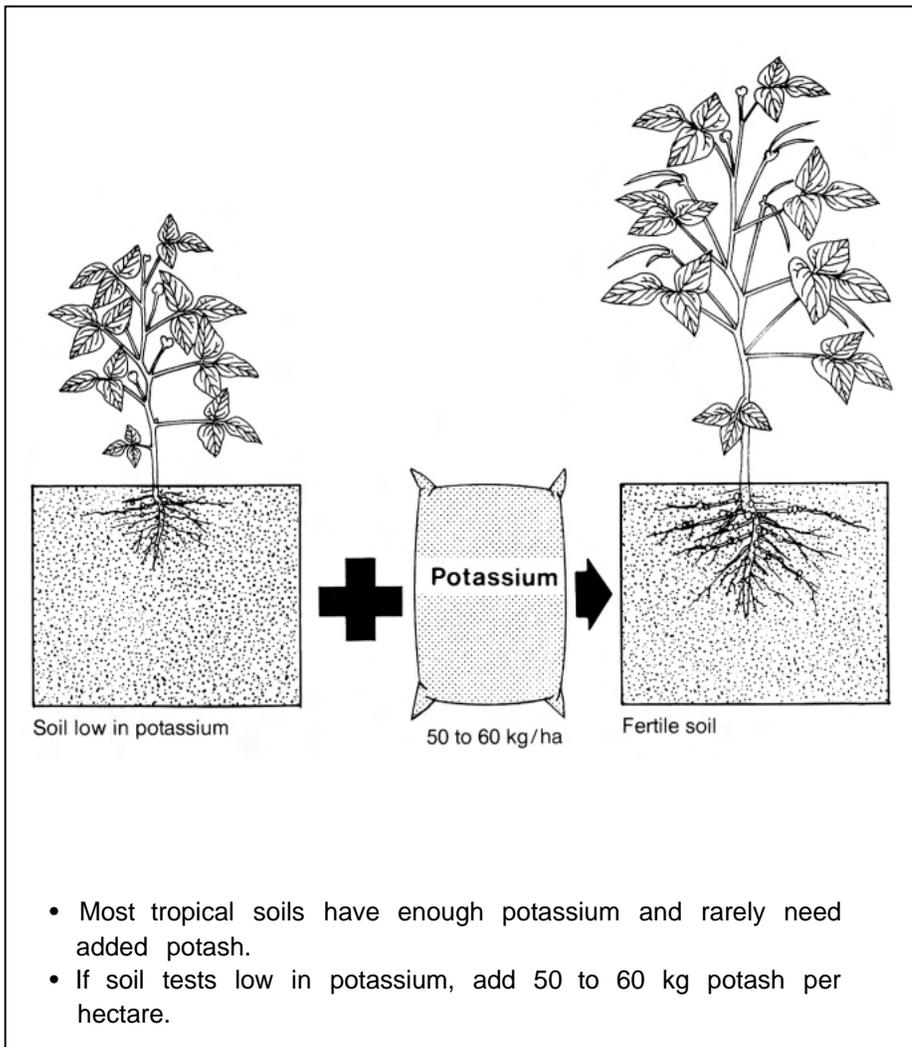
# Fertilizer — phosphorus



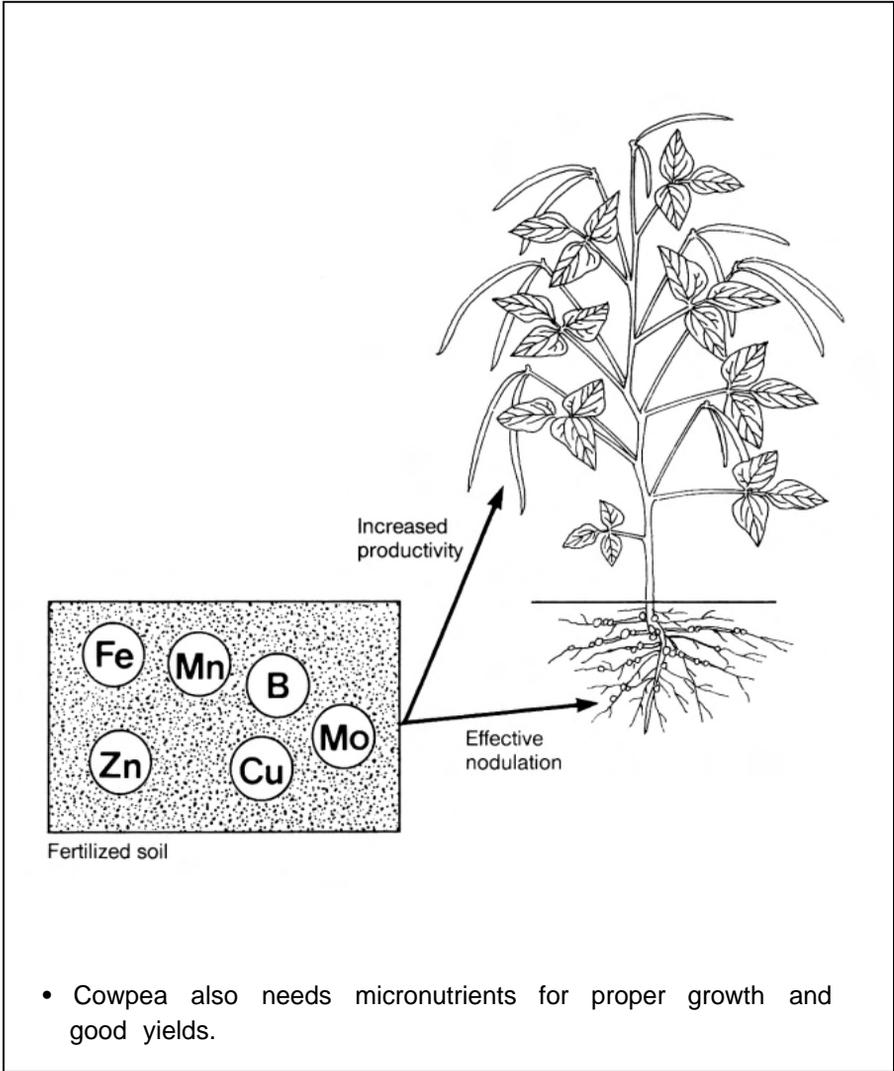
Add 180 kg P/ha

- Phosphorus is needed for good nodulation and nitrogen fixation.
- If soil is low in phosphorus, add 180 kg single super-phosphate at planting time.

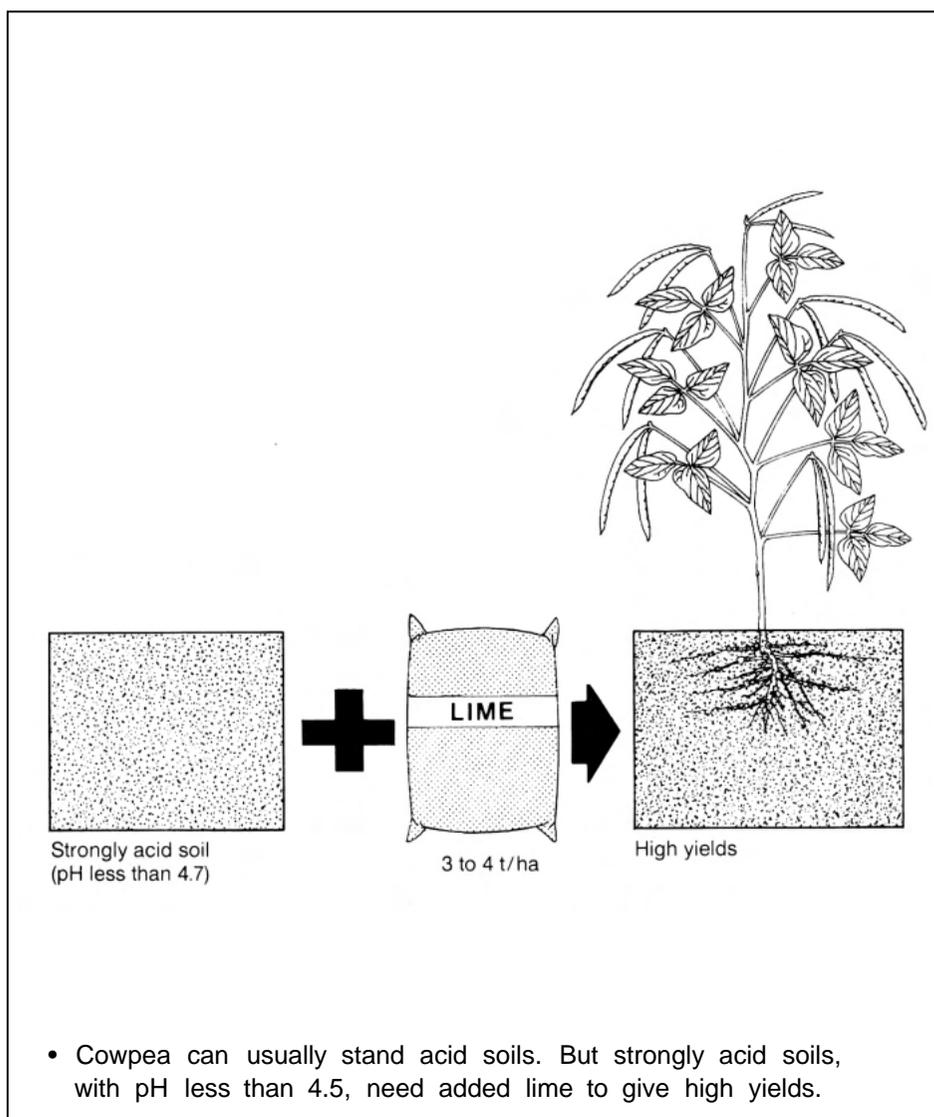
# Fertilizer — potassium



# Fertilizer — micronutrients



# Lime





# Harvesting and storage

When to harvest – vegetable	135
When to harvest – seed	136
When to harvest – fodder	137
Seed drying	138
Threshing	139
Storage	140
Controlling storage pests	141

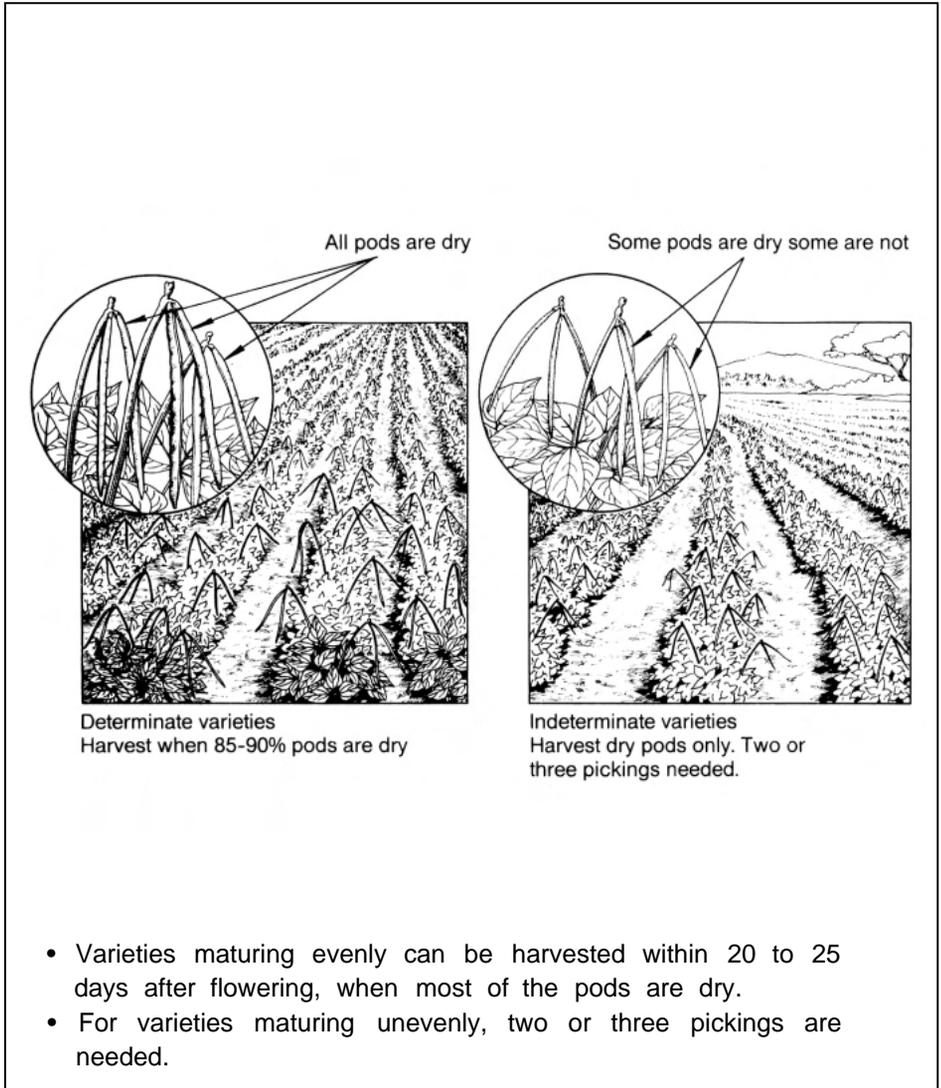


# When to harvest — vegetable

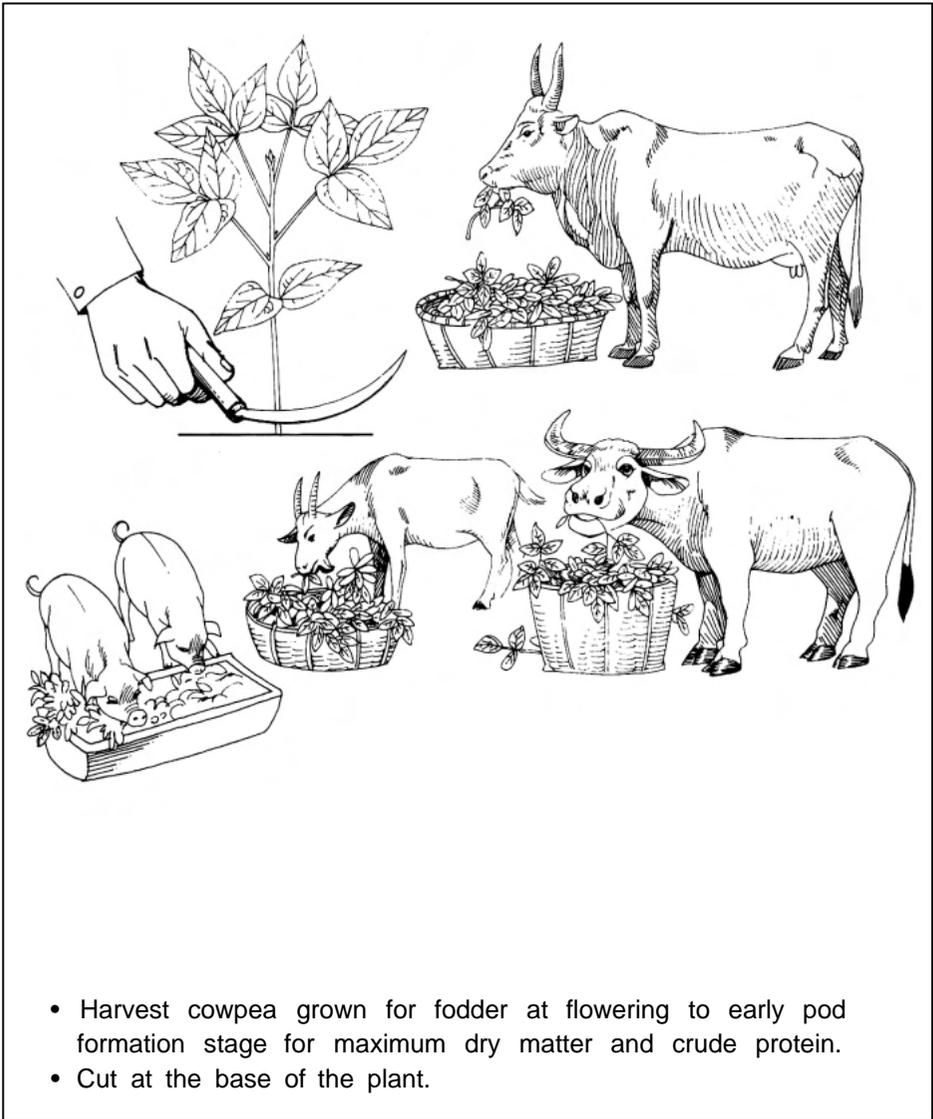


- For use as a green vegetable, hand-pick cowpea pods within 12 to 14 days after flowering, when pods are still tender.
- Pick every 3 or 4 days after that.

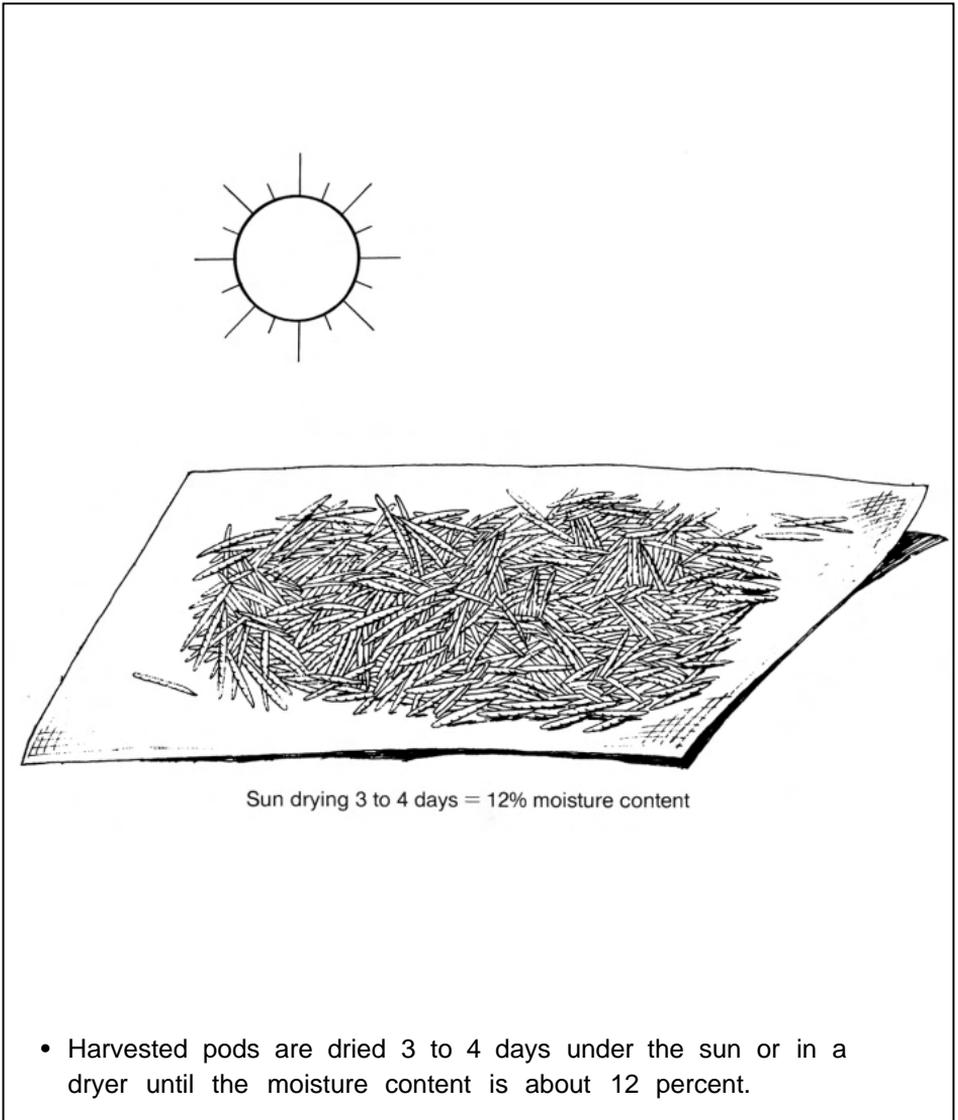
# When to harvest — seed



# When to harvest — fodder



# Seed drying



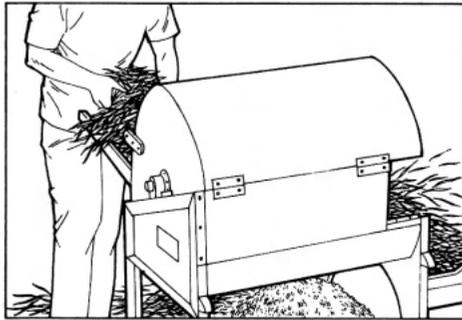
# Threshing



Hand threshing



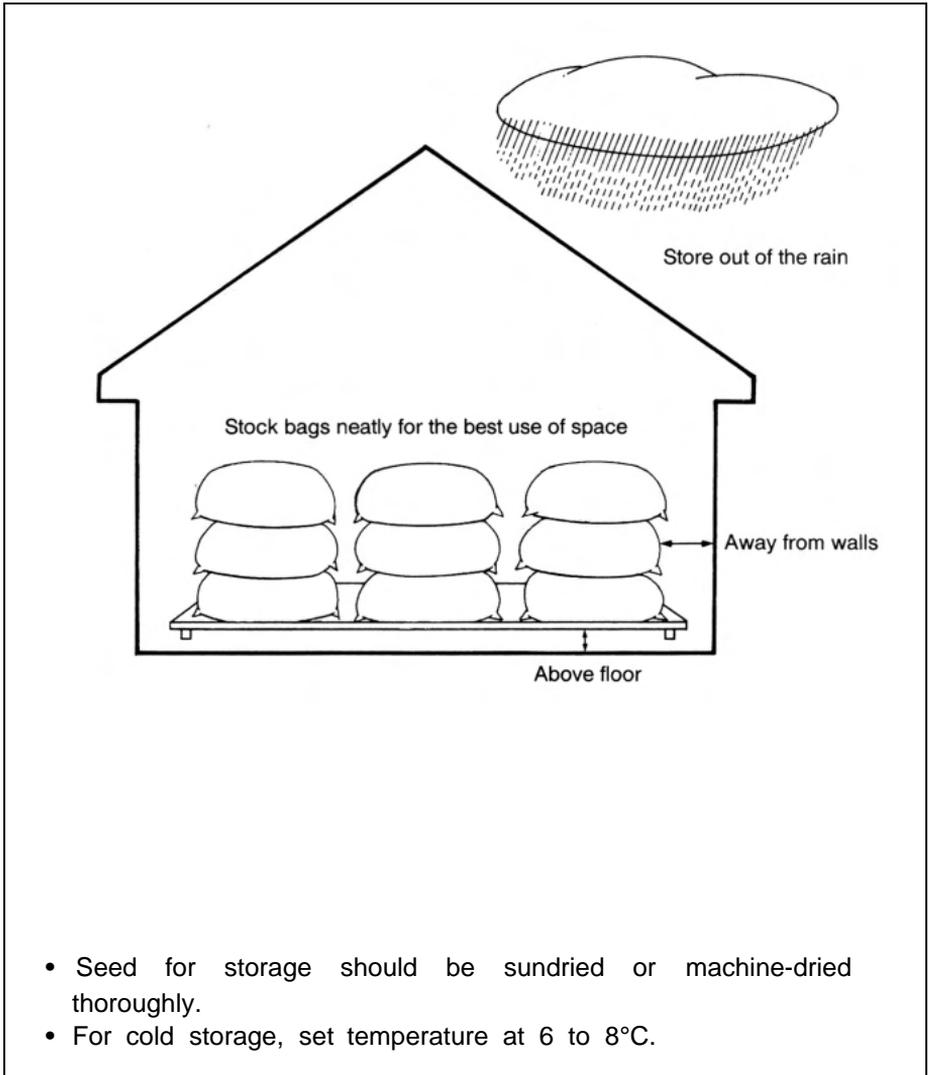
Animal threshing



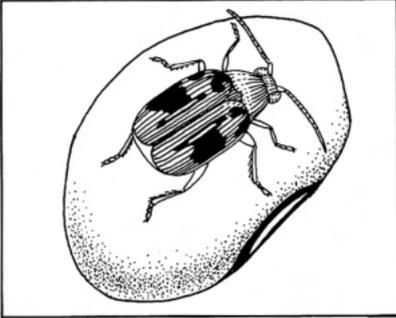
Machine threshing

- Hand-threshing is done by beating with a stick.
- Sometimes cattle may be used to trample dry pods.
- For large-scale production, cowpeas can be machine-threshed.

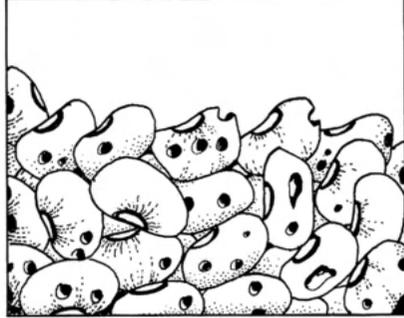
# Storage



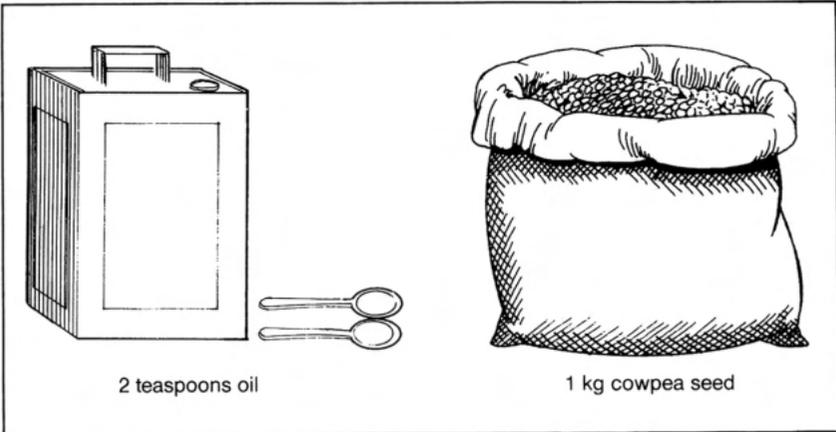
# Controlling storage pests



Bean weevil



Weevil damage



2 teaspoons oil

1 kg cowpea seed

For protection against bean weevil

- The bean weevil can severely damage stored cowpea seed.
- Mix seeds with vegetable oil to protect against this pest.



# **Increasing yields and profits**



# Increasing yields and profits — yield components

Yield components **147**

Yield components – plants per unit area **148**

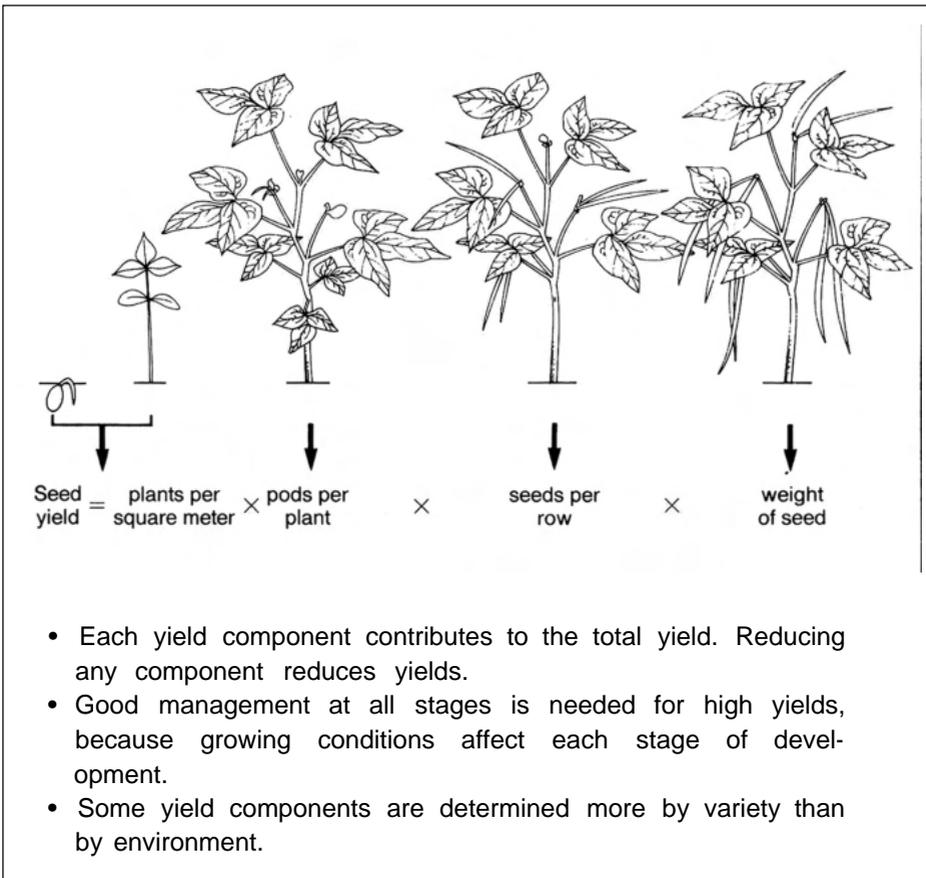
Yield components – pods per plant **149**

Yield components – seeds per pod **150**

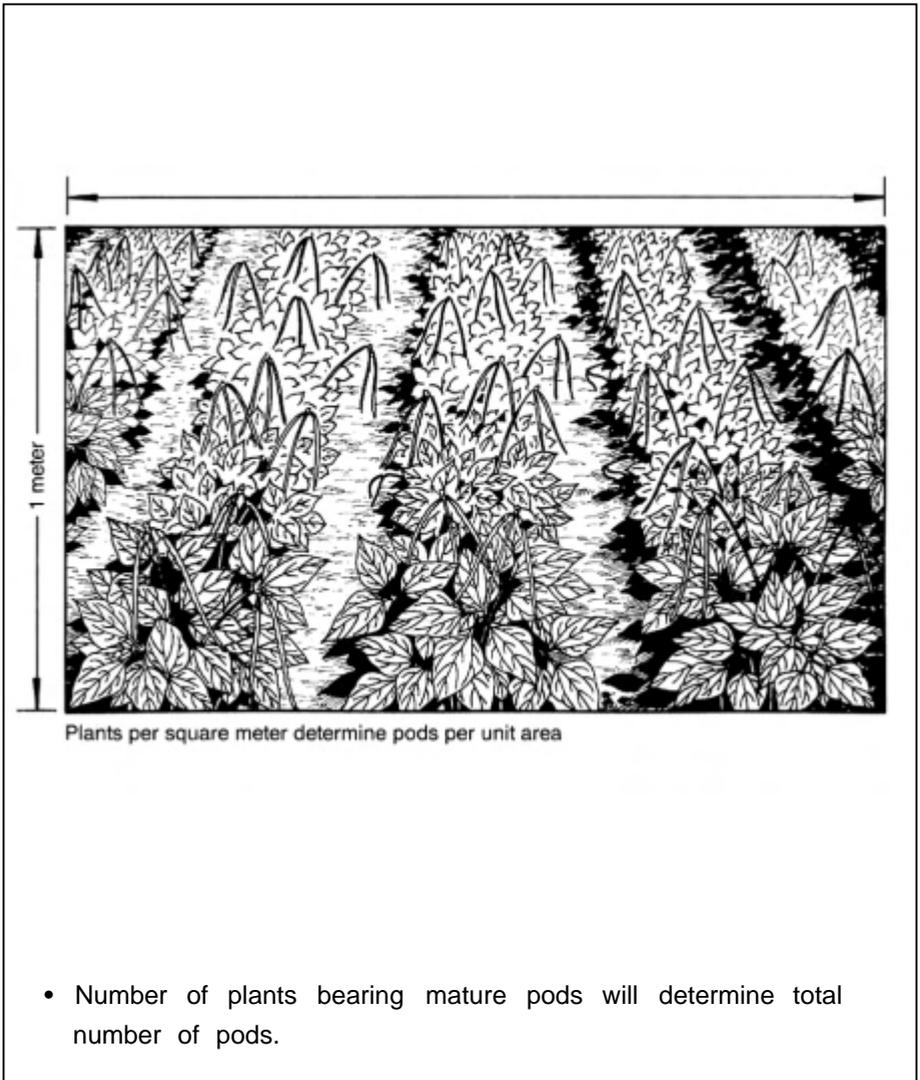
Yield components – seed weight **151**



# Yield components

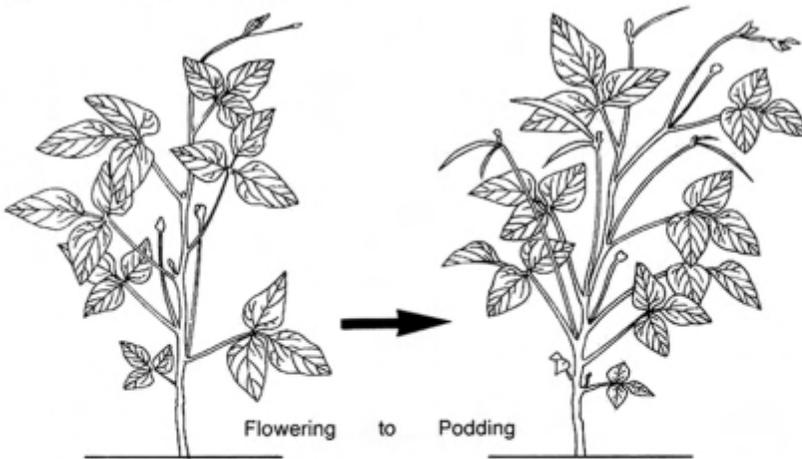


# Yield components — plants per unit area

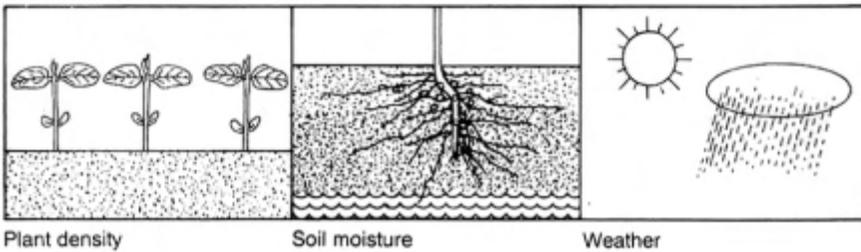


# Yield components — pods per plant

Number of pods per plant is determined from:

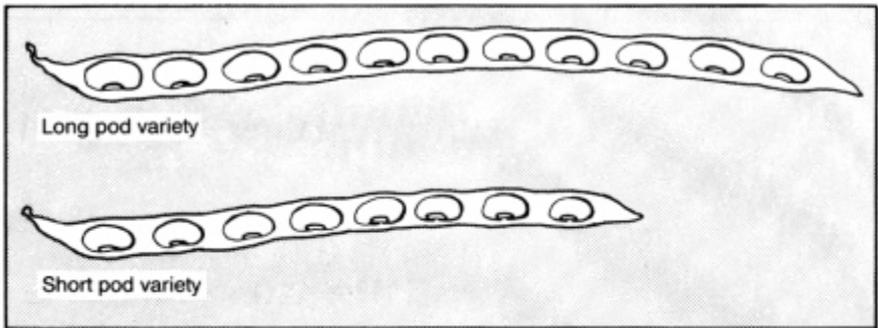


Number of pods that mature depends on:

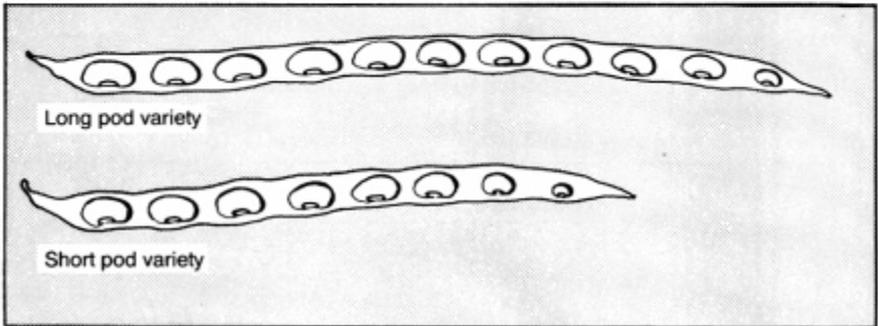


- The number of pods per plant is the most important yield component.
- It is the most affected by growing conditions: plant density, soil moisture, and weather.

# Yield components — seeds per pod



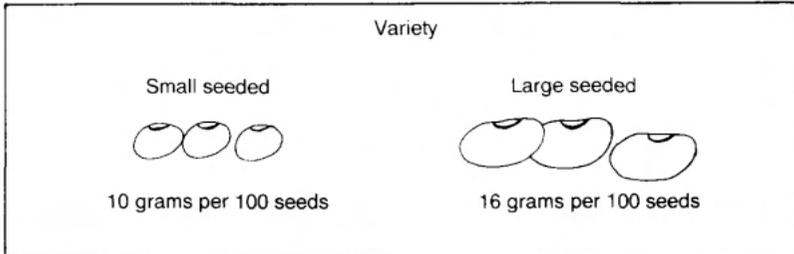
Adequate water and nutrient supply



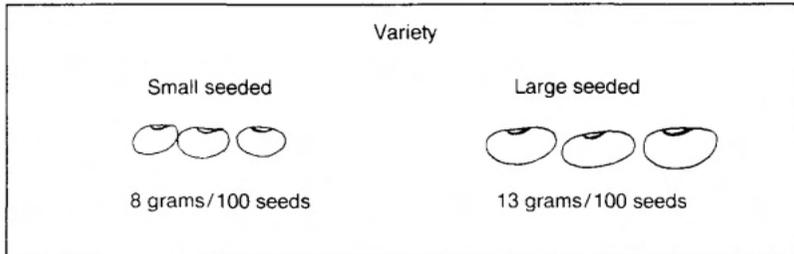
Poor water and nutrient supply

- The number of seeds per pod is determined at flowering, when male pollen cells are transferred to the ovules in the pod.
- Fertilized ovules will develop into seeds.

# Yield components — seed weight



Good soil moisture and nutrient supply ensure proper seed filling



Poor soil moisture and nutrient supply

- Seed weight is determined during pod filling.
- It depends on variety, soil moisture, and nutrient supply.



# Increasing yields and profits — production factors

Production factors **155**

Making the most of soil moisture — tillage and planting time **156**

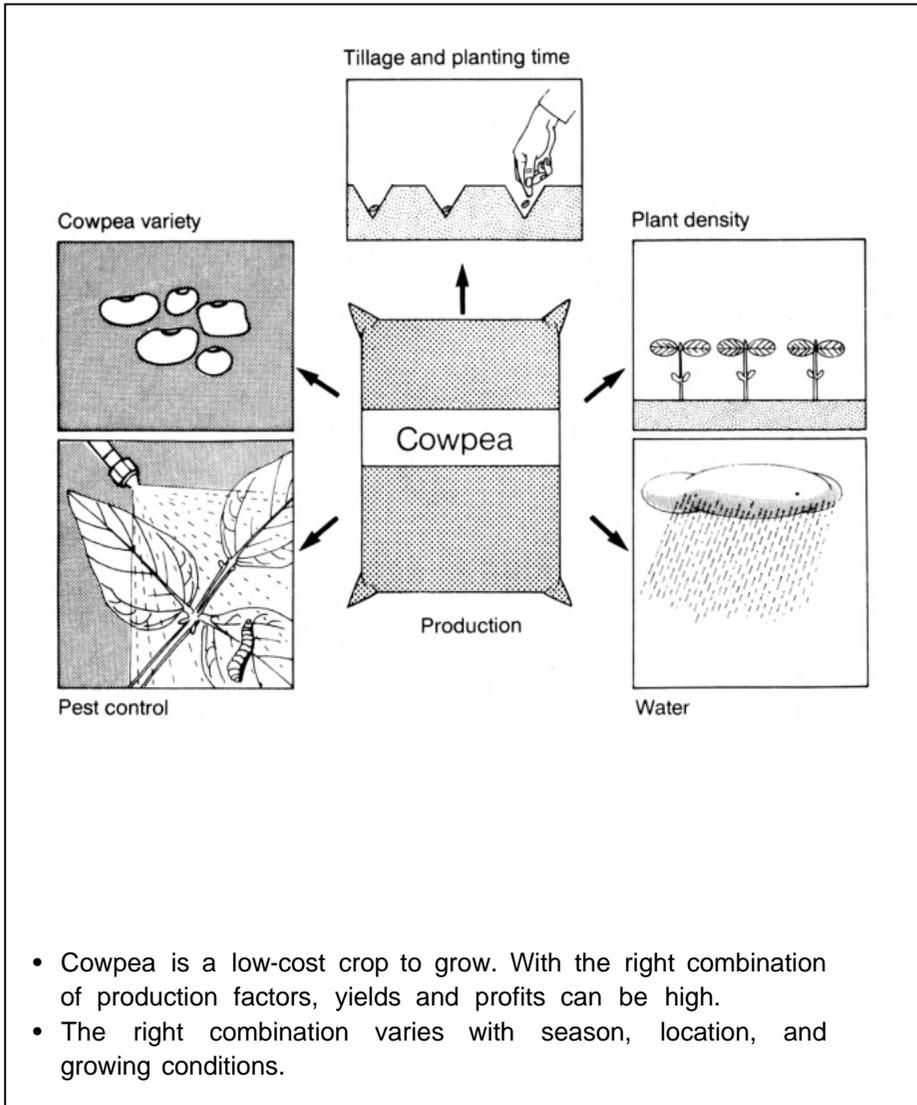
Making the most of soil moisture — variety **157**

Making the most of soil moisture — fertilizing and weeding **158**

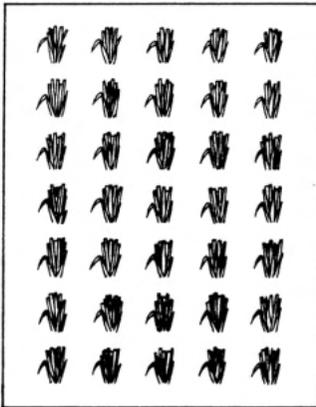
Increasing yields — using irrigation **159**



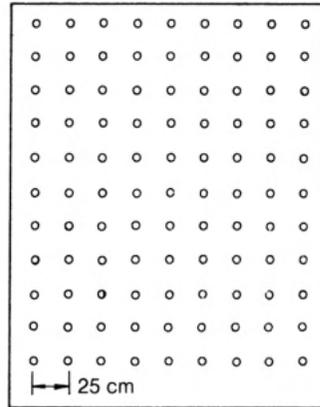
# Production factors



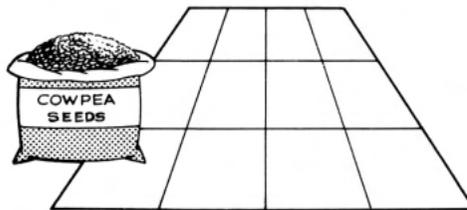
# Making the most of soil moisture — tillage and planting time



Use zero tillage



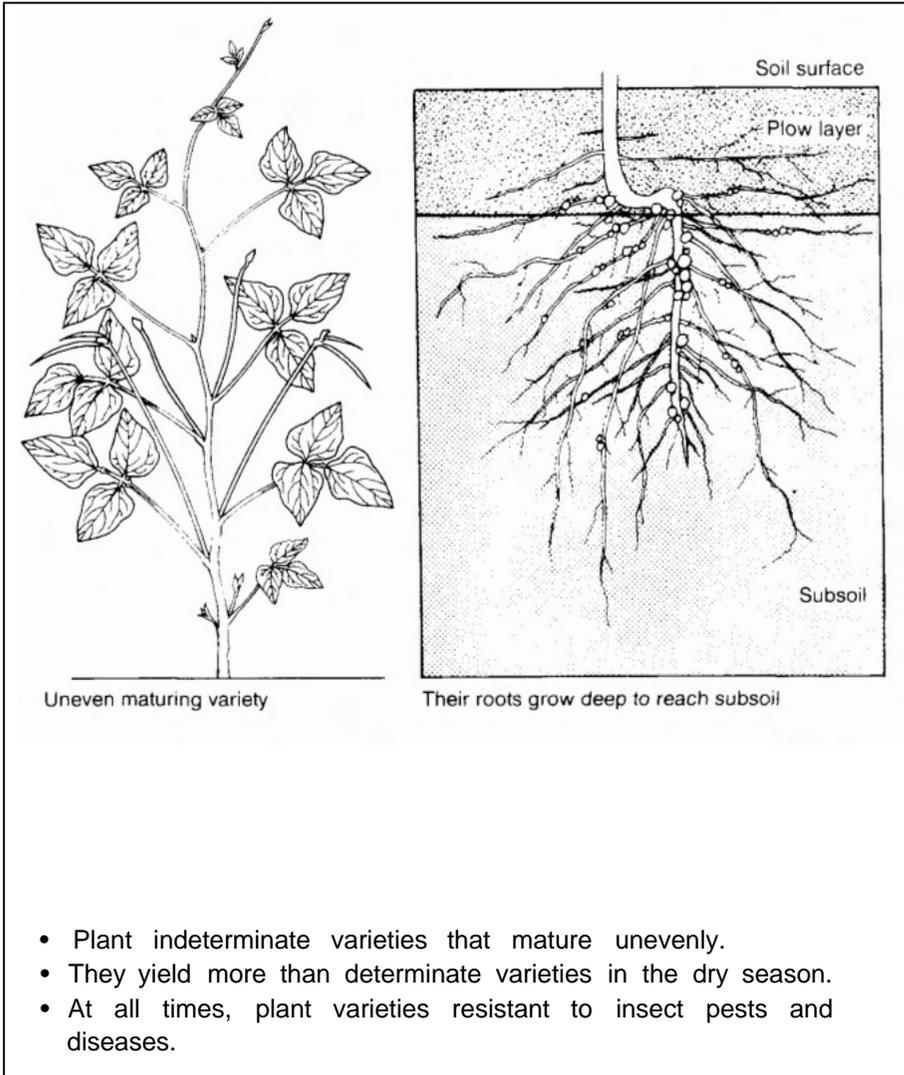
Use narrow rows



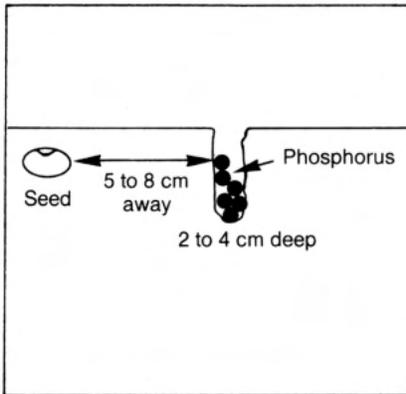
Use 40 kg seed/ha

- In rainfed crops, making the best use of soil moisture is the key to high yields.
- Plant the cowpea crop at once after the rice harvest. Or plant as a relay crop in standing rice 10 days before harvest.
- Use zero tillage and narrow spacing between rows. High tillage and wide row spacing dry out the soil.

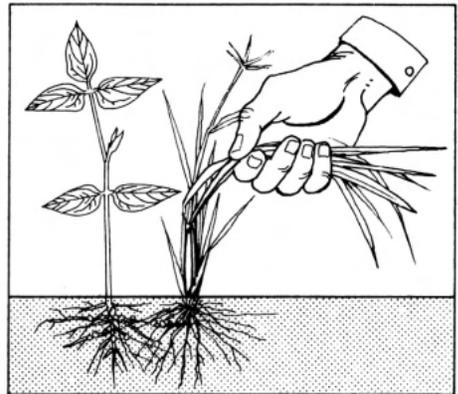
# Making the most of soil moisture — variety



# Making the most of soil moisture — fertilizing and weeding



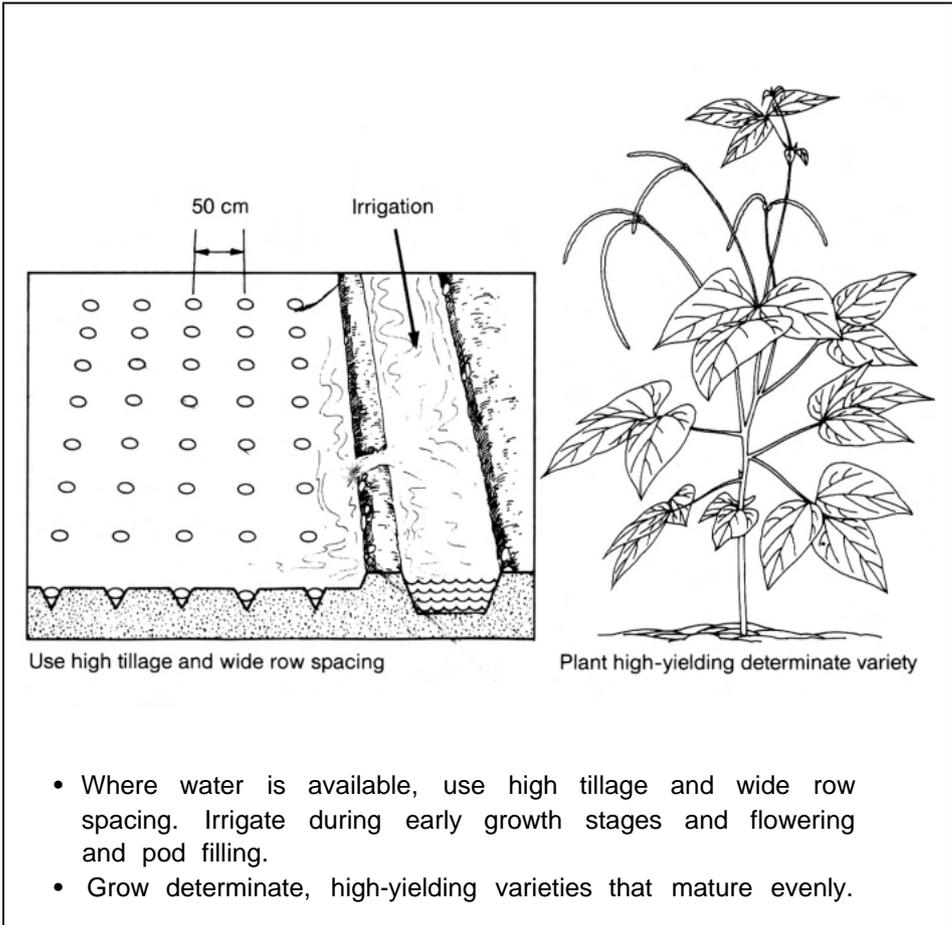
Add 180 kg of single superphosphate at planting time



Remove weeds that steal crop nutrients

- Add phosphorus at planting time for good nodule growth and nitrogen fixing.
- Weed at least twice during the first 40 days.

# Increasing yields — using irrigation



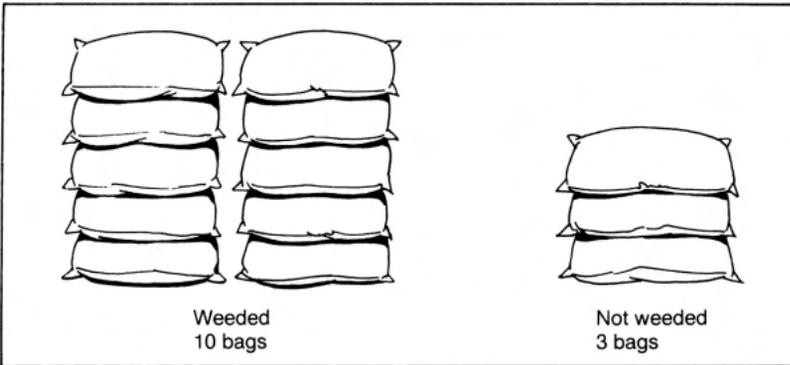


# Yield reducers — weeds

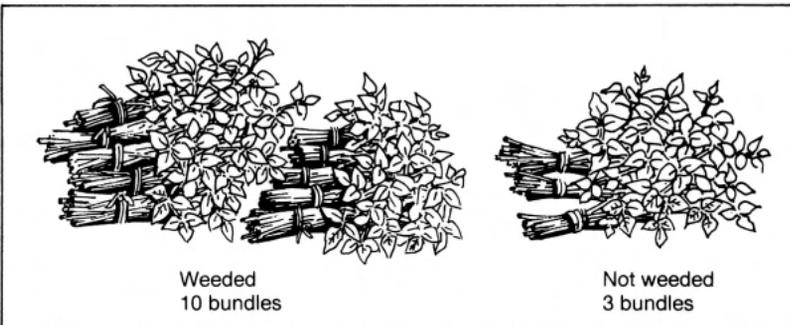
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# Yield loss to weeds



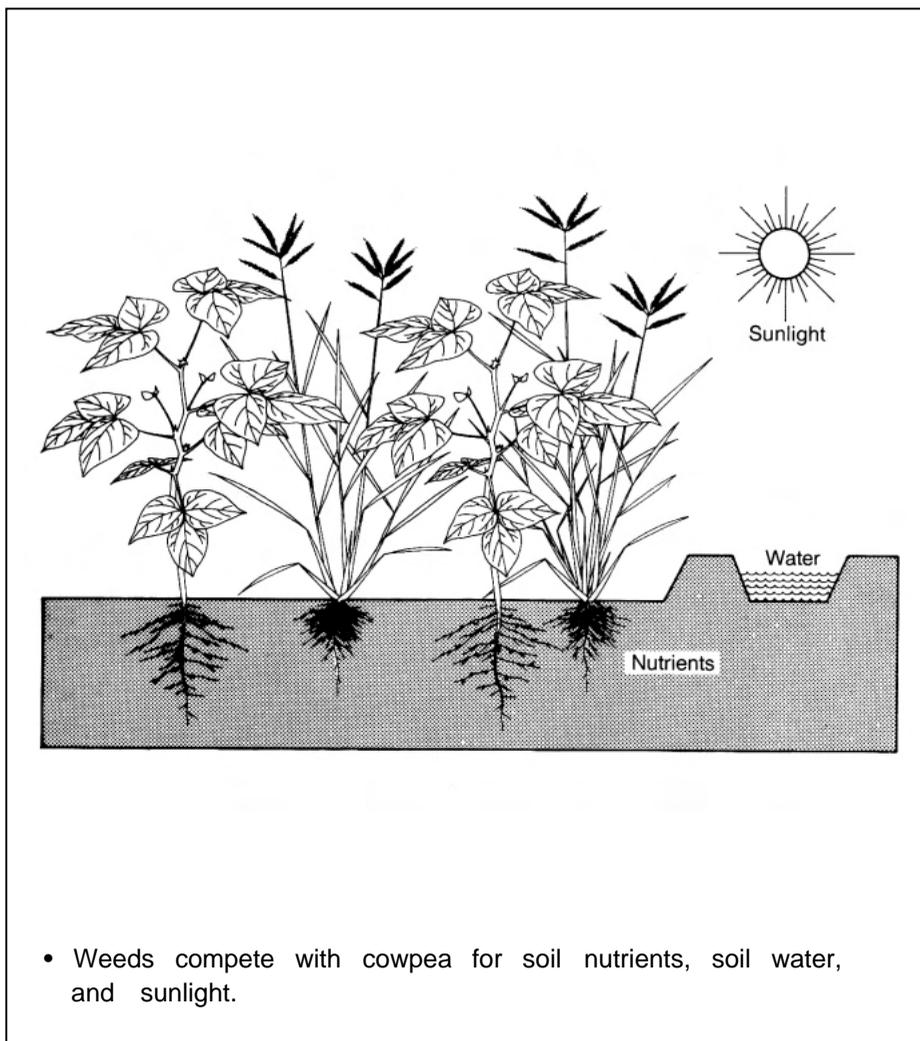
Seed yield



Fodder yield

- Uncontrolled weeds may reduce cowpea yields by 60 to 70 percent. Seed yields may come down from 1000 to 300 kg per hectare. Fodder yields may come down from 10 tons to 3 tons per hectare.

# Weeds compete with cowpea



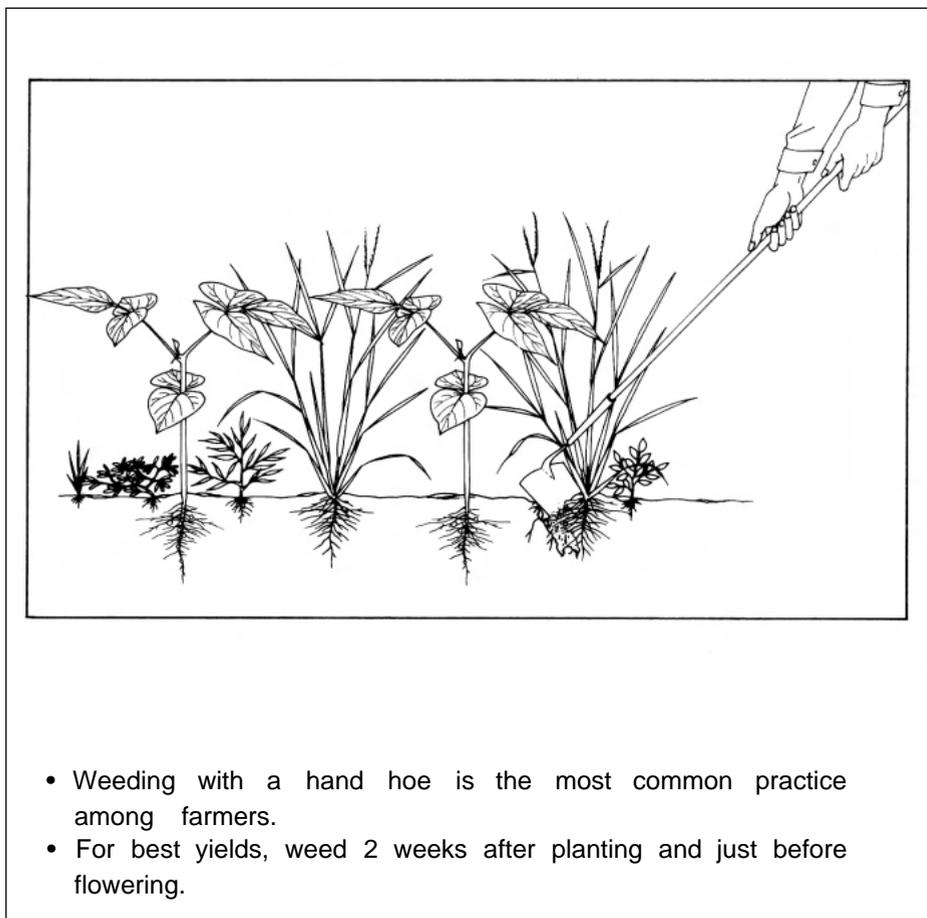
# Weeds affect seedling growth



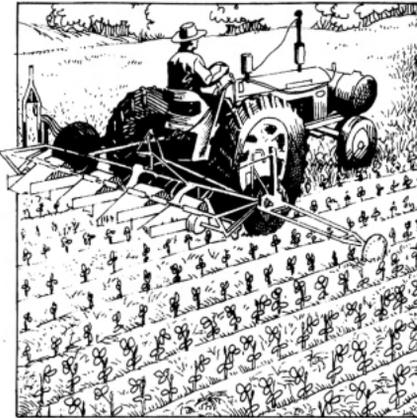
Weeds harm most from emergence to 40 days later

- Weeds do most harm in the first 40 days after planting.
- After the crop has flowered, weeds are not as damaging as at early stages.

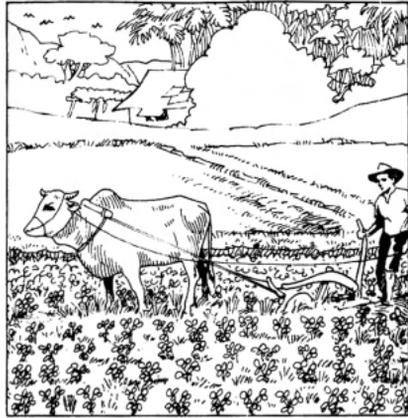
# Controlling weeds — by handweeding



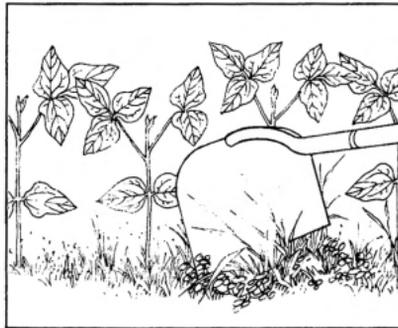
# Controlling weeds — using cultural practices



Tractor



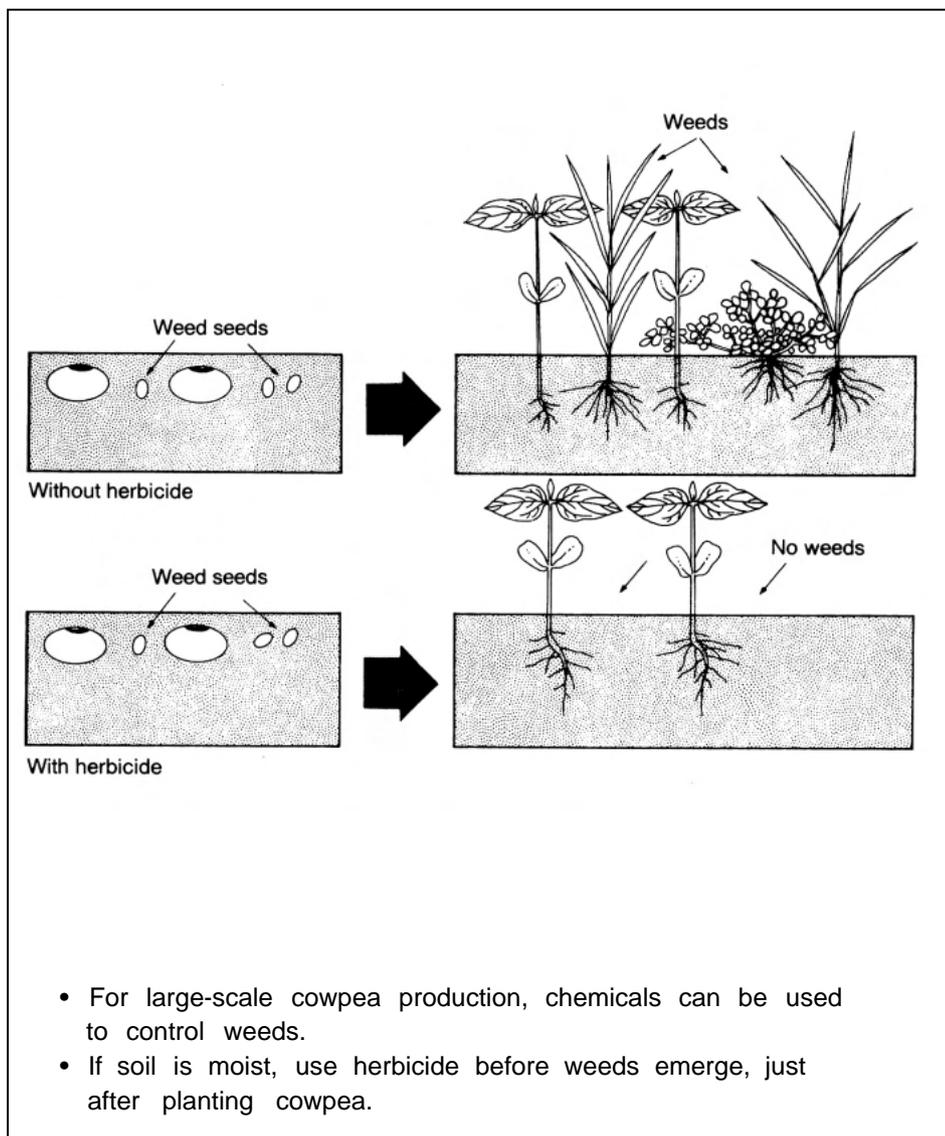
Animal-drawn desi plow



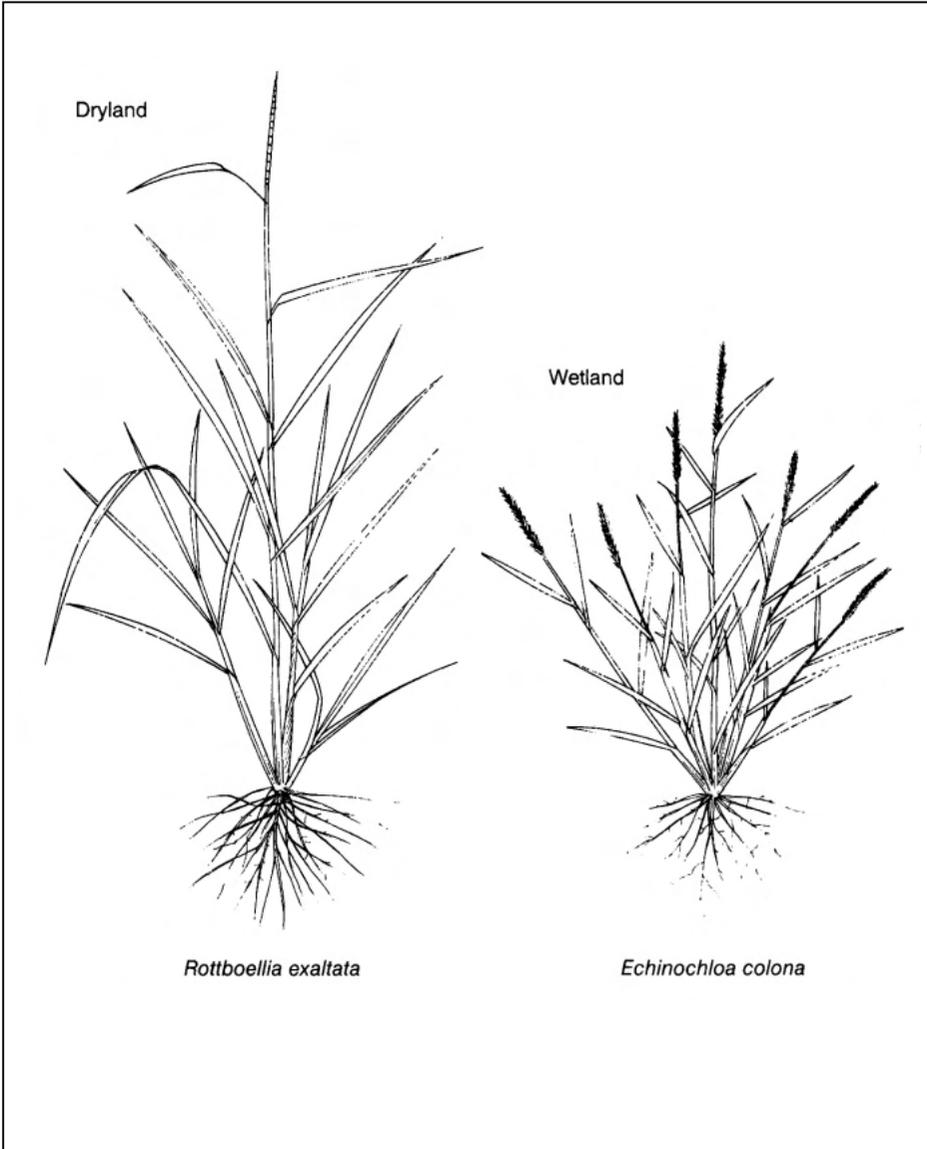
Hoe

- Two or three intercultivations with a hoe or animal-drawn tool or a tractor will control cowpea weeds.
- Close plant spacing keeps down weeds.

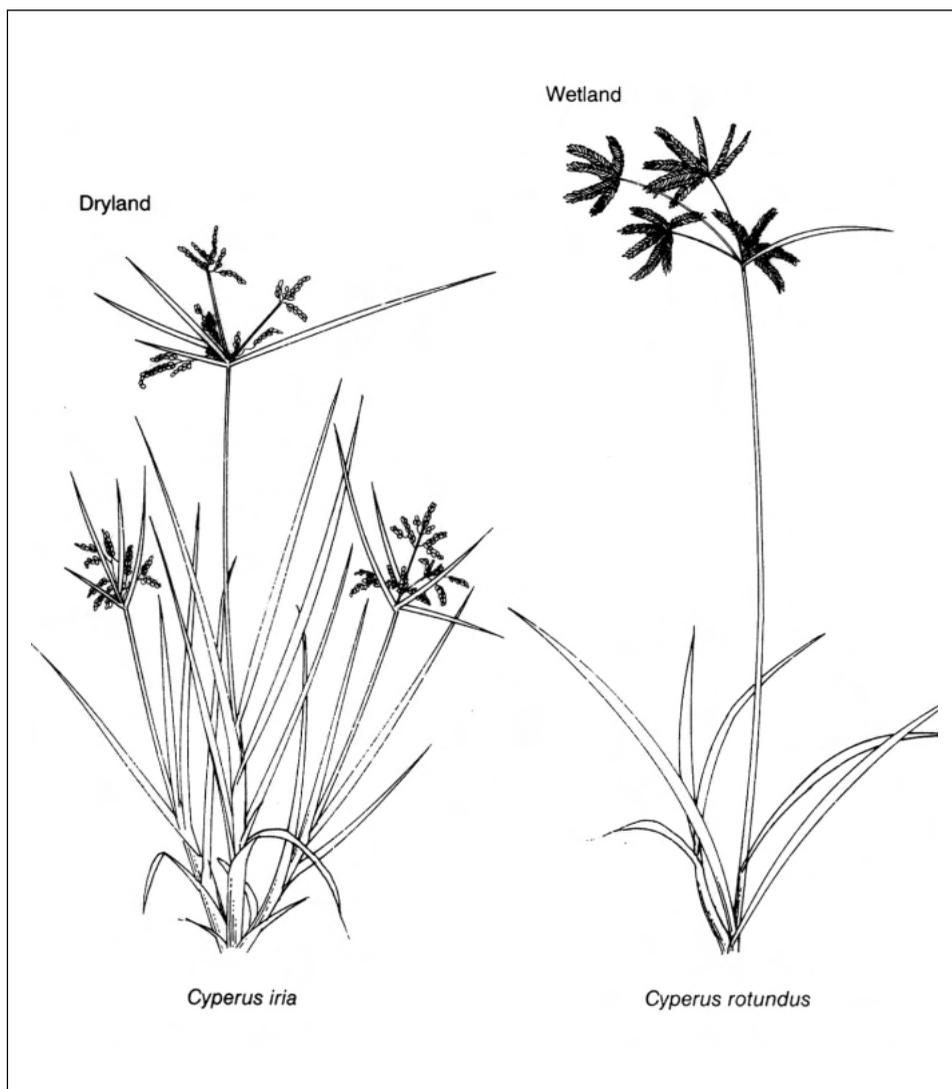
# Controlling weeds — using herbicides



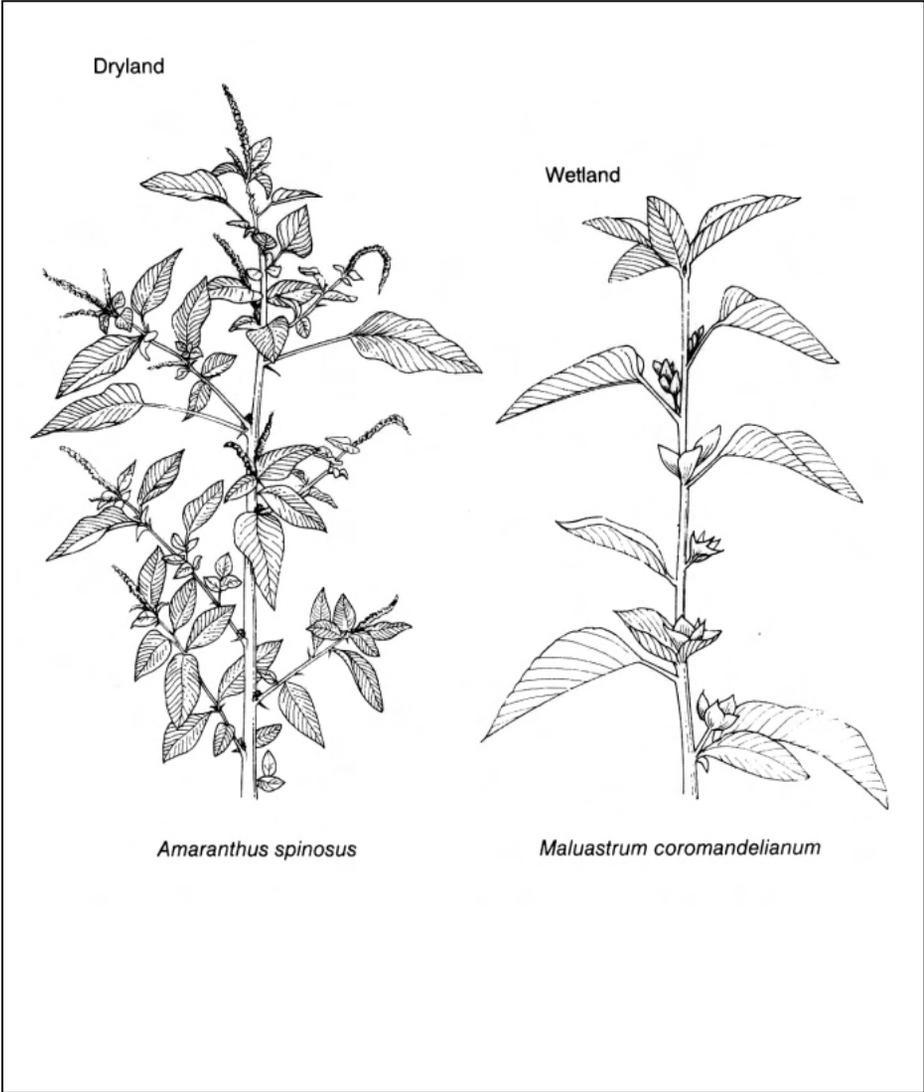
# Common cowpea weeds — grasses



# Common cowpea weeds — sedges



# Common cowpea weeds — broadleaf weeds



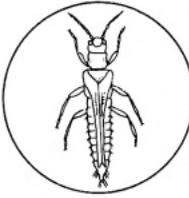


# Yield reducers — insect pests

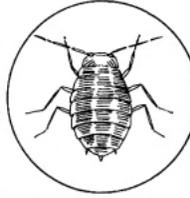
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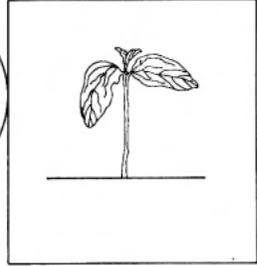
# Yield loss to insect pests



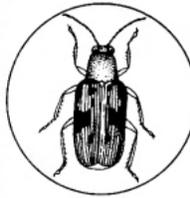
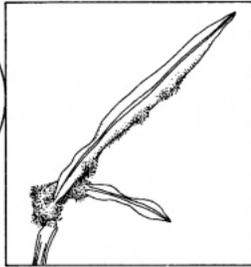
Thrips



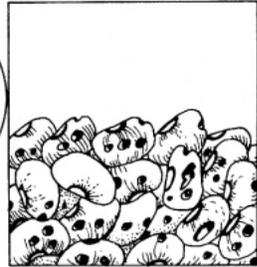
Aphid



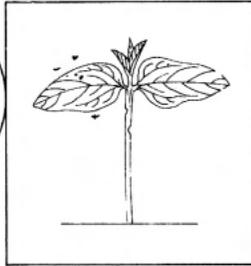
Pod borer



Bean weevil



Beanfly

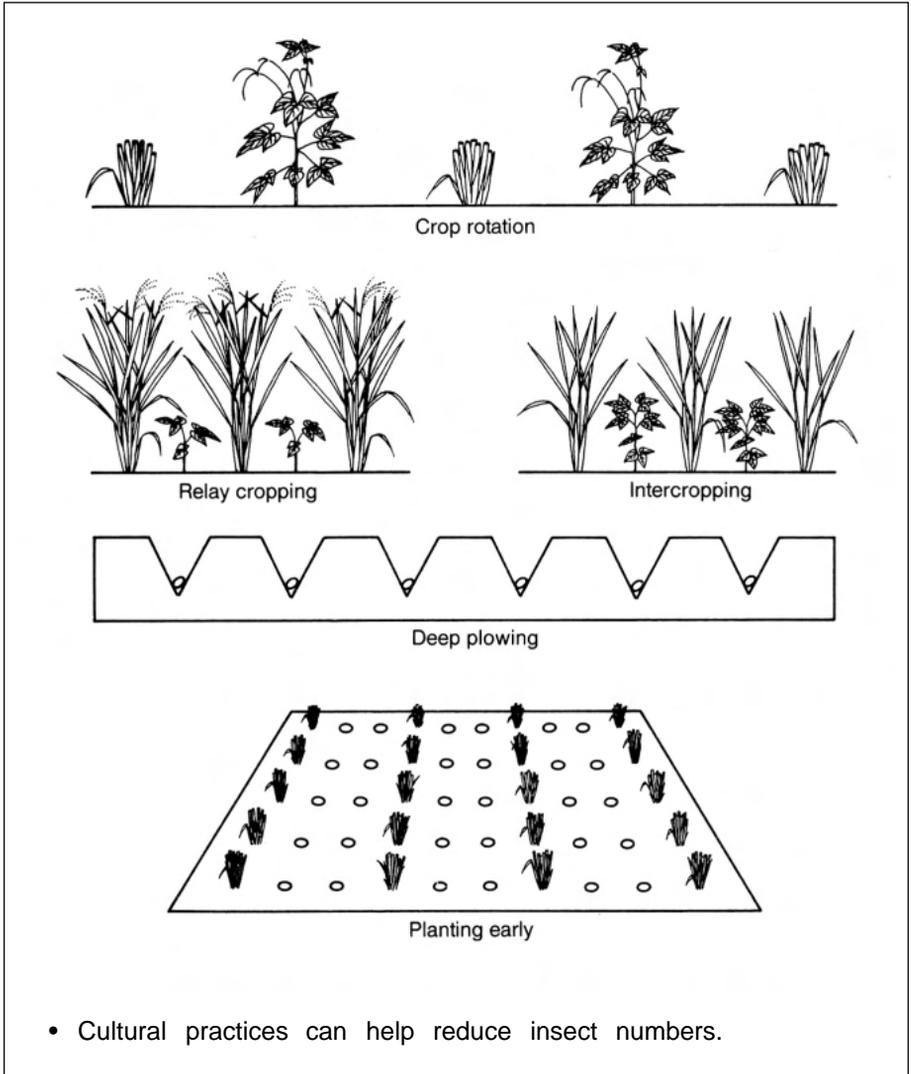


Cowpea seed moth



- Insect pests are a serious threat to the cowpea crop. They can attack all parts of the plant at all stages of growth.
- Uncontrolled insects can destroy the crop.

# Controlling pests — using cultural practices

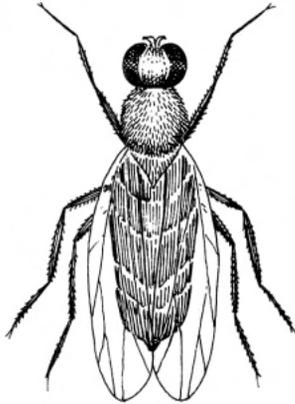


# Controlling pests — using insecticides

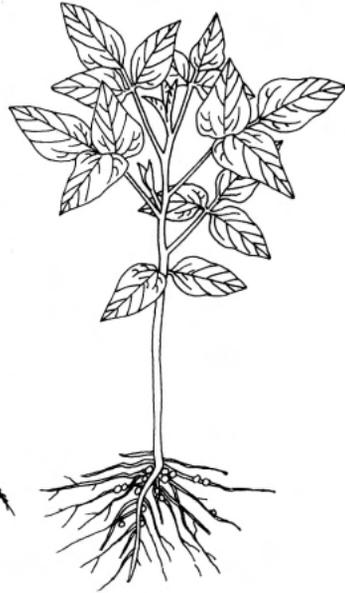
All insecticides do not kill all insects. Choose the right one for the pest damaging your crop.



Insecticide



Pest



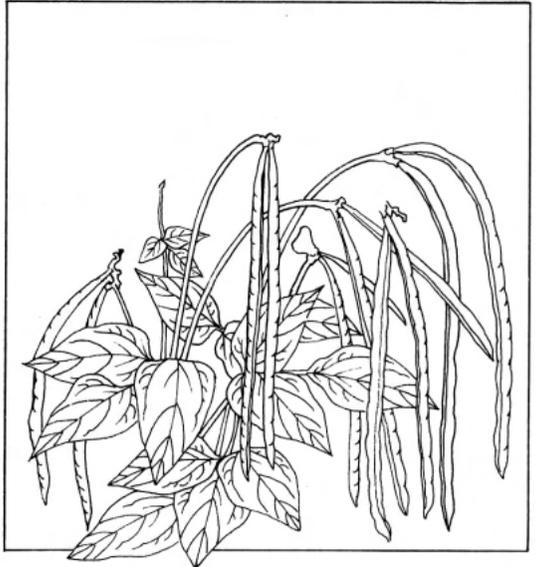
Crop

- Chemical insecticides effectively control many cowpea insects. Apply chemicals only as directed.
- Sprays are most needed at
  - 2 days after emergence
  - 12 days after emergence
  - flowering
  - 10 days later.

# Controlling pests — planting resistant varieties



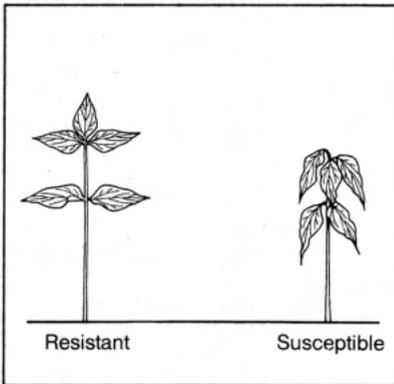
Not resistant



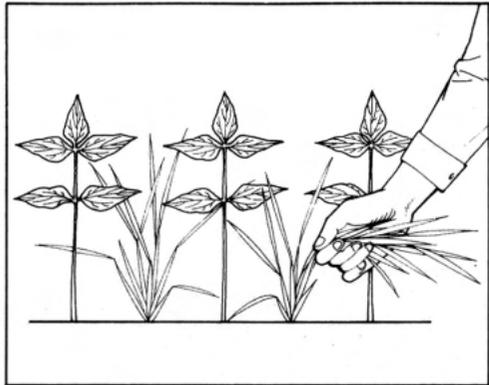
Resistant

- Some cowpea varieties resist pest damage better than others.
- Planting resistant varieties is a low-cost way of reducing insect damage.

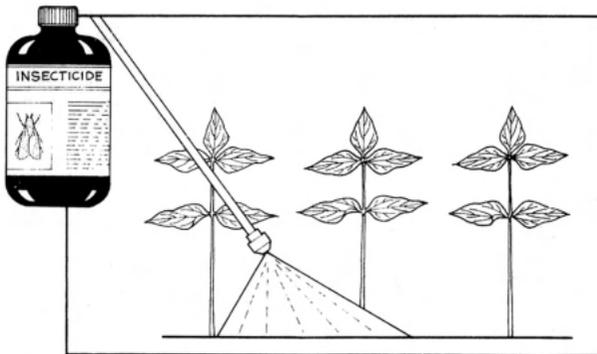
# Combining pest control methods



Plant resistant varieties



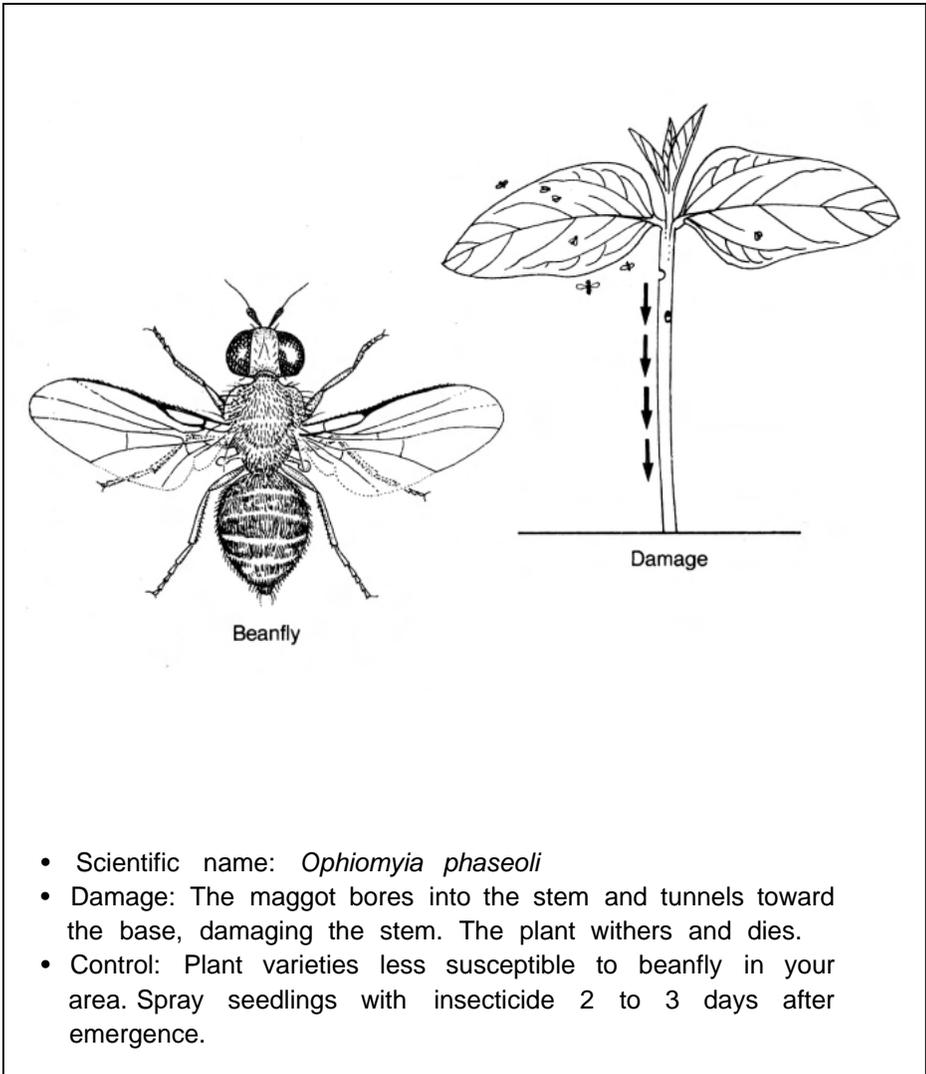
Use proper cultural practices



Spray with insecticides

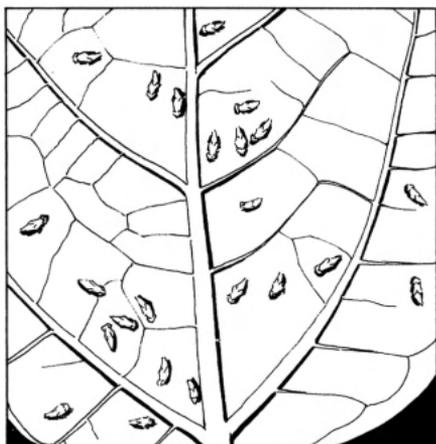
- Several pest control methods can be combined:
  - using proper cultural practices
  - spraying the right insecticides at the right times
  - planting varieties that resist pest damage.

# Common insect pests of cowpea — at seedling stage



- Scientific name: *Ophiomyia phaseoli*
- Damage: The maggot bores into the stem and tunnels toward the base, damaging the stem. The plant withers and dies.
- Control: Plant varieties less susceptible to beanfly in your area. Spray seedlings with insecticide 2 to 3 days after emergence.

# At preflowering stage



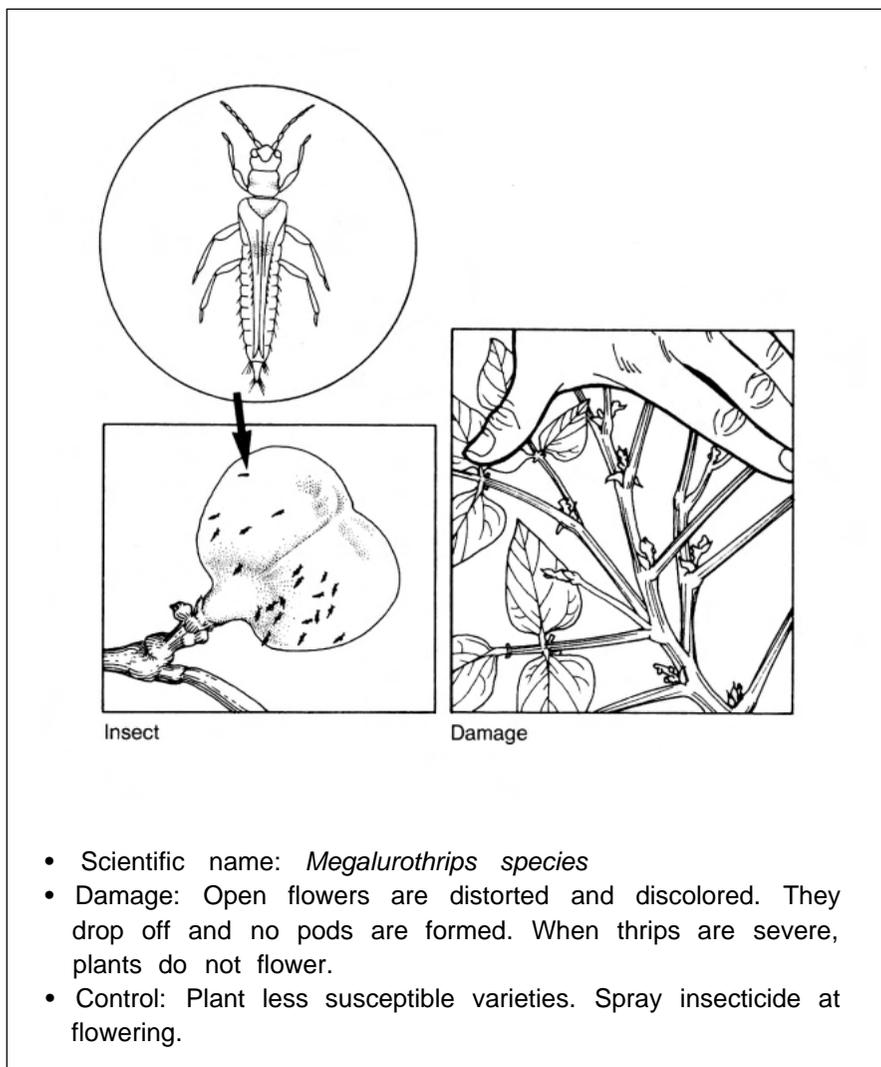
Insect



Damage

- Scientific name: *Empoasca* species
- Damage: Leaf turns yellow at veins and margins, then curls into a cup.
- Control: Plant varieties less susceptible to leafhopper damage in your area. Spray insecticide at preflowering stage, if needed.

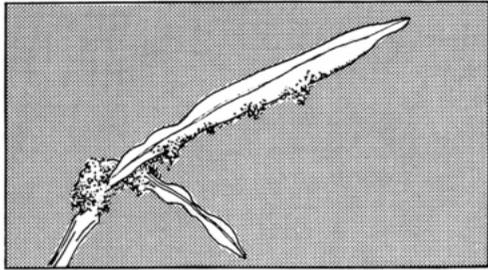
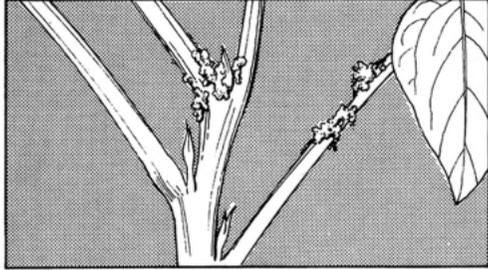
# At flowering



# At pod formation



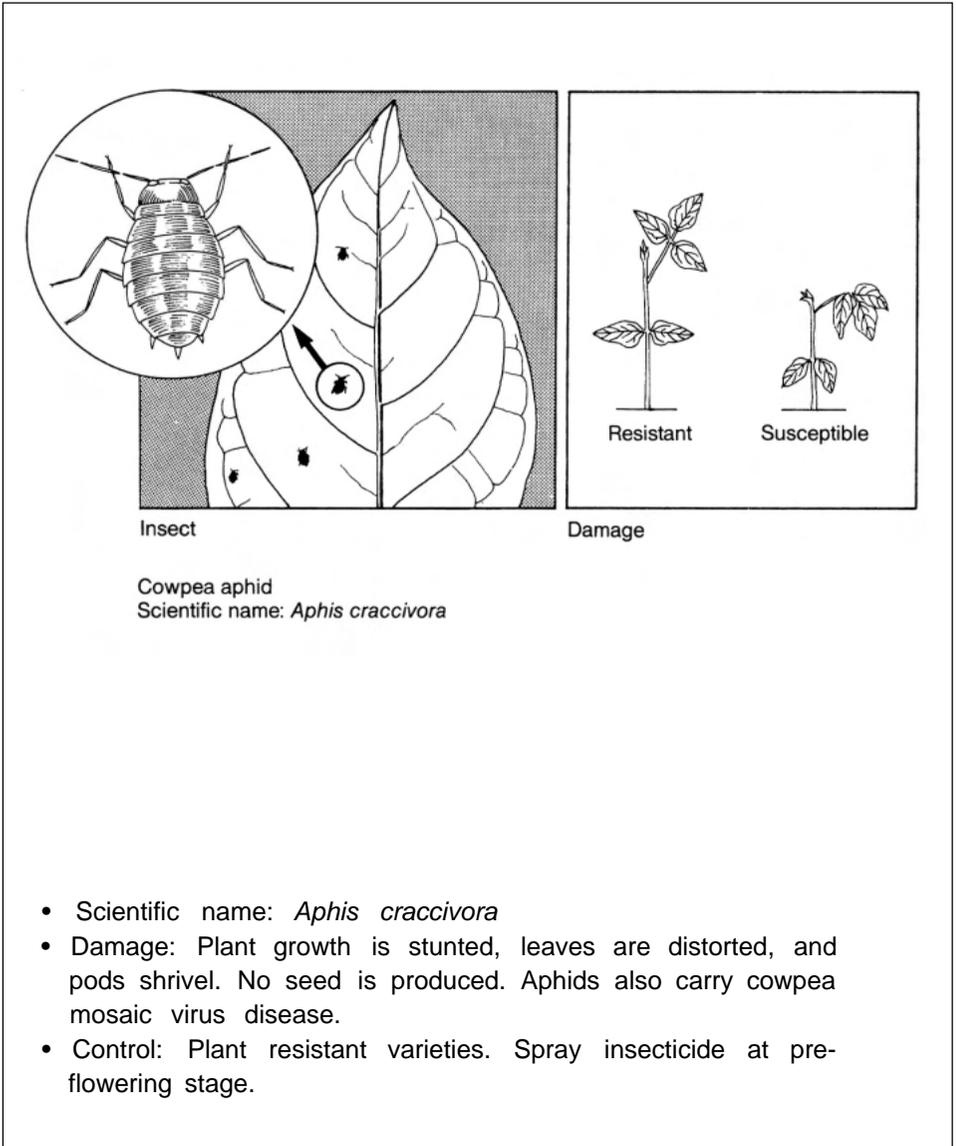
Insect



Damage

- Scientific name: *Maruca testulalis*
- Damage: Larva eats through leaves, flowers, and pods, leaving webbing and frass on them. Seeds do not fill.
- Control: Plant resistant varieties. Spray insecticide 10 days after flowering begins.

# Preflowering to pod filling

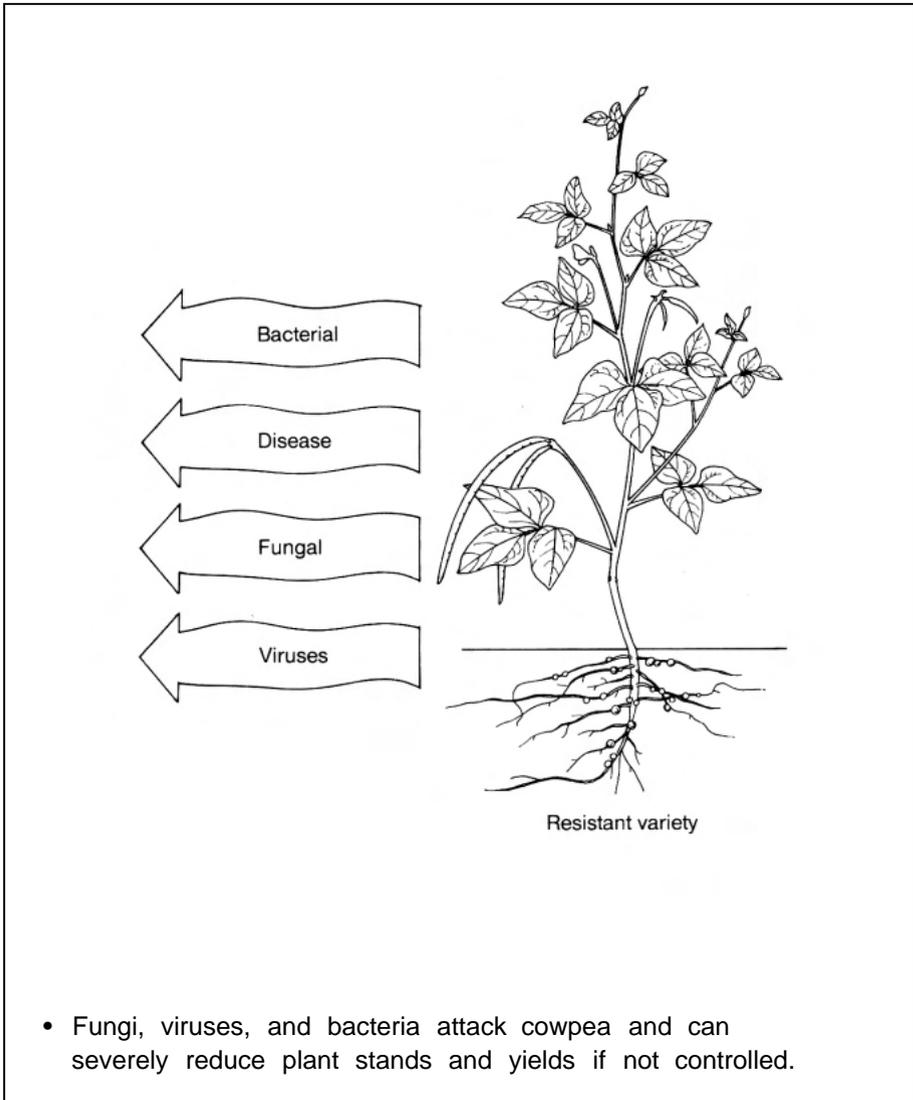


# Yield reducers — diseases

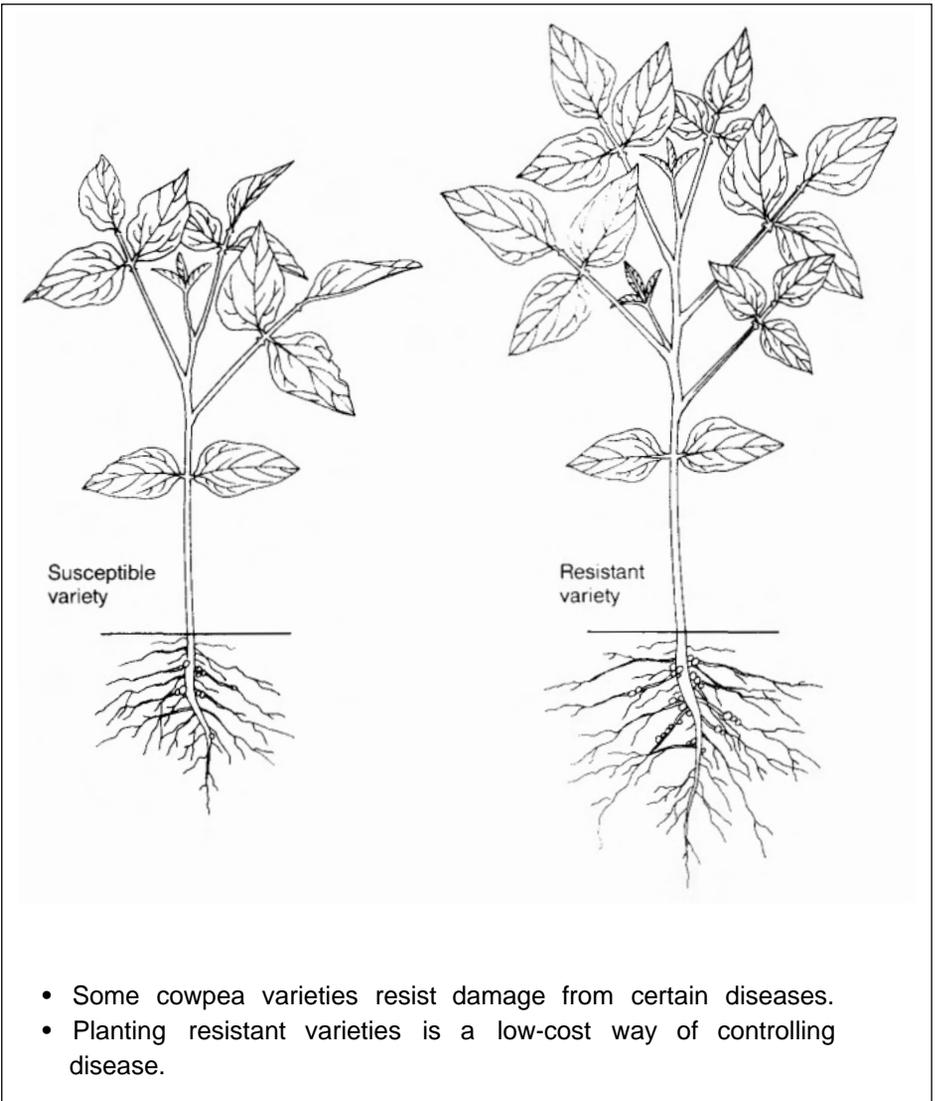
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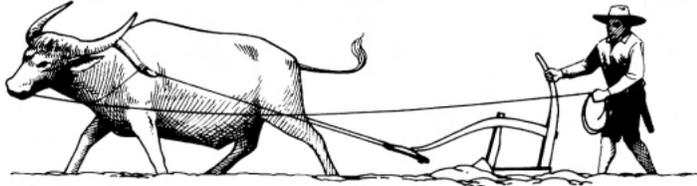
# Yield loss to diseases



# Controlling diseases — planting resistant varieties



# Controlling diseases — using cultural practices



Deep plowing



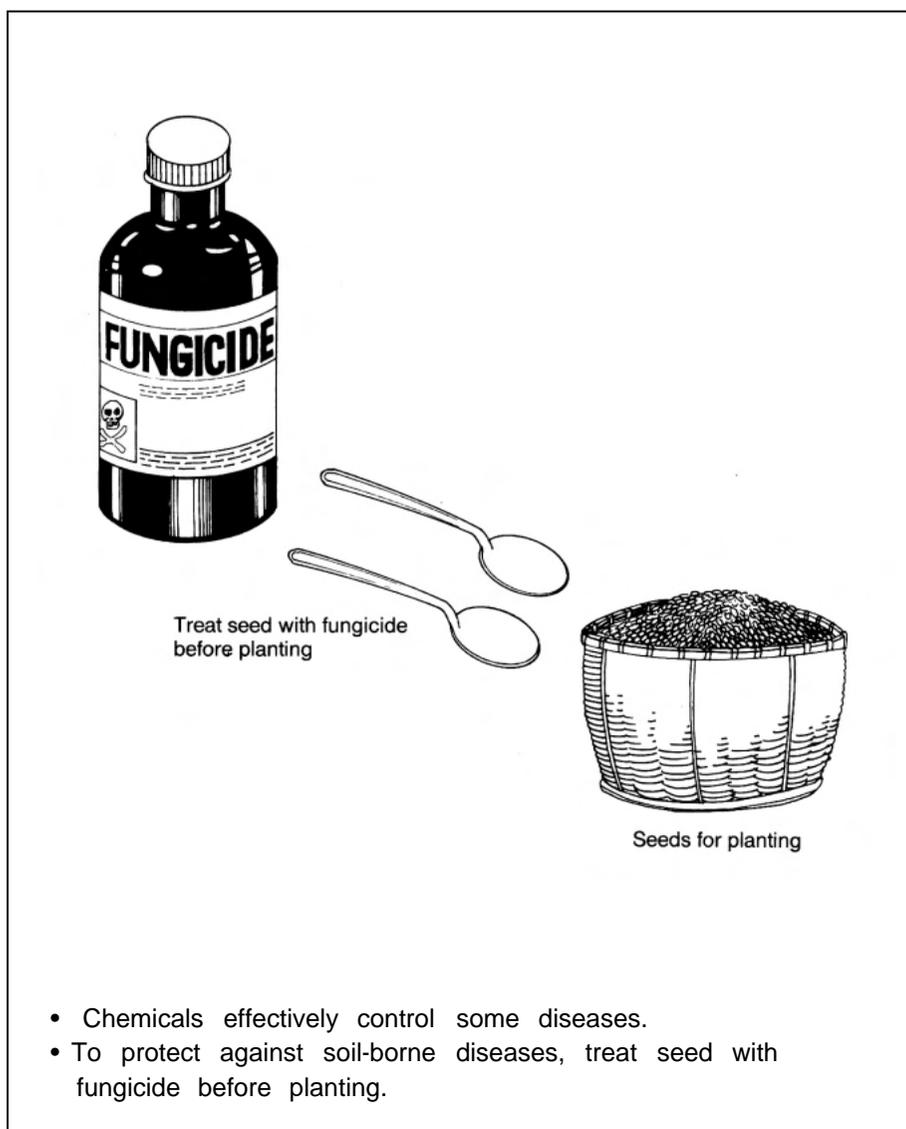
Intercropping



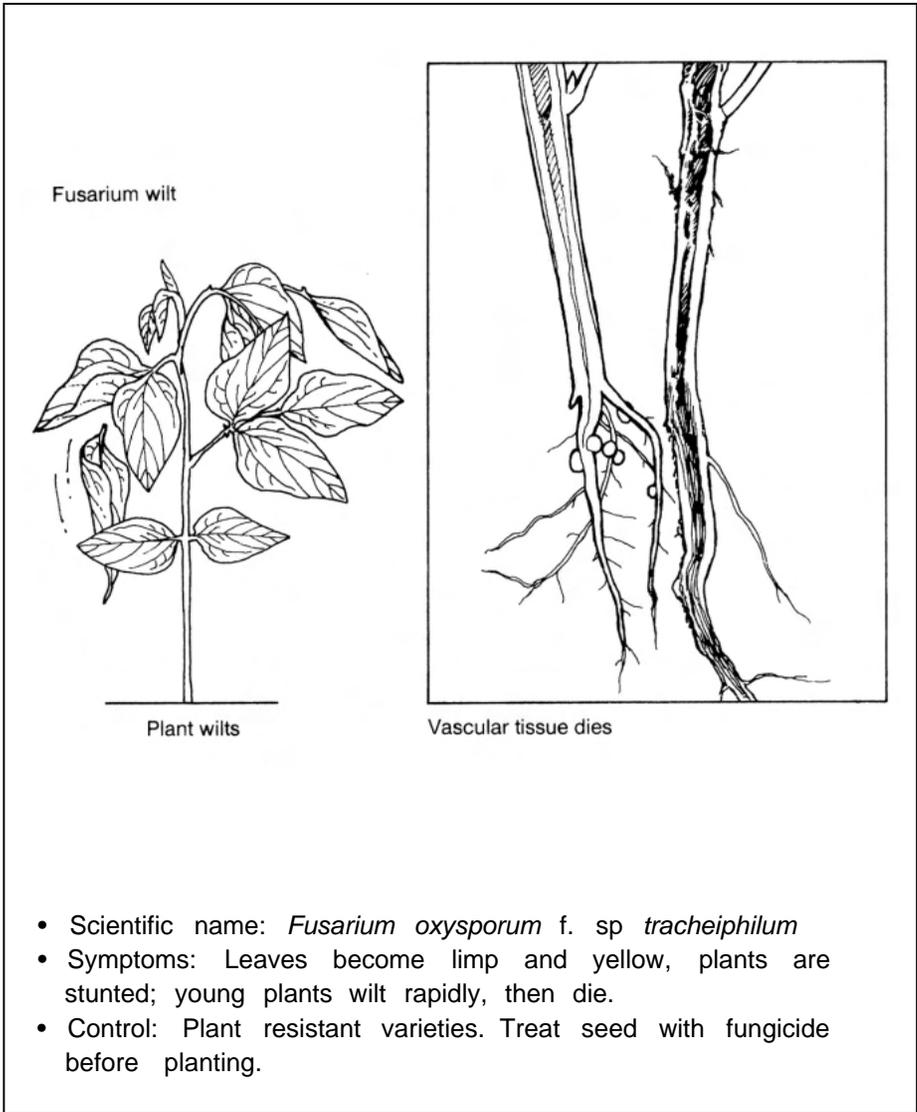
Crop rotation

- Use cultural practices such as plowing, crop rotation, and intercropping to control diseases.
- Destroy crop residue because it may shelter and spread disease.

# Controlling diseases — using chemicals



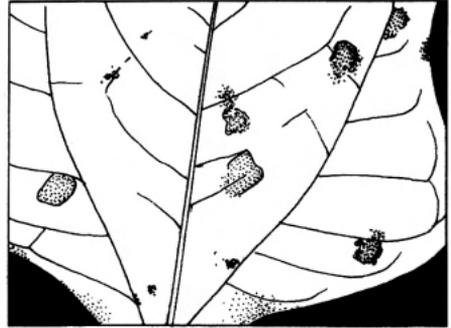
# Common diseases of cowpea — Fusarium wilt



# Cercospora leafspot



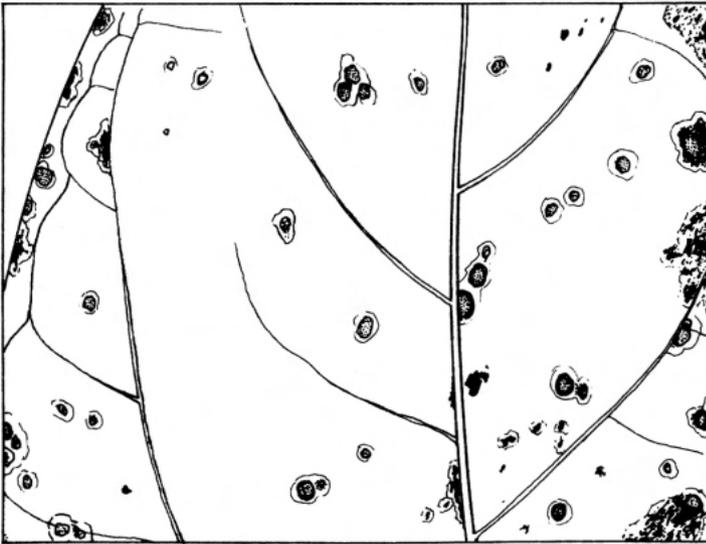
Lower leaf surface



Upper leaf surface

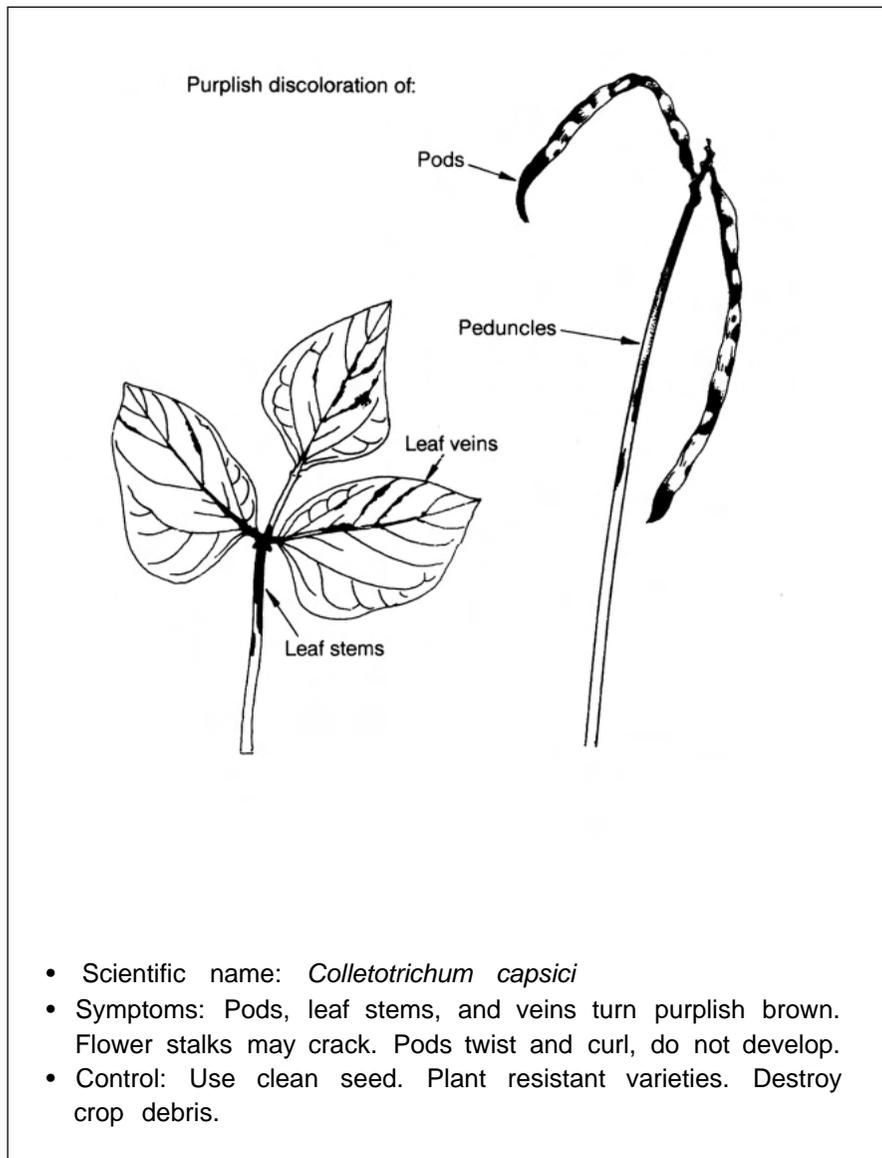
- Scientific name: *Cercospora canescens*; *Cercospora cruenta*
- Symptoms: Round or roundish cherry-red to reddish brown sores, up to 10 mm across, appear on leaves.
- Control: Use clean seed and plant resistant varieties. Treat with fungicide.

# Brown rust

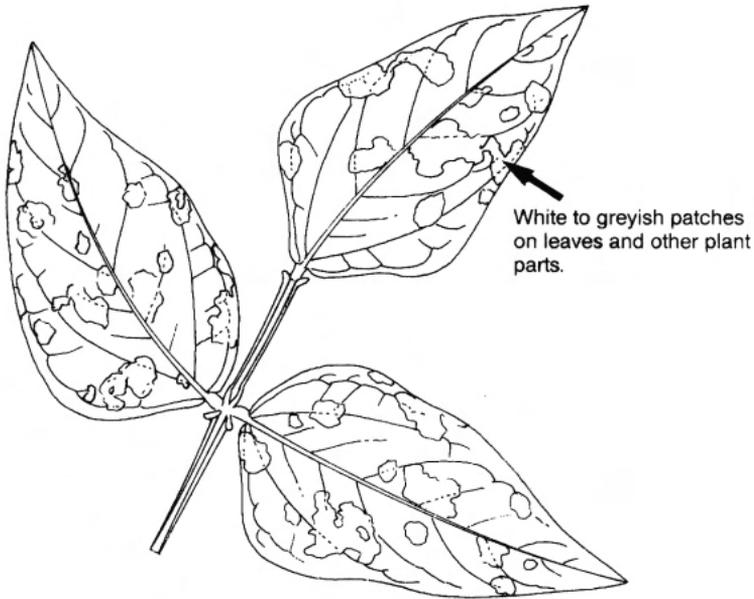


- Scientific name: *Uromyces appendiculatus*
- Symptoms: Blisters develop on leaves, releasing powdery, reddish brown spores.
- Control: Plant resistant varieties.

# Brown blotch

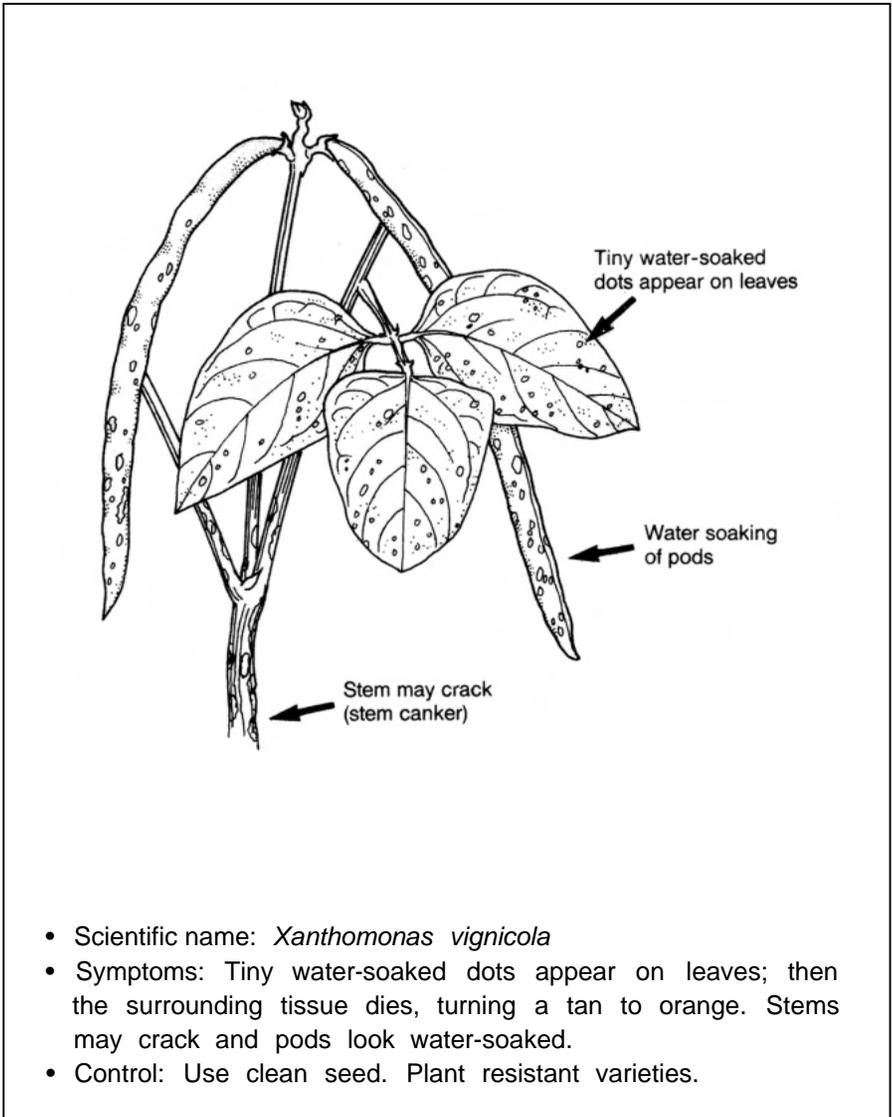


# Powdery mildew



- Scientific name: *Erysiphe polygoni*
- Symptoms: White patches, turning greyish, and spreading on leaves and other plant parts.
- Control: Plant resistant varieties. Use fungicide.

# Bacterial blight

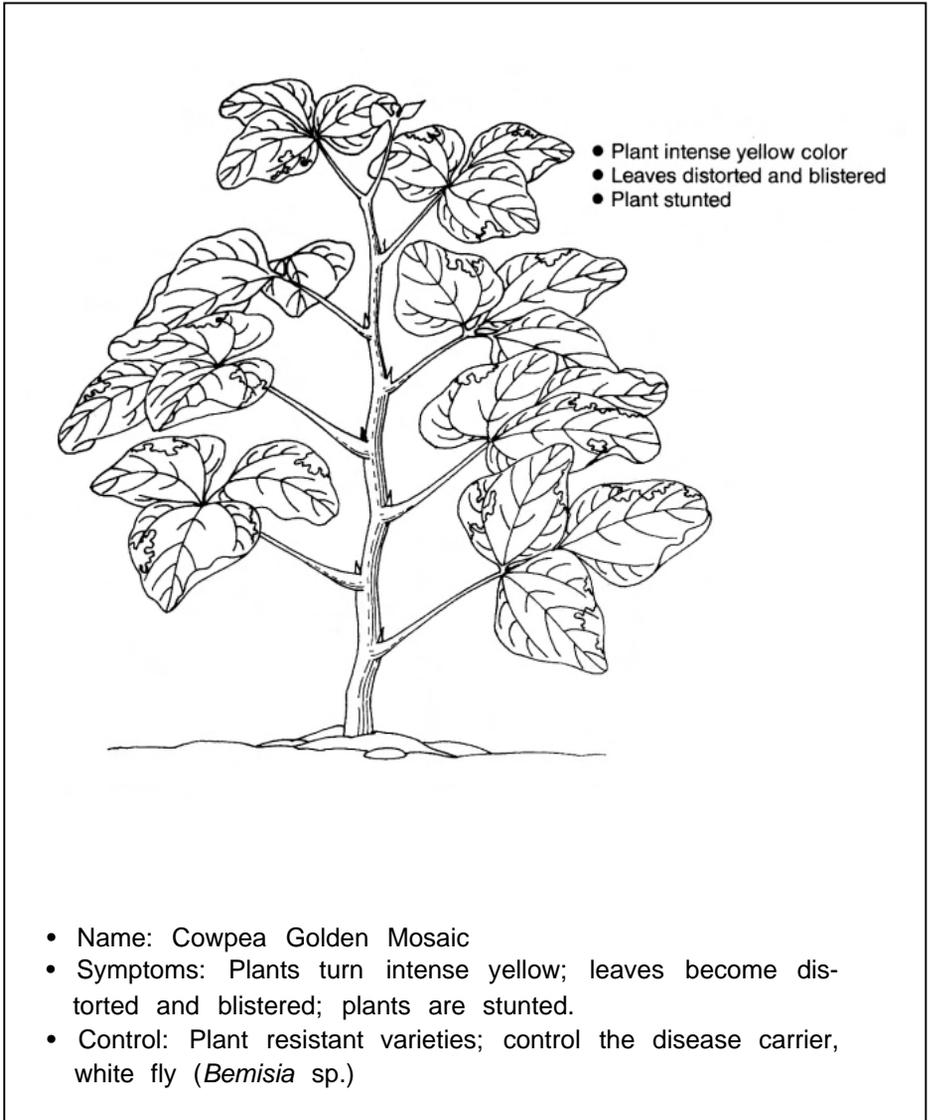


# Cowpea (severe) mosaic virus



- Name: Cowpea (Severe) Mosaic Virus (CSMV)
- Symptoms: Leaves become mottled and distorted.
- Control: Use clean seed and plant resistant varieties. Control virus carriers such as beetles.

# Cowpea golden mosaic



# **Cowpea in other cropping systems**

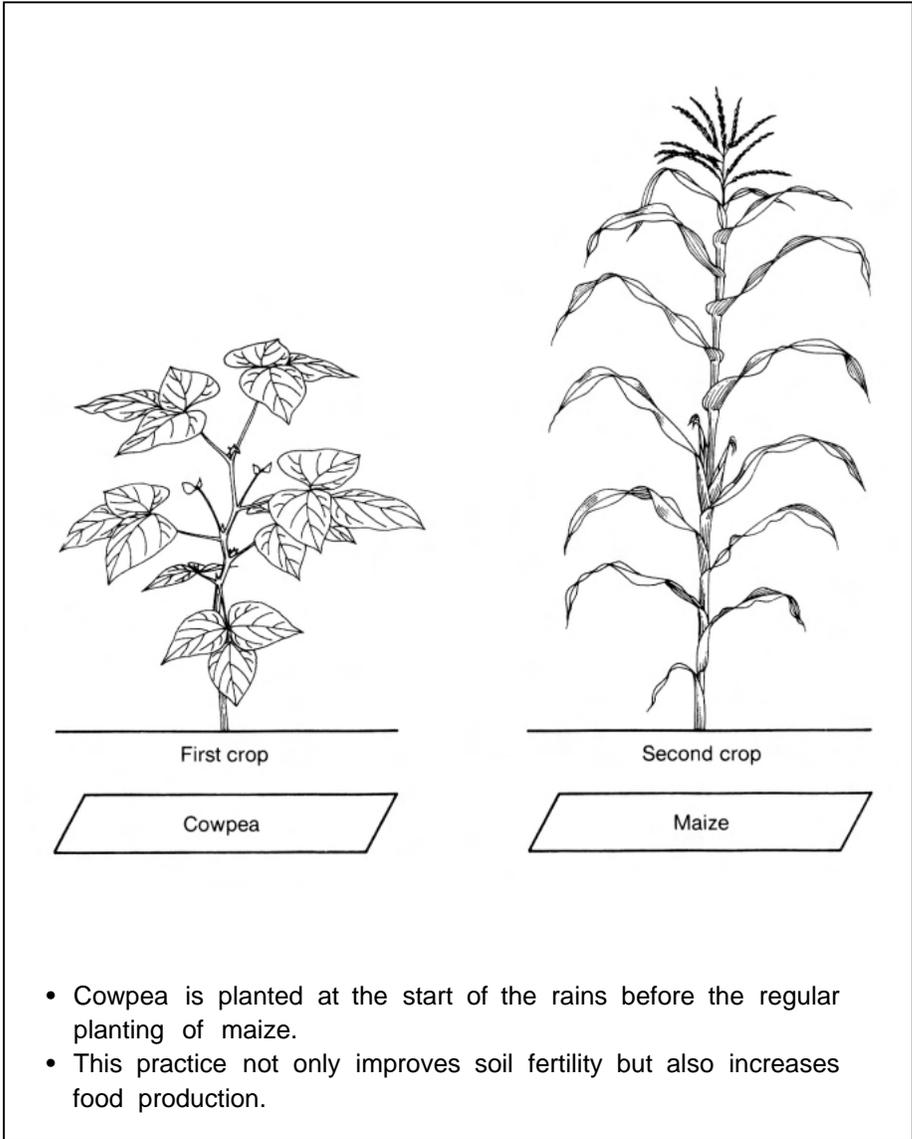


# Cowpea in other cropping systems — sequence cropping

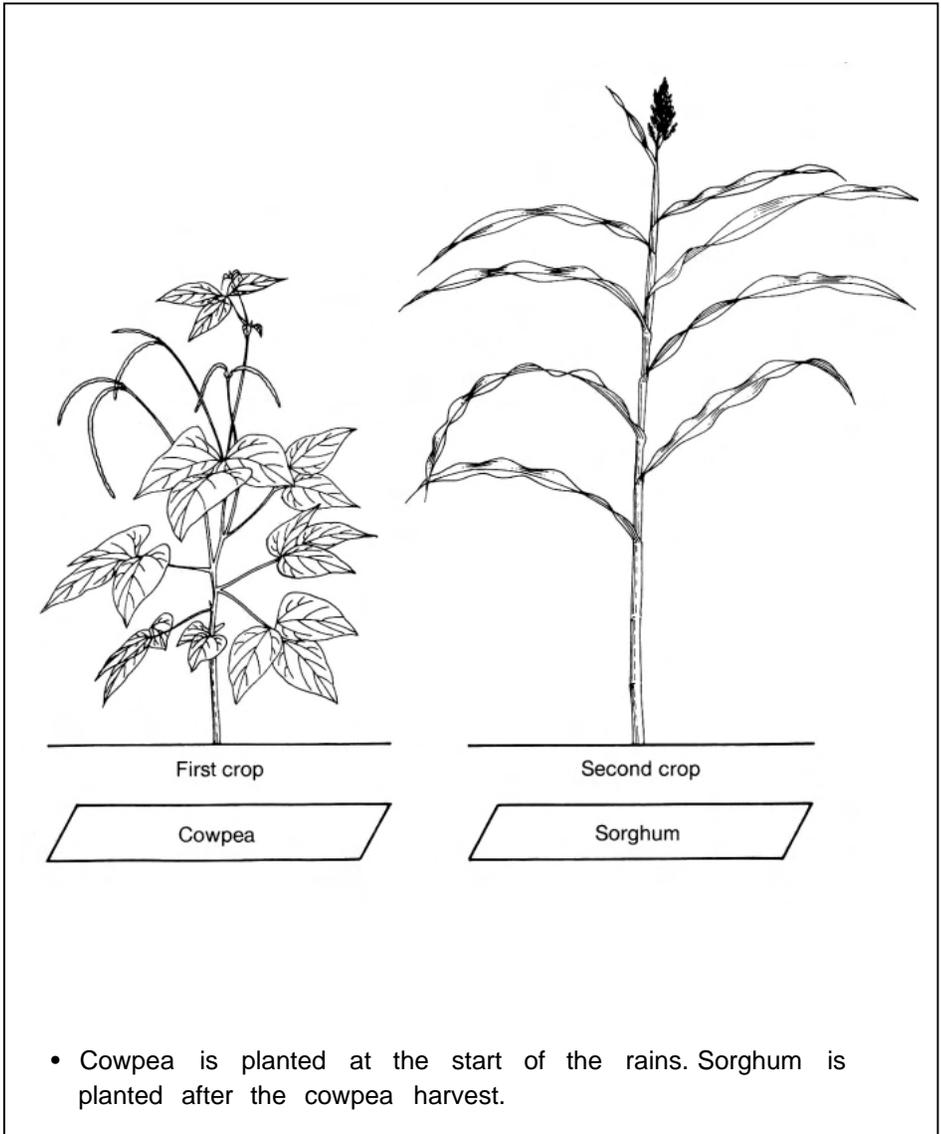
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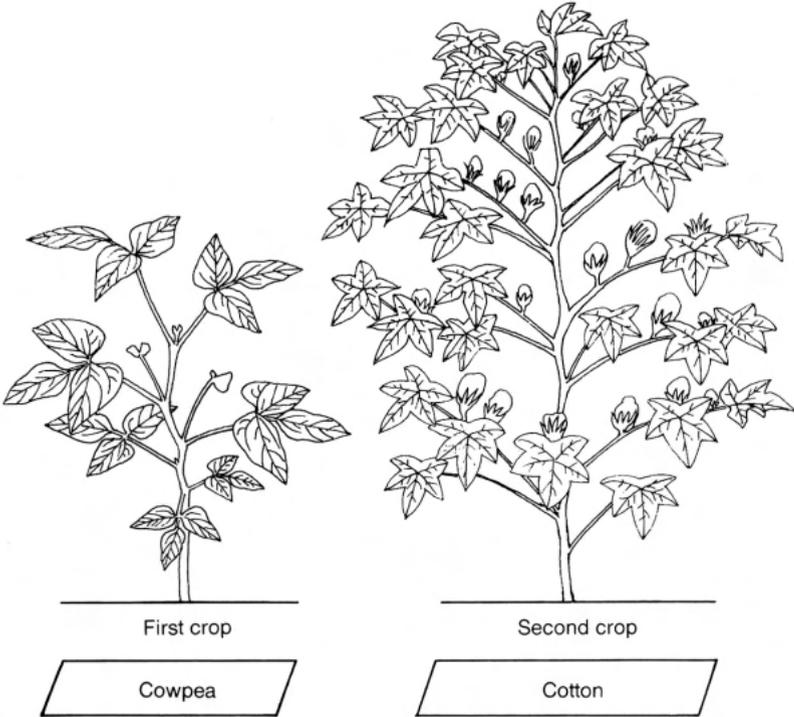
# Cowpea before maize



# Cowpea before sorghum

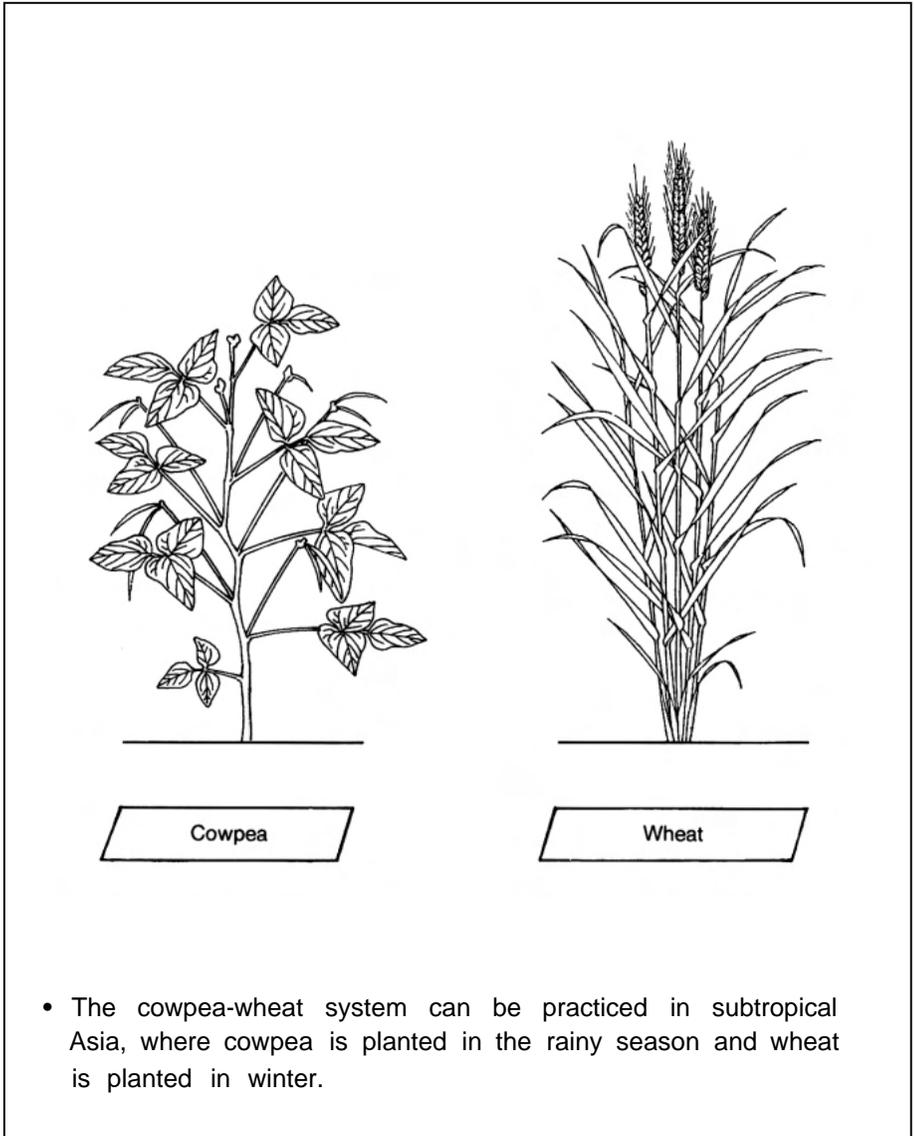


# Cowpea before cotton



- Cowpea can be planted before the regular planting of cotton at the start of the rainy season.
- It provides additional income and food for the farmer.

# Cowpea before wheat



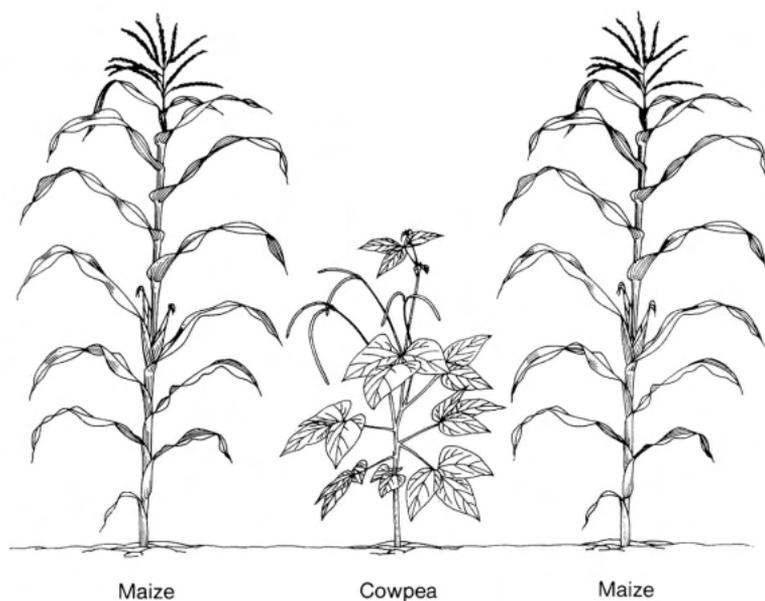
- The cowpea-wheat system can be practiced in subtropical Asia, where cowpea is planted in the rainy season and wheat is planted in winter.

# **Cowpea in other cropping systems — intercropping**

Maize and cowpea	<b>209</b>
Sorghum and cowpea	<b>210</b>
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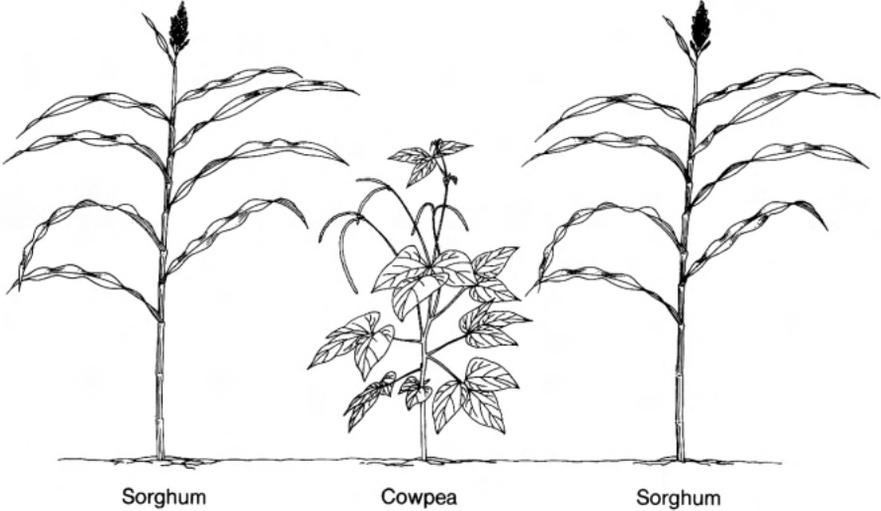


# Maize and cowpea



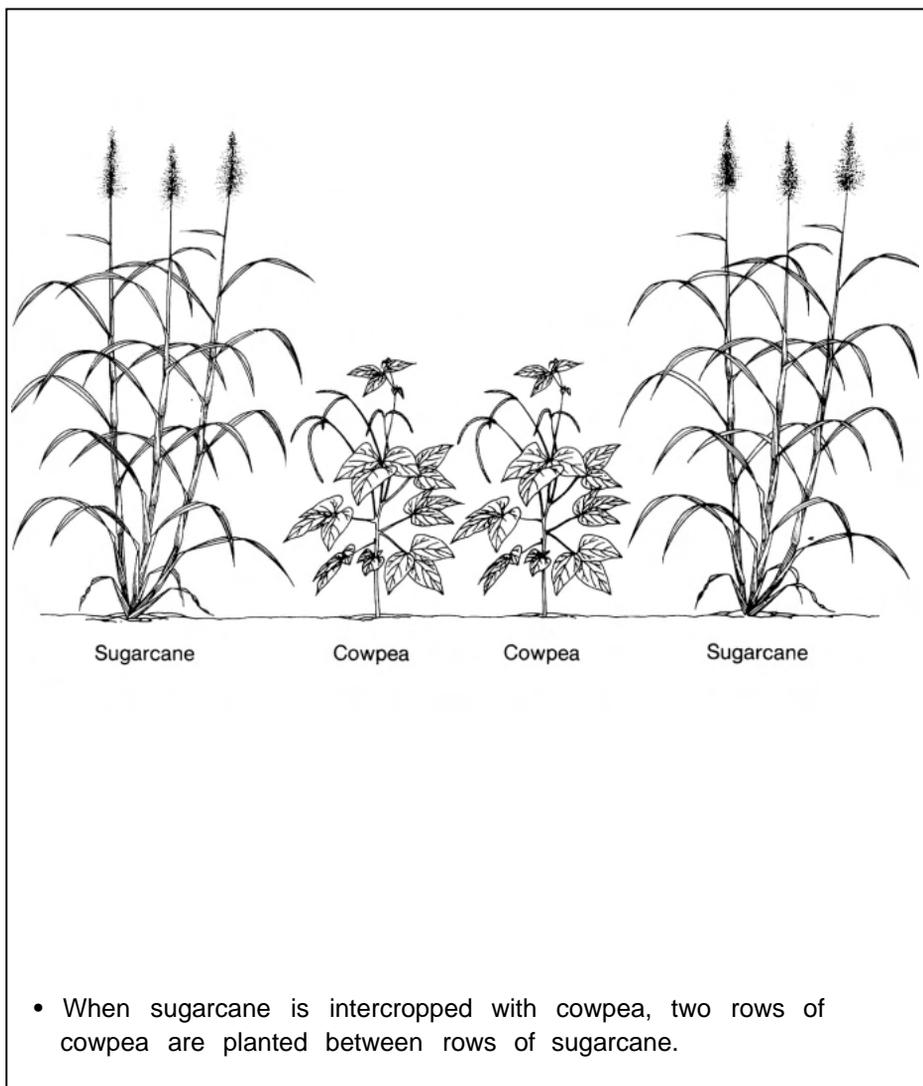
- Cowpea is planted between rows of the main crop, maize. Both crops are planted at the same time.
- This system insures against crop failure from drought and pests.

# Sorghum and cowpea

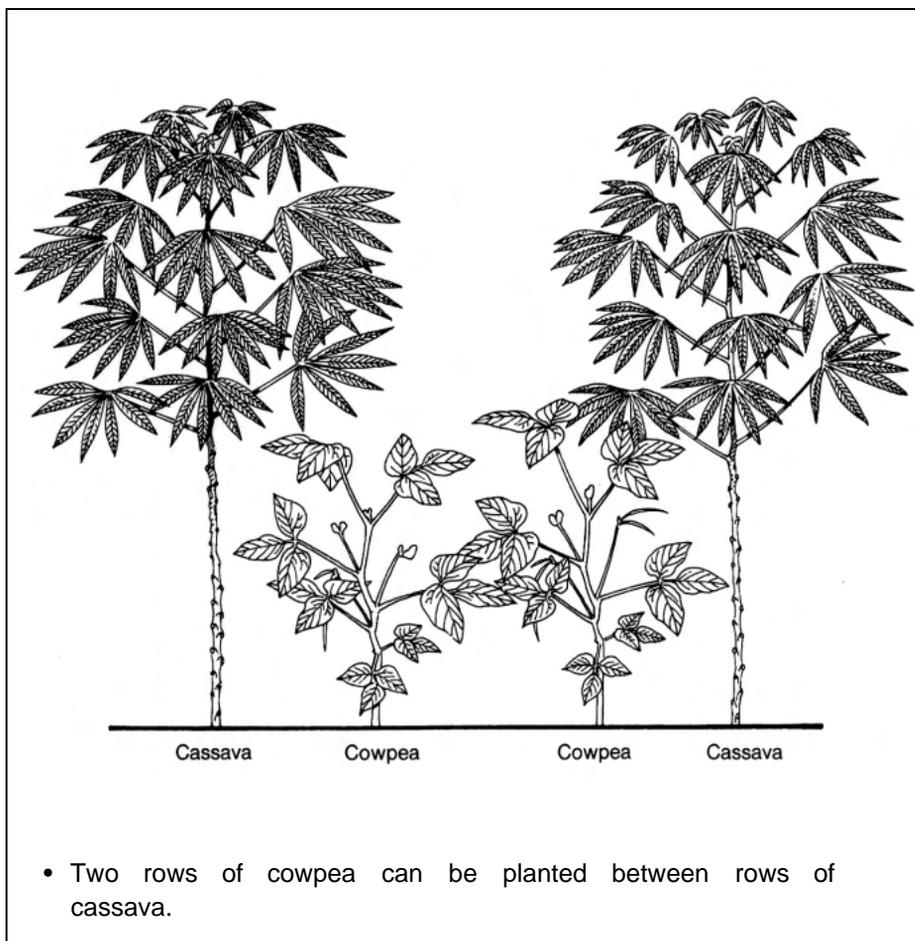


- Cowpea can be planted between rows of sorghum.

# Sugarcane and cowpea



# Cassava and cowpea



# Plantation crops and cowpea



Oil palm/cowpea



Rubber /cowpea



Coconut/cowpea



Banana/cowpea

- Cowpea can be planted in the vacant spaces of plantation crops.

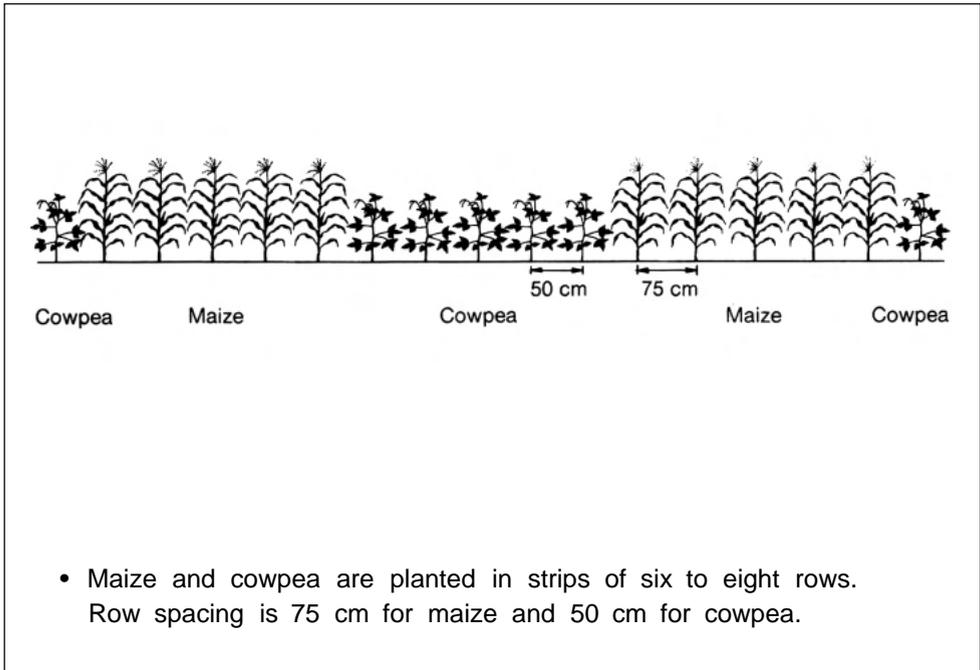


# Cowpea in other cropping systems — strip-cropping

Strip-cropping maize and cowpea	217
Strip-cropping sorghum and cowpea	218



# Strip-cropping maize and cowpea



# Strip-cropping sorghum and cowpea

