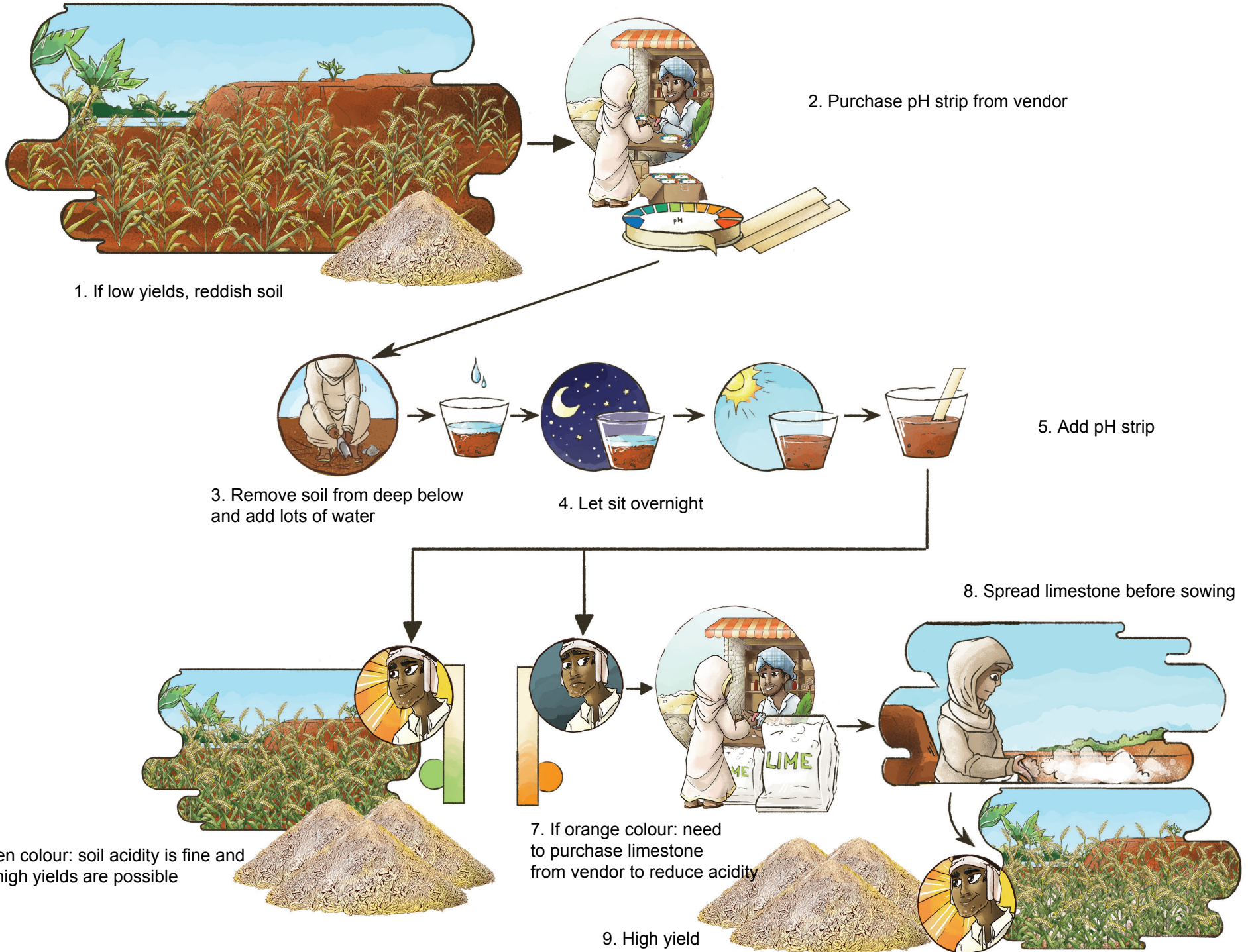
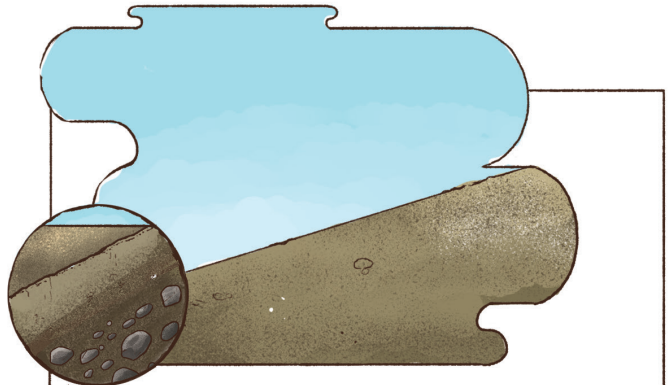


# Lesson: If yields are low and the soil is reddish, soil acidity should be tested

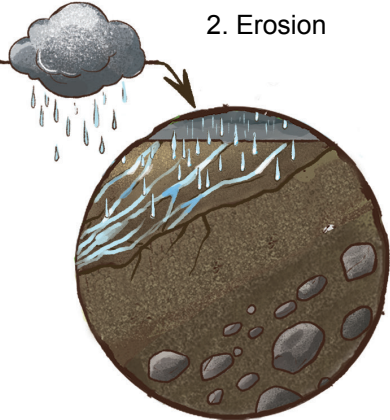


# Lesson: Creating shallow trenches with a stick perpendicular to a slope will reduce soil erosion, capture water and increase yields

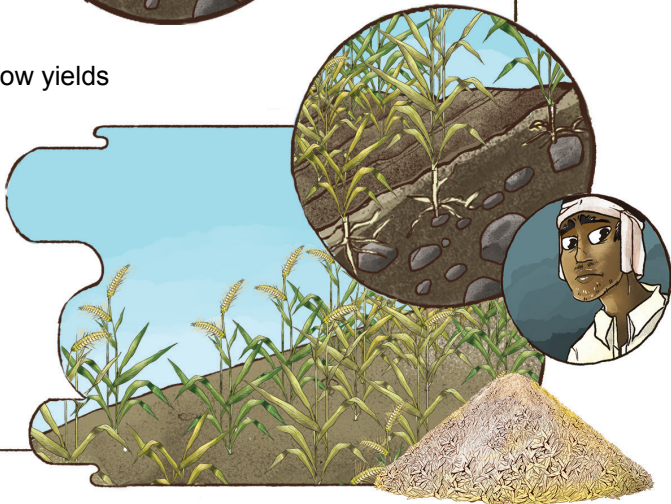
1. Traditional practice on slope



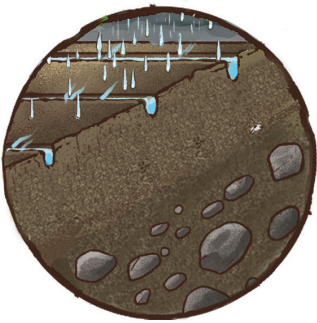
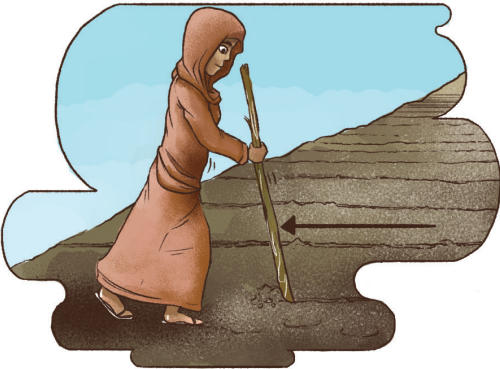
2. Erosion



3. Low yields



4. Improved practice: use stick to create shallow trenches perpendicular to slope



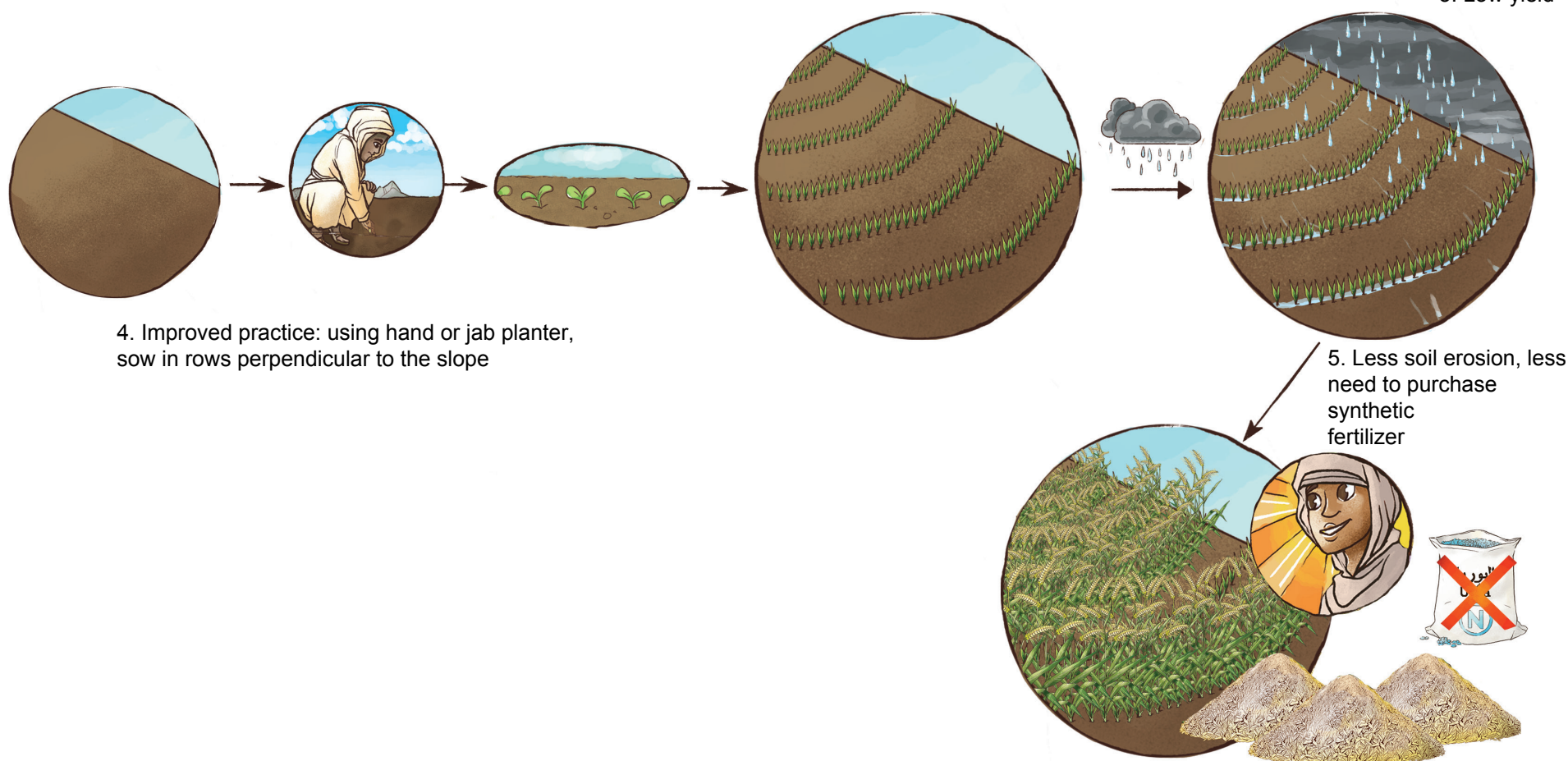
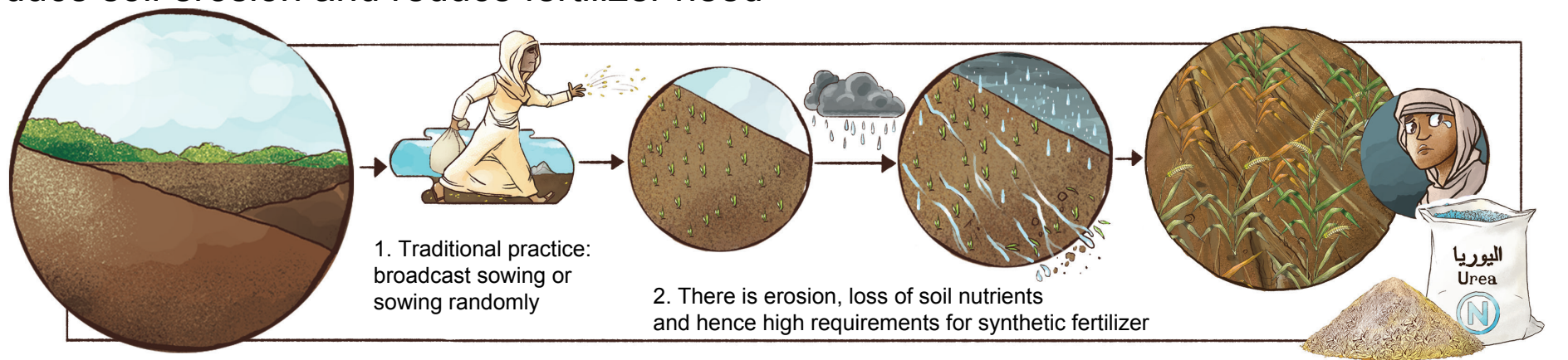
5. Trenches capture water flow and prevent erosion



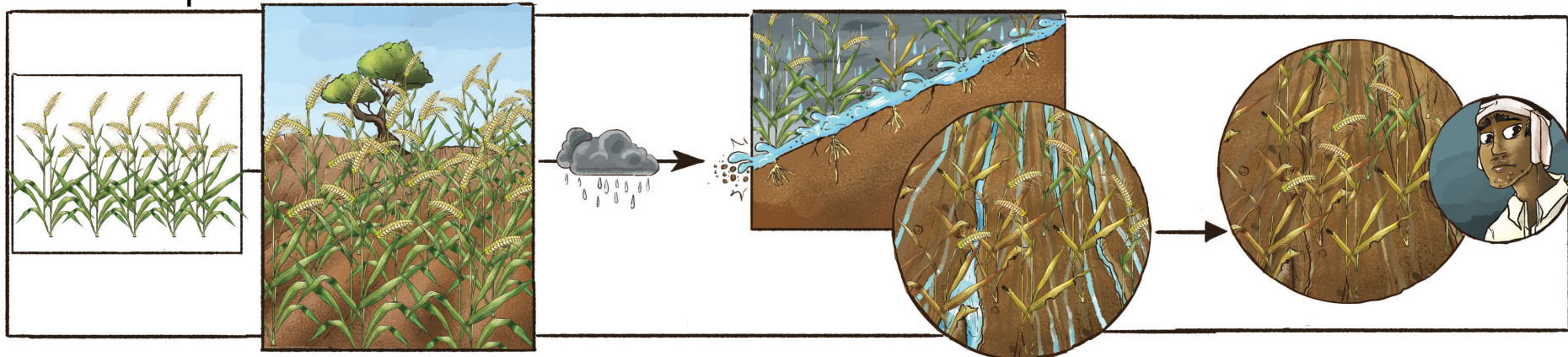
6. Higher yields



# Lesson: On non-terraced, sloped land, sowing crops in rows perpendicular to the slope will reduce soil erosion and reduce fertilizer need

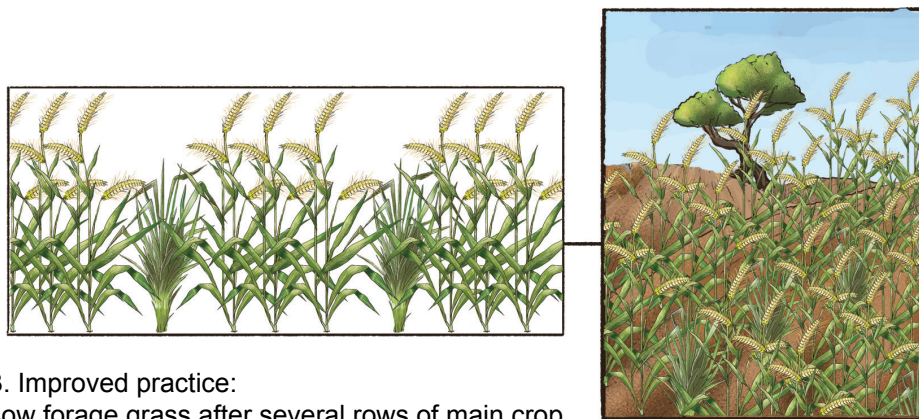


# Lesson: On sloped, non-terraced land, sowing vetiver or other forage grasses will reduce erosion and prevent water loss



1. Traditional practice

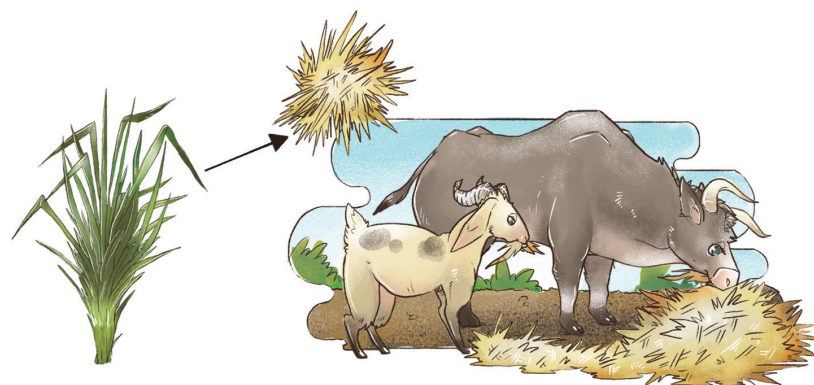
2. Erosion



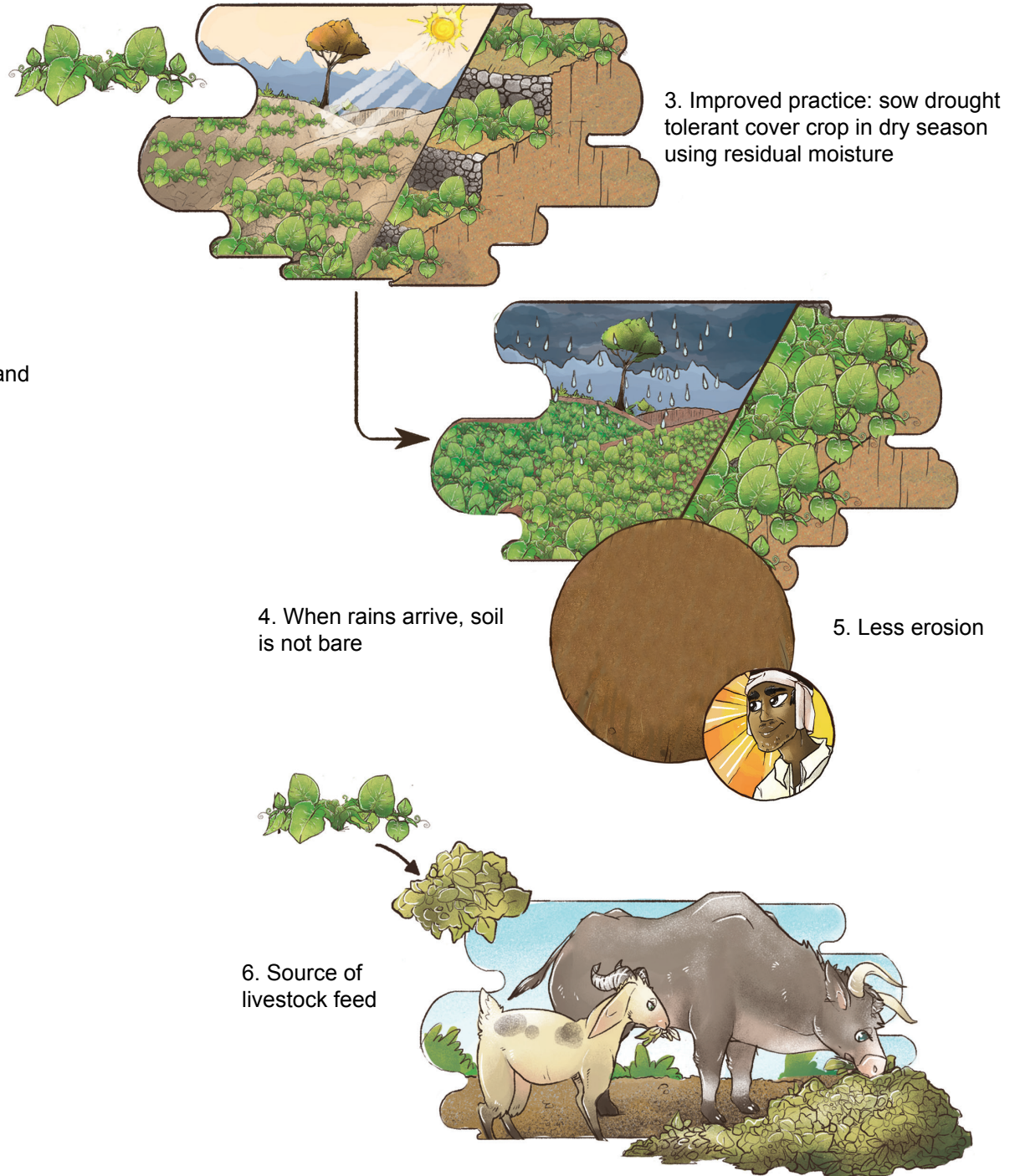
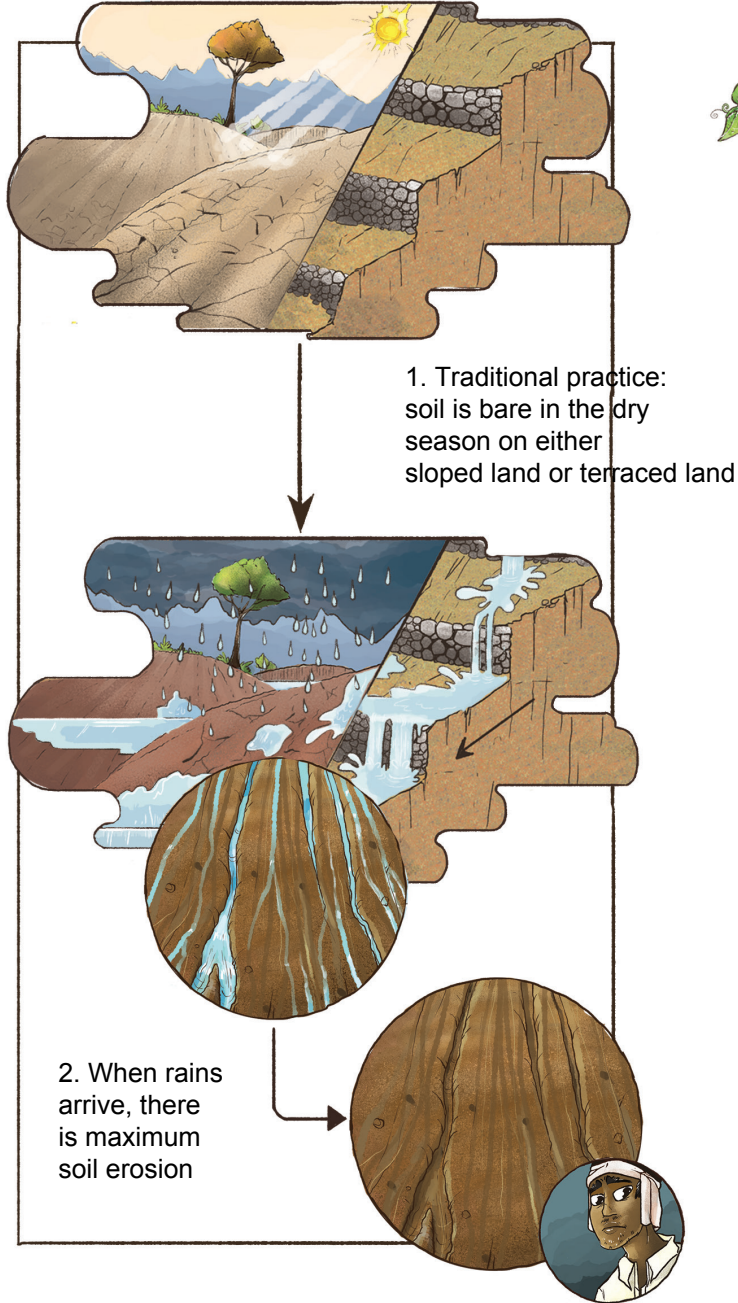
3. Improved practice:  
sow forage grass after several rows of main crop  
all in rows, perpendicular to slope

4. Less erosion since  
forage grass roots grab soil

5. Forage  
grass can  
be fed to  
livestock

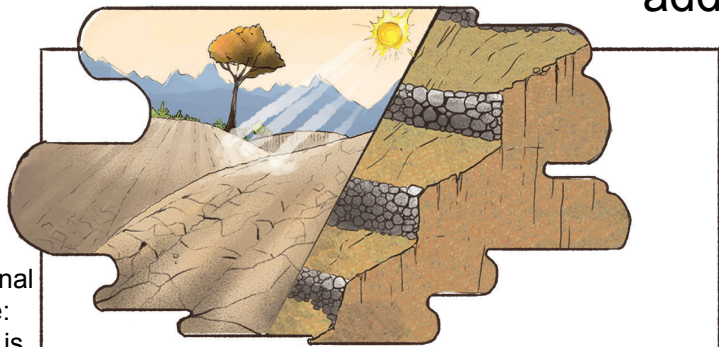


# Lesson: Sowing a spreading type cover crop prior to the transition between the dry season and the wet season will reduce soil erosion and provide livestock feed in the dry season

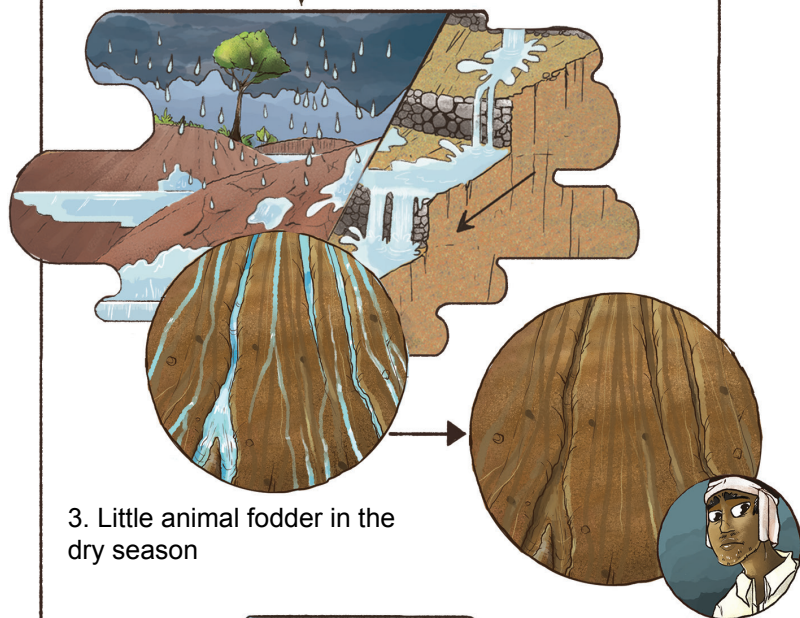


# Lesson: Planting vetch in the dry season will reduce soil erosion, provide animal fodder and add nutrients to soil.

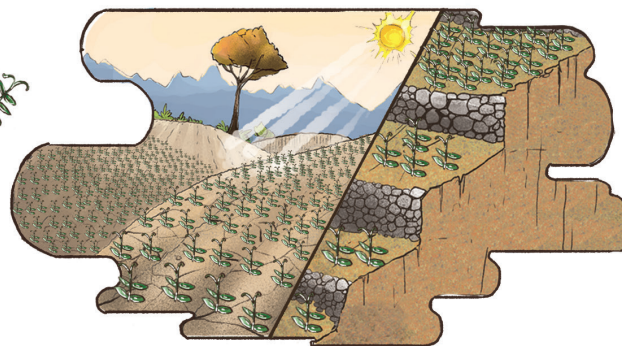
1. Traditional practice: nothing is sown in the dry season



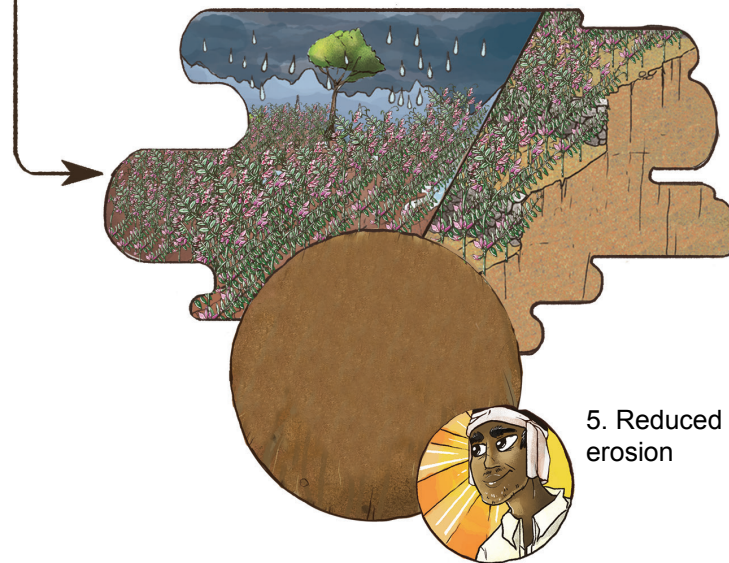
2. Soil erosion when first rain arrives



3. Little animal fodder in the dry season



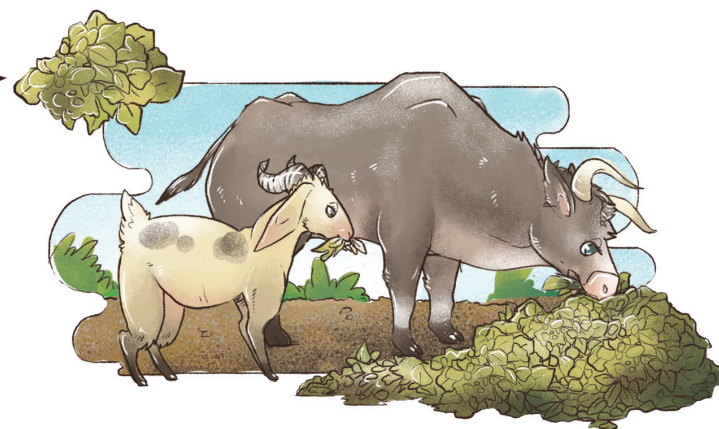
4. Improved practice: sow vetch prior to the beginning of the rainy season



5. Reduced erosion

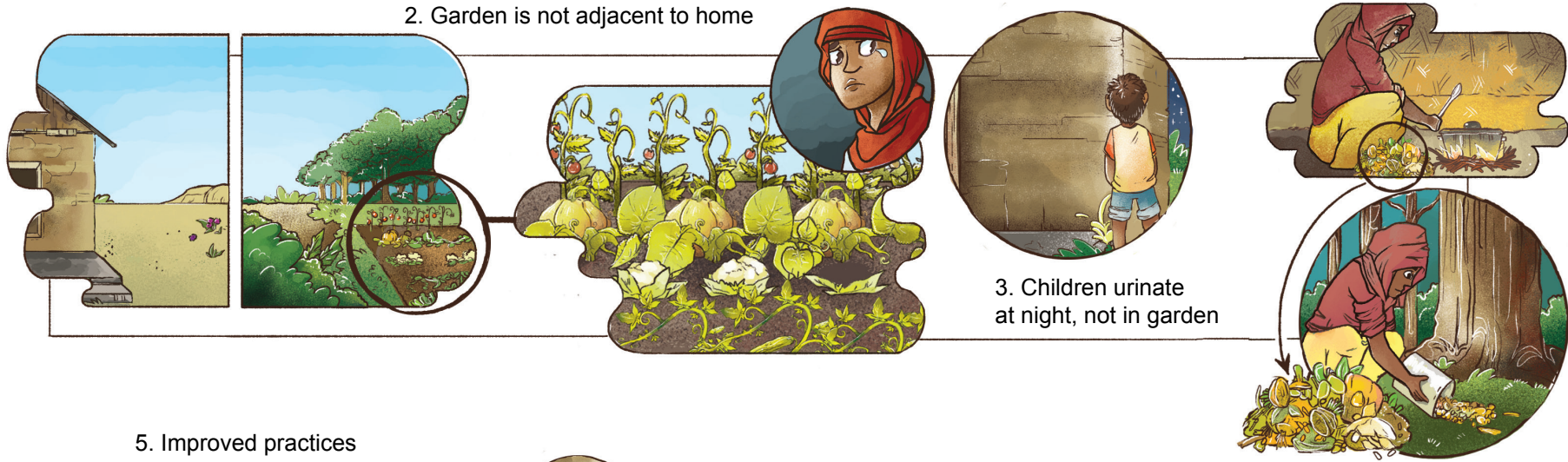


6. Good animal fodder in dry season



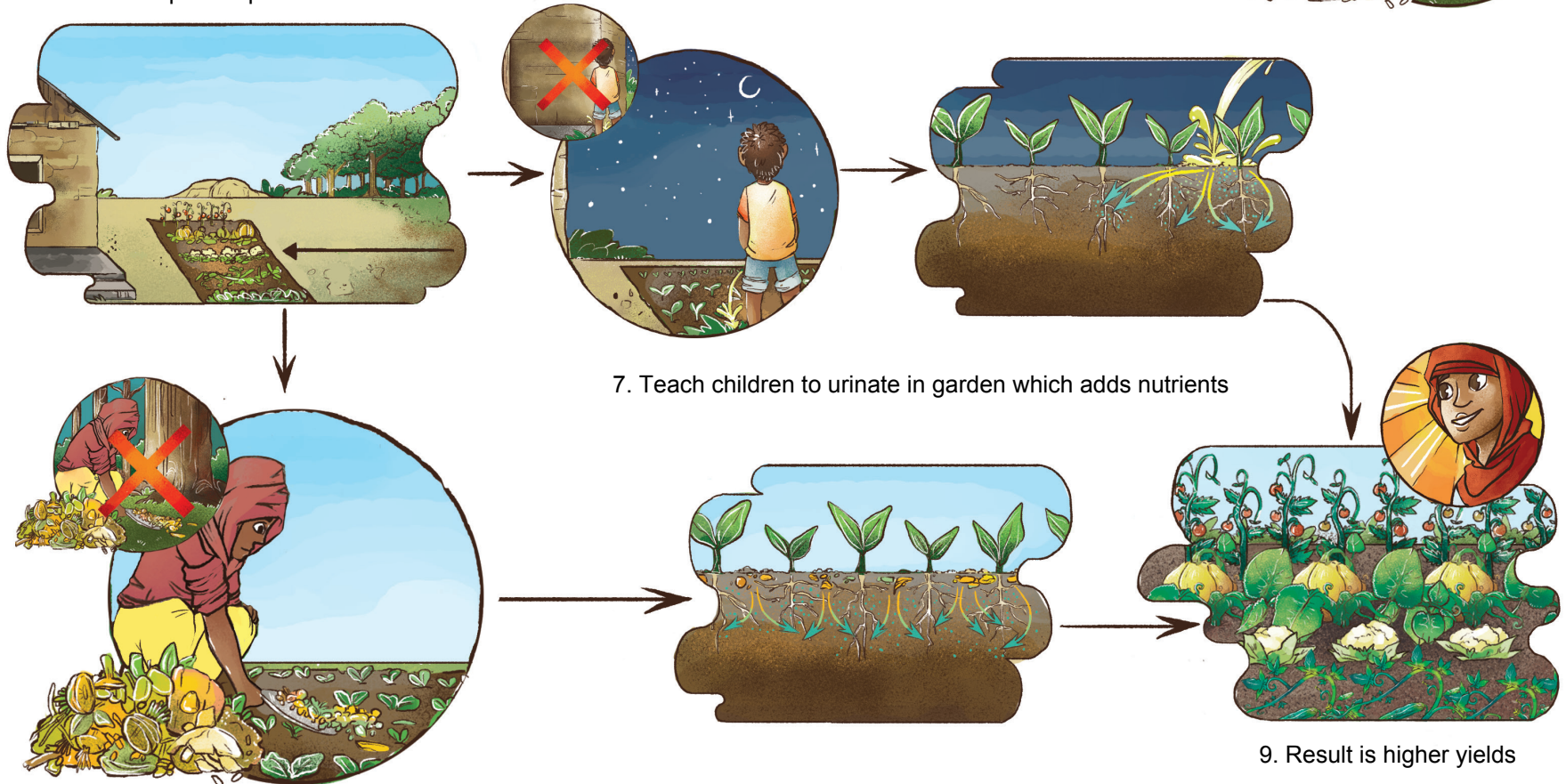
# Lesson: Simple practices can improve yields of home gardens

1. Less ideal practices cause low yield



5. Improved practices

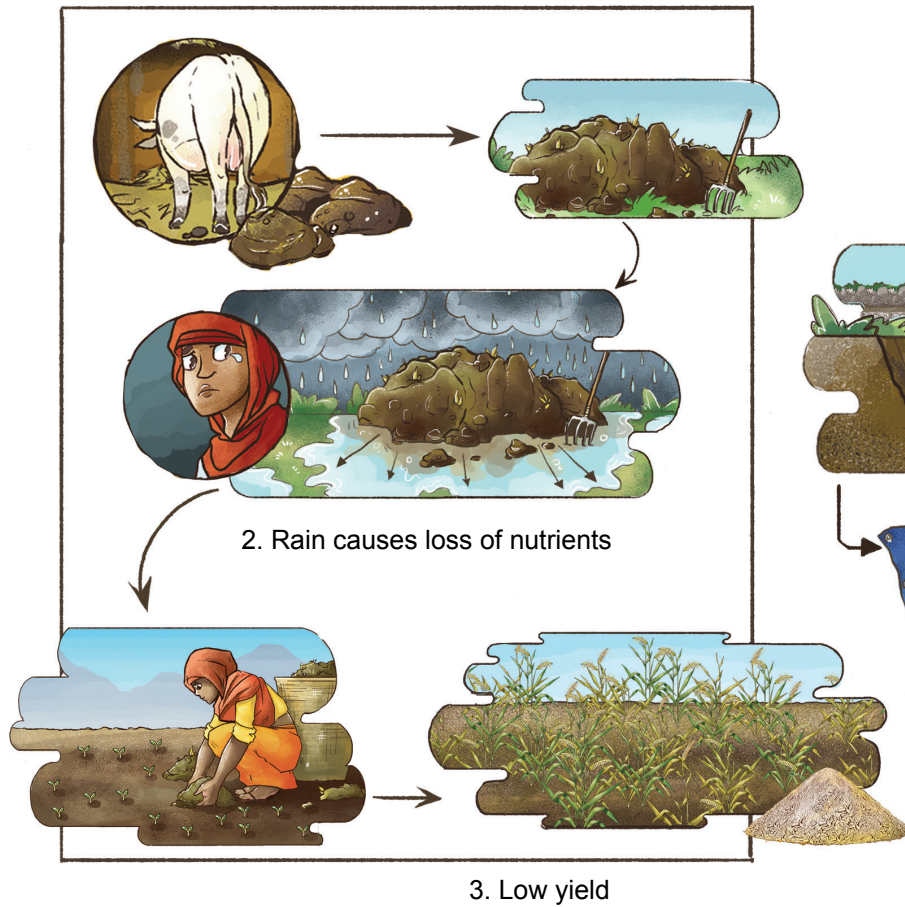
6. Shifting garden adjacent to home increases yields



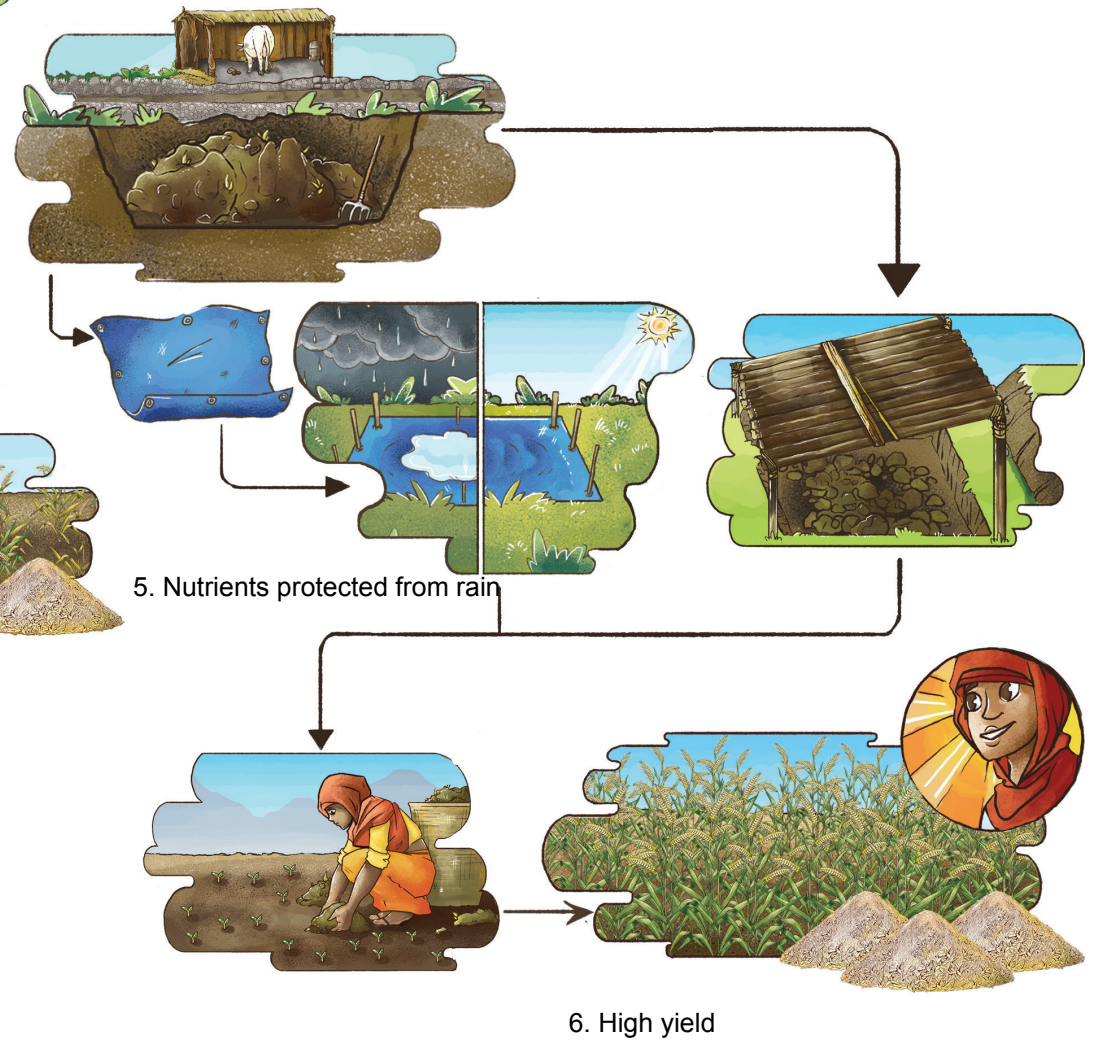
8. Add kitchen waste to garden which adds nutrients as it decomposes

# Lesson: Covering manure from rain will prevent loss of its nutrients

1. Traditional practice of storing manure in the open on the ground



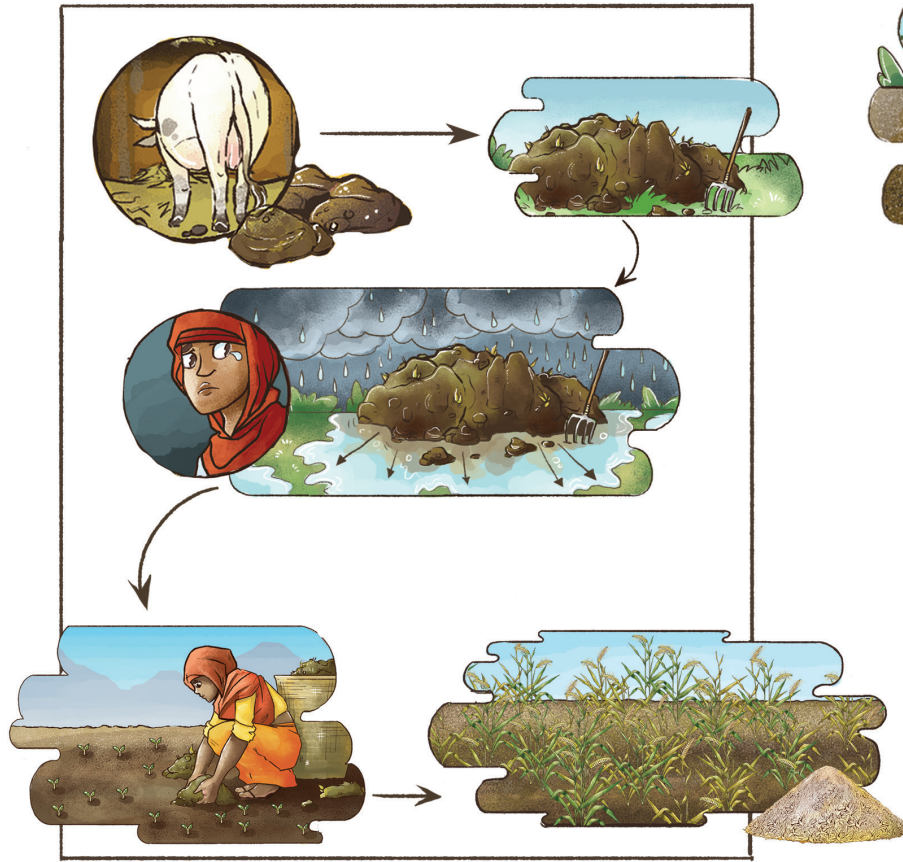
4. Improved practices: store manure in pit or inside mud/stone walls and cover





# Lesson: Covering manure from rain will prevent loss of its nutrients

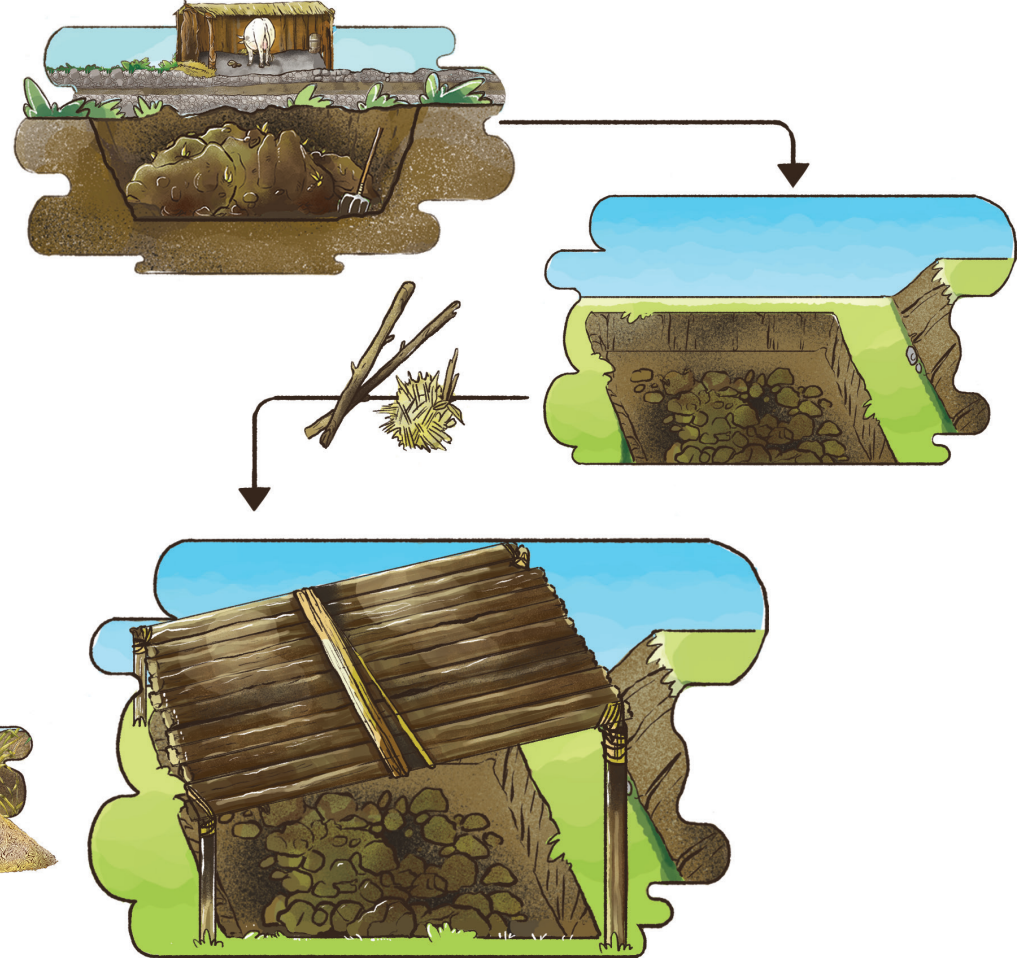
1. Traditional practice of storing manure in the open on the ground



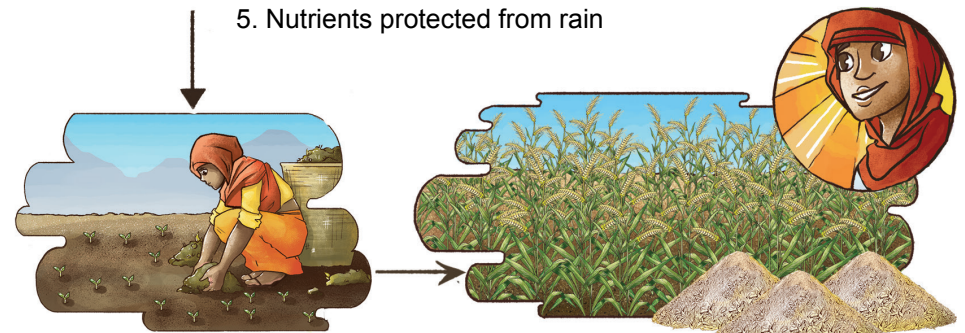
2. Rain causes loss of nutrients

3. Low yield

4. Improved practices: store manure in pit and cover with wood and thatch



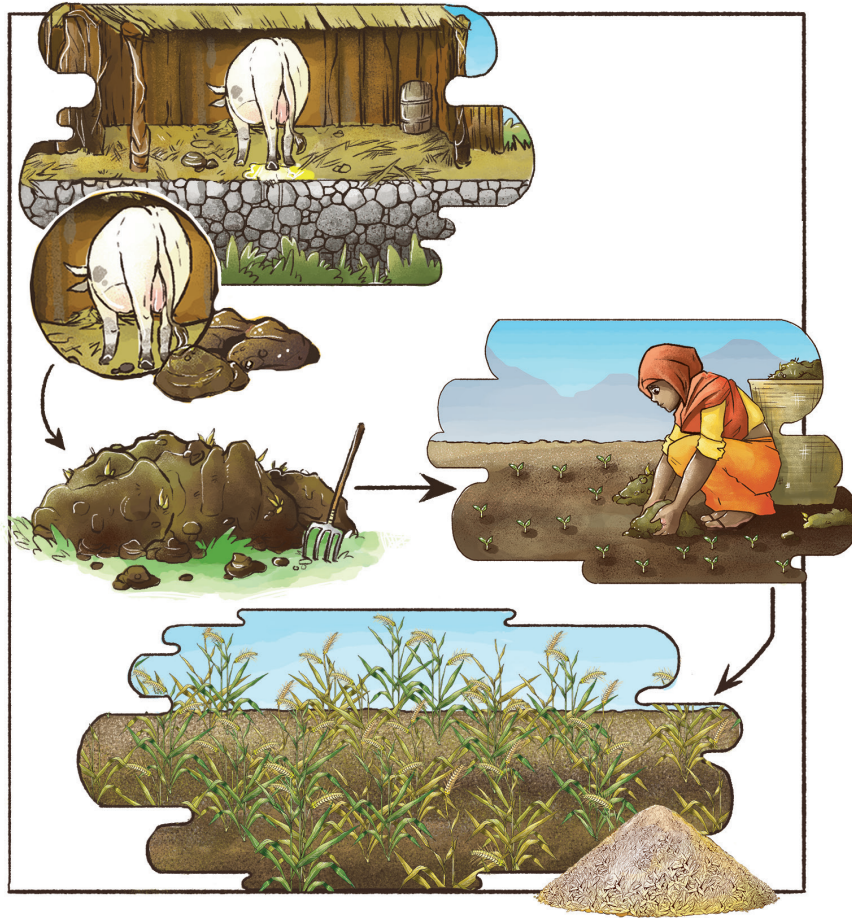
5. Nutrients protected from rain



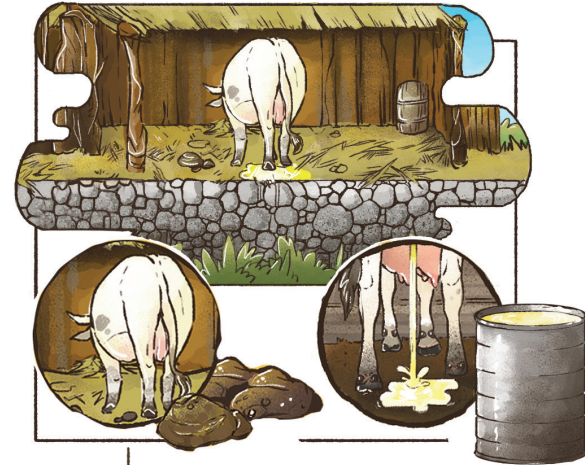
6. High yield

# Lesson: There are methods to improve the nutrients of manure (Part 1)

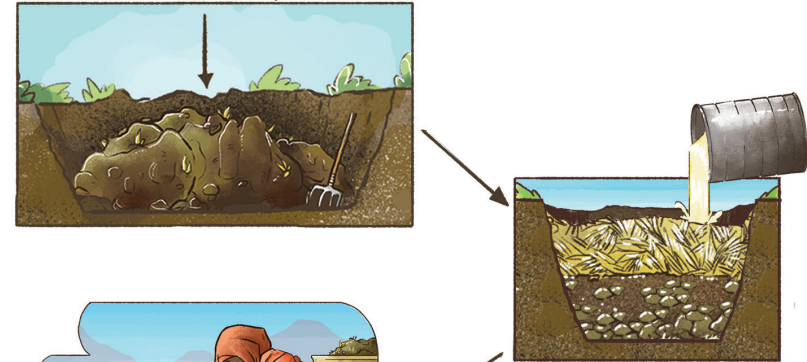
1. Traditional practice: livestock urine is not collected



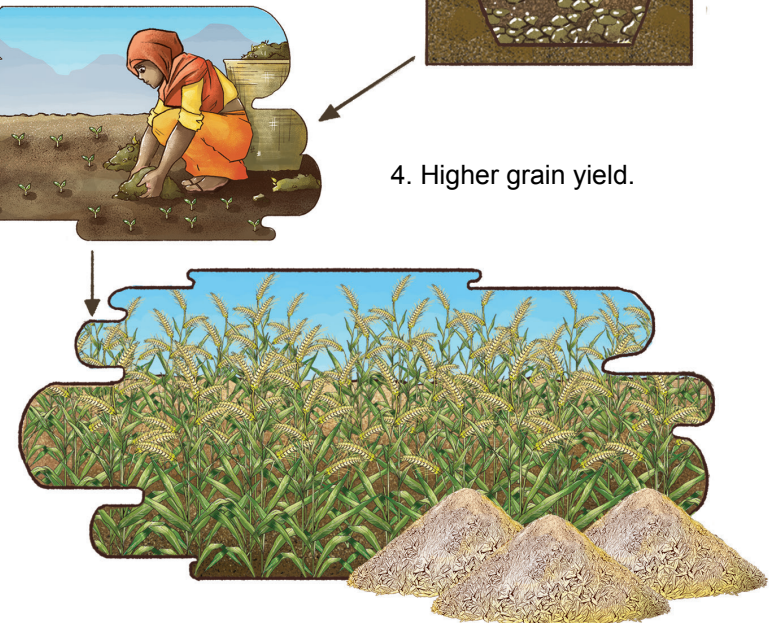
2. Manure gives lower grain yield.



3. New practice: combine urine with manure

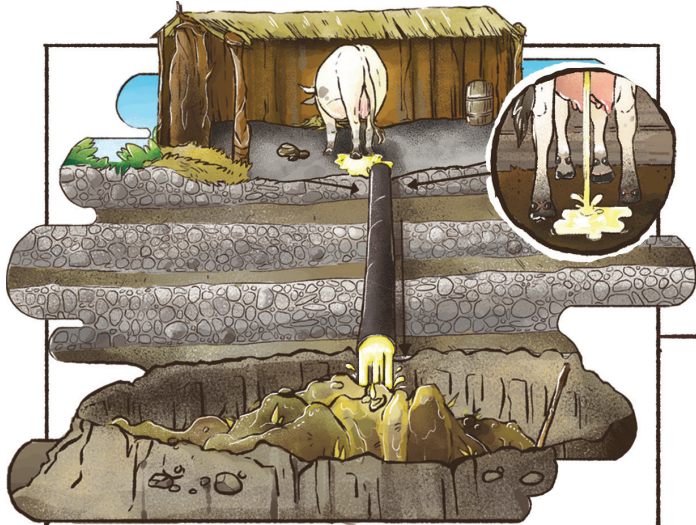


4. Higher grain yield.

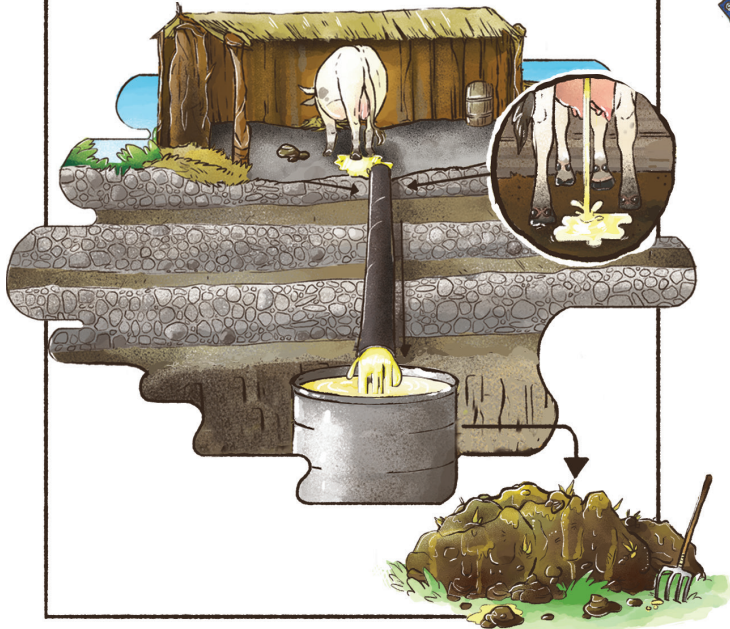


# Lesson: There are methods to improve the nutrients of manure (Part 2)

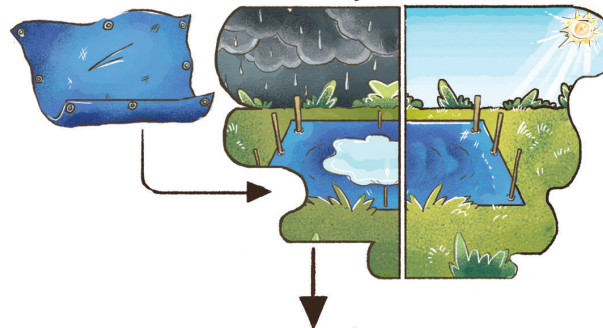
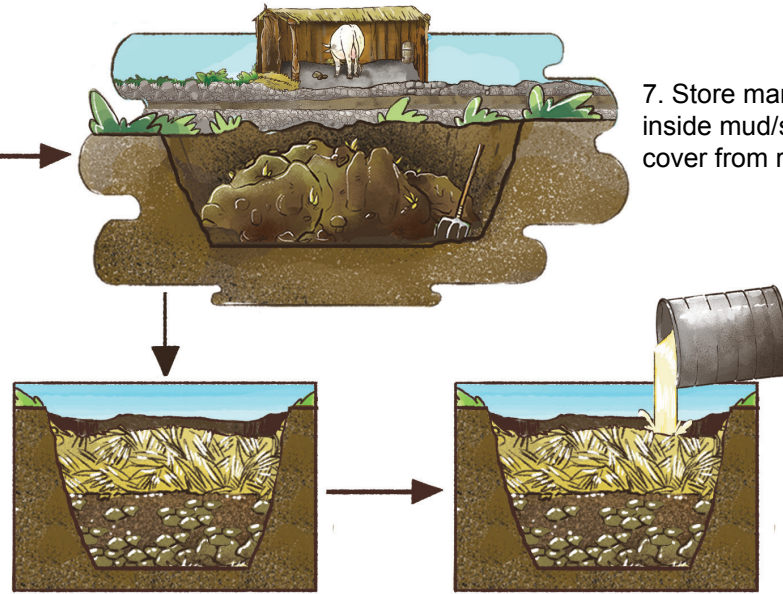
5. Collect urine by using concrete floor that is sloped towards a pipe, and empties into the manure pit.



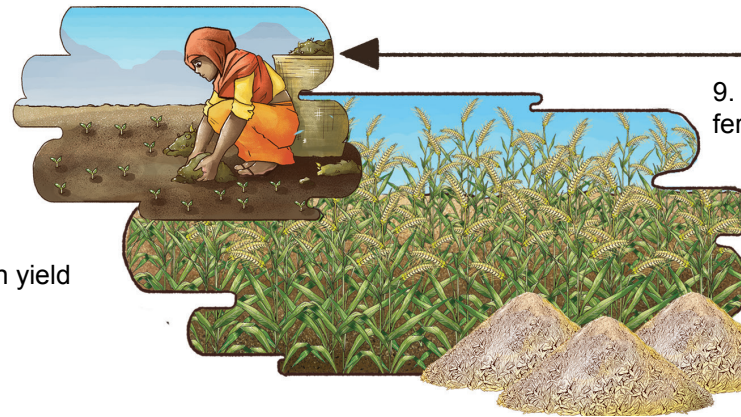
6. Alternative: urine pipe can go to a drum from which urine can be added to manure



7. Store manure in pit or inside mud/stone walls and cover from rain



8. High yield

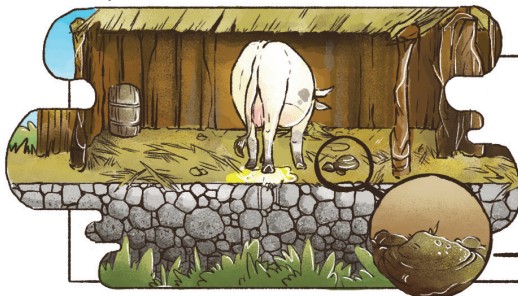


9. Less need to purchase fertilizer



# Lesson: Adding manure in layers with straw and soil in a container or pit will improve its nutrients

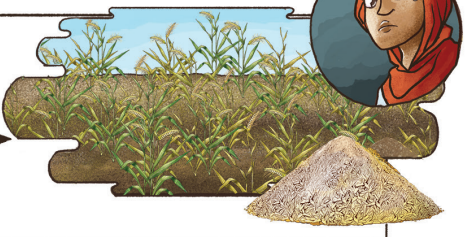
1. Traditional practice is to collect manure and store on ground or in pit



2. Spread manure



3. Low yield



4. Improved practice is to store manure inside walls, elevated, with repeating layers of straw, manure and soil

5. Create storage structure with sticks, mud or brick



9. Soil layer

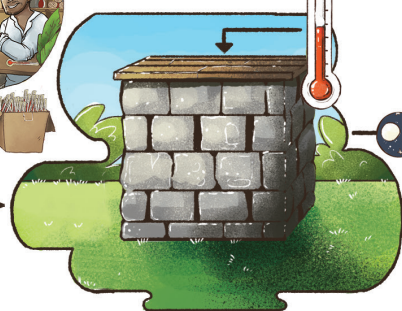
8. Manure layer

7. Layer of straw

6. Bottom should be sticks to prevent water from soaking up



10. Optional: purchase thermometer at vendor and place in heap



11. If heap was built properly, it should become hotter over a period of weeks.

12. Let compost incubate for several weeks



13. Spread in field



14. Higher yields

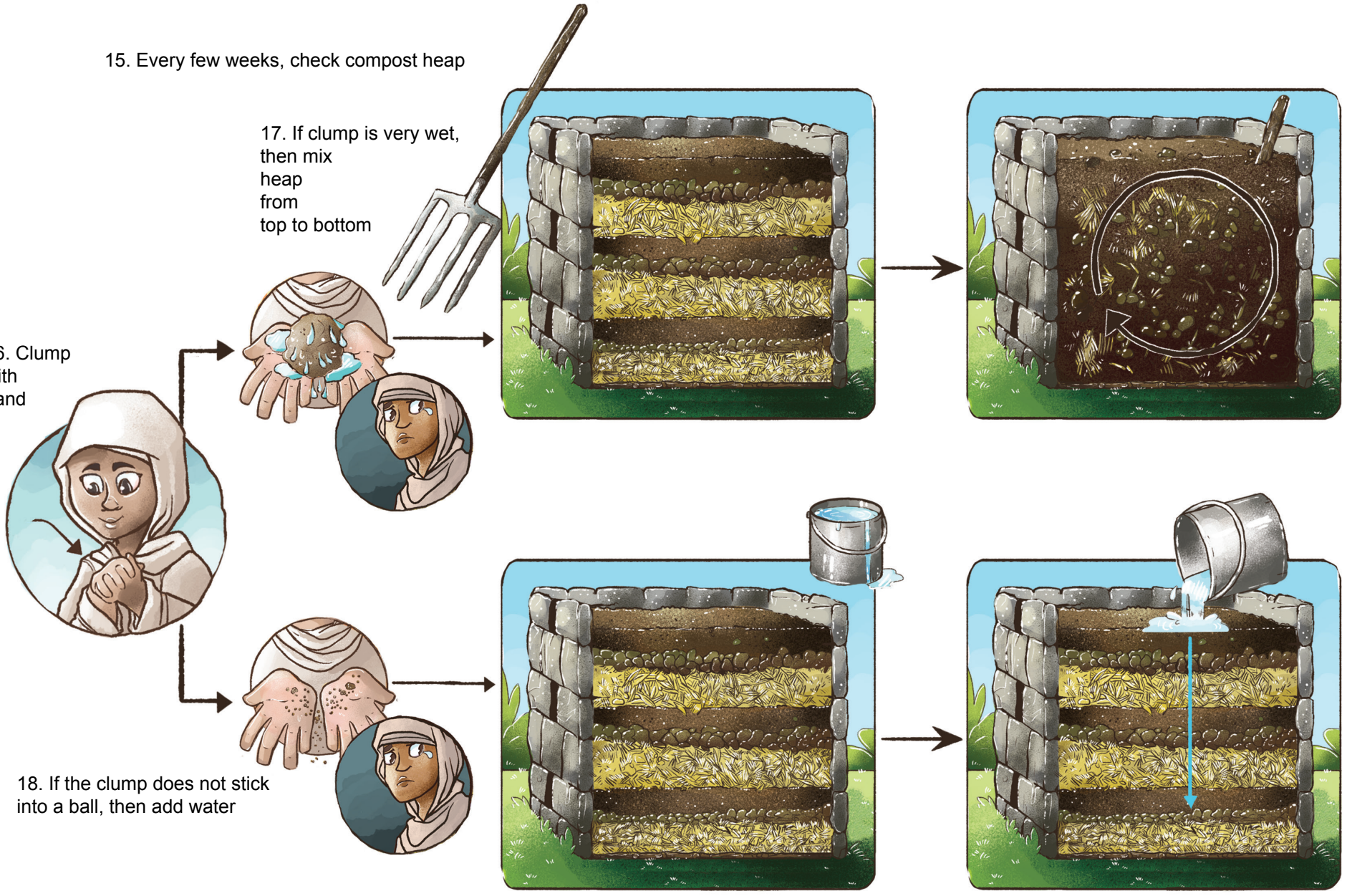
# Lesson: Adding manure in layers with straw and soil in a container or pit will improve its nutrients (continued)

15. Every few weeks, check compost heap

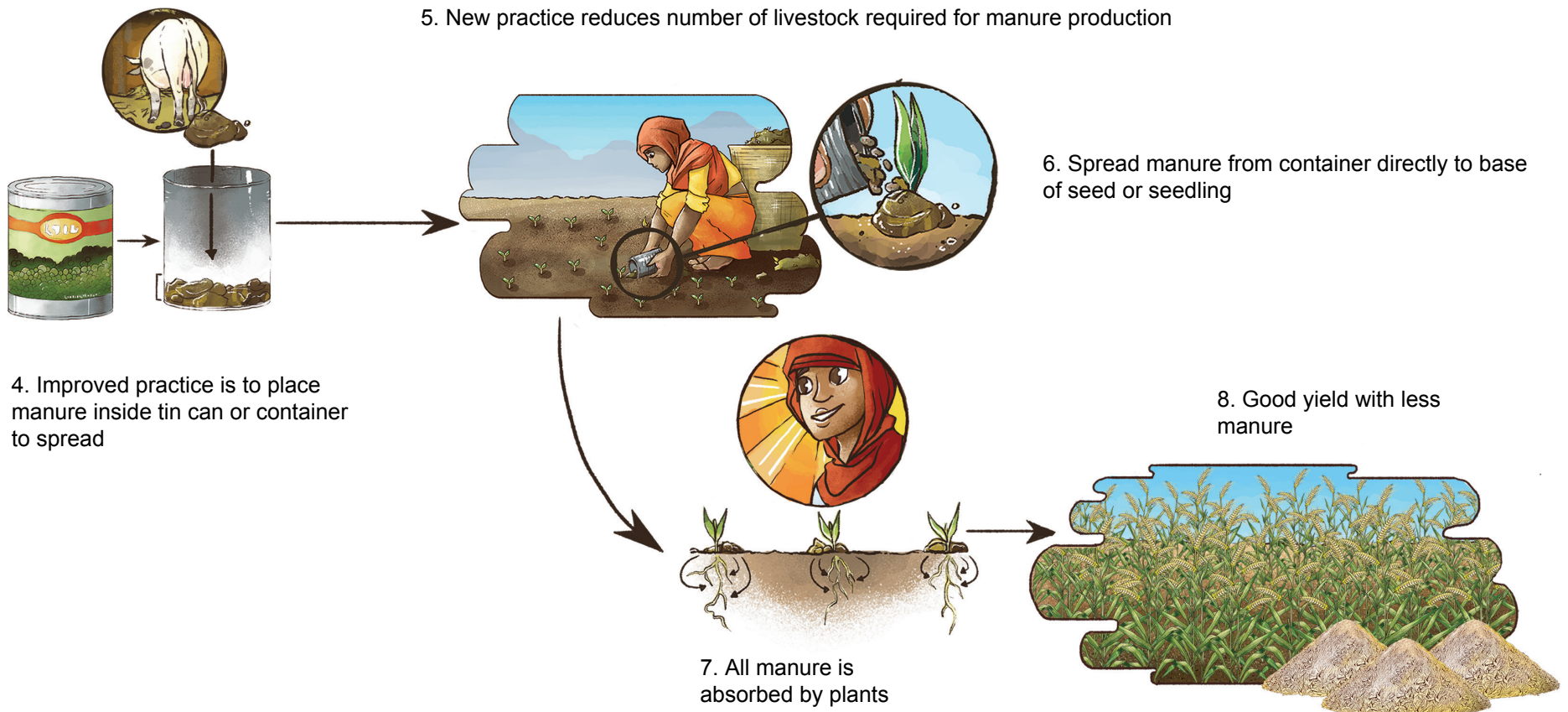
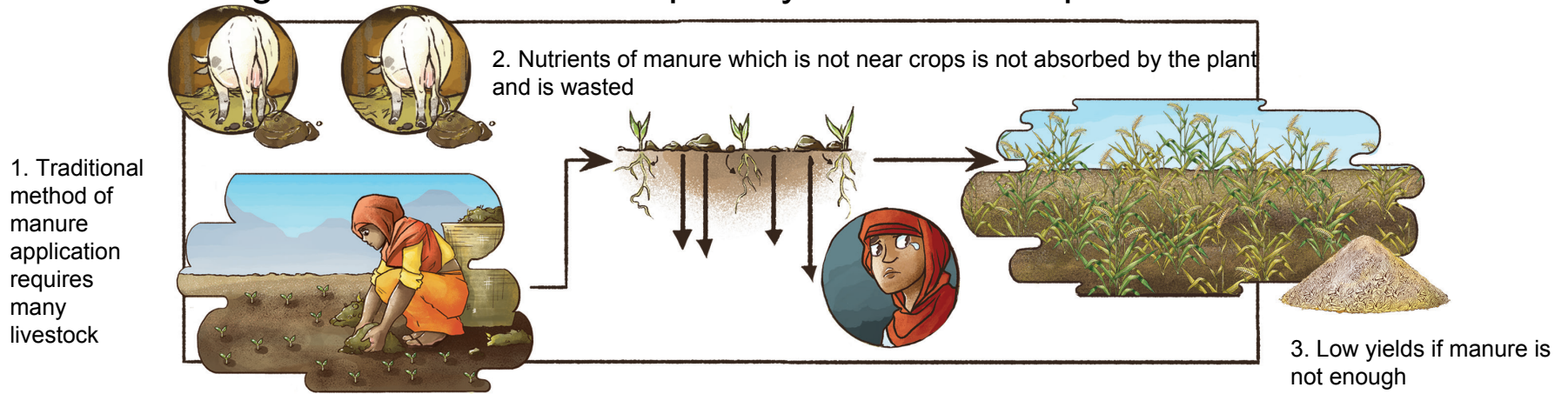
17. If clump is very wet, then mix heap from top to bottom

16. Clump with hand

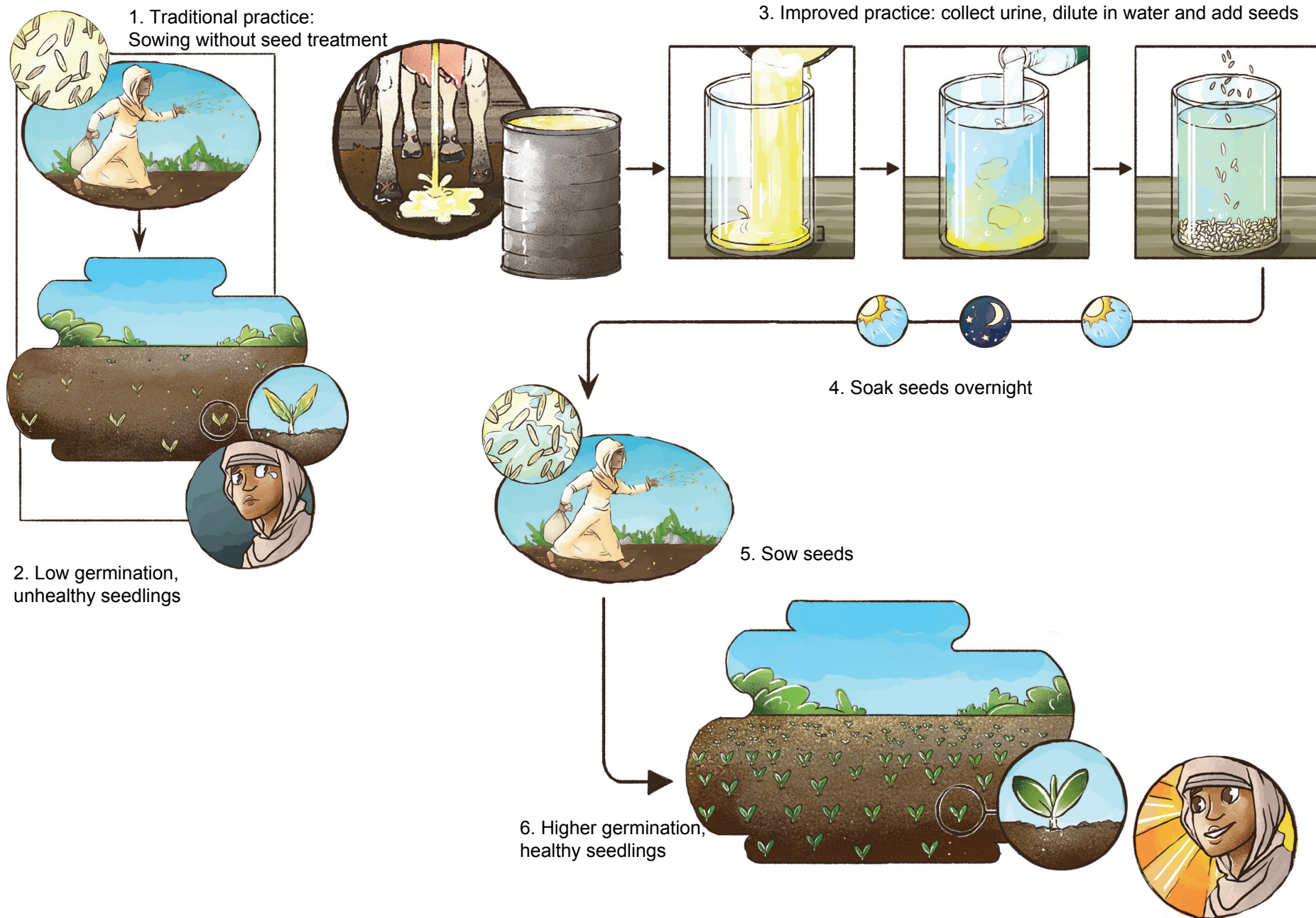
18. If the clump does not stick into a ball, then add water



# Lesson: Rather than traditional method of spreading manure, adding small amounts of manure directly to each seedling will reduce the total quantity of manure required

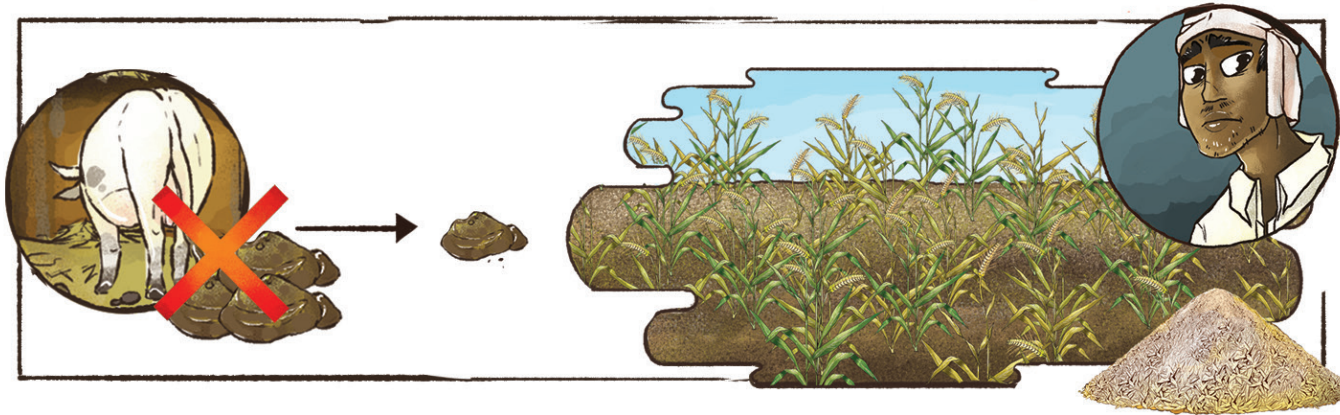


# Lesson: Treatment of seeds with livestock urine will improve seed germination and health

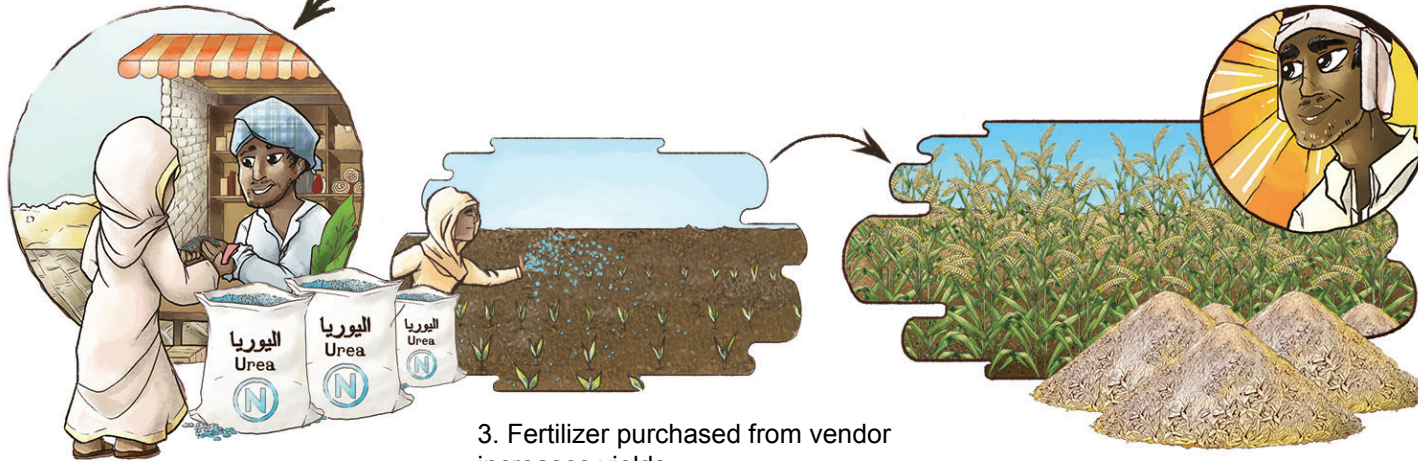
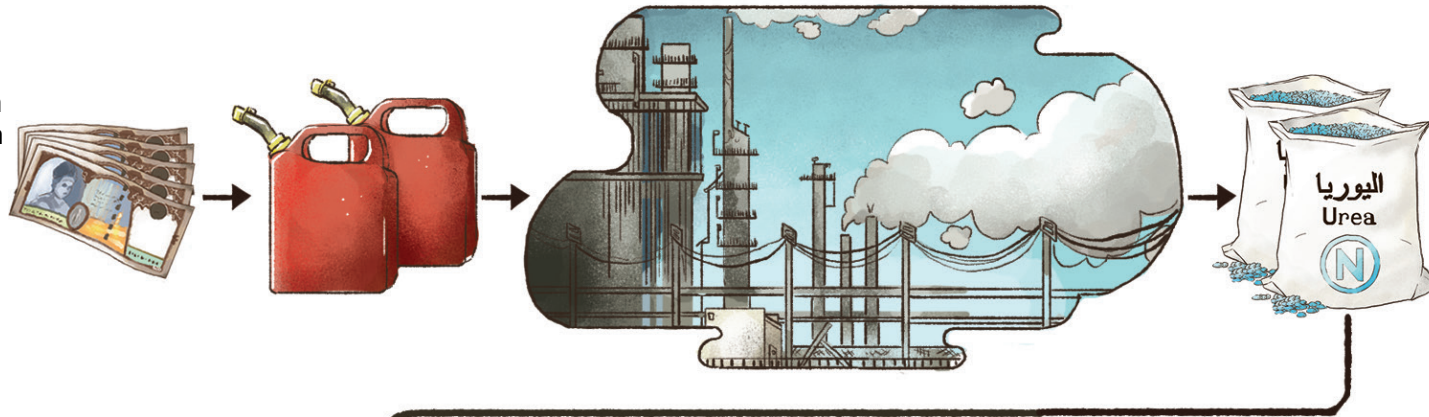


# Lesson: Synthetic nitrogen fertilizer raises crop yields

1. If not fertilizer or manure, crop yields are low



2. Synthetic nitrogen fertilizer is created in factories using natural gas or petrol, hence when petrol prices increase, fertilizer price will increase

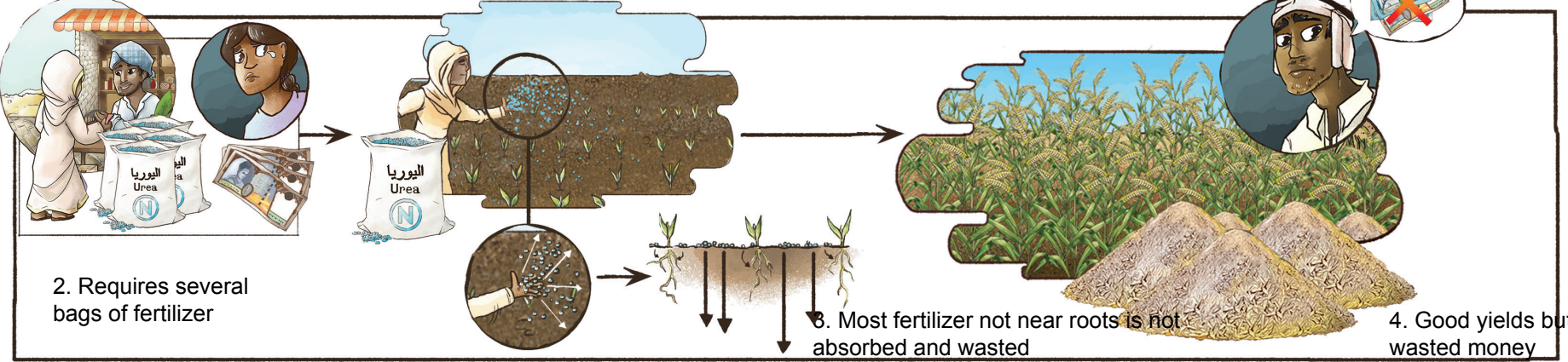


3. Fertilizer purchased from vendor increases yields

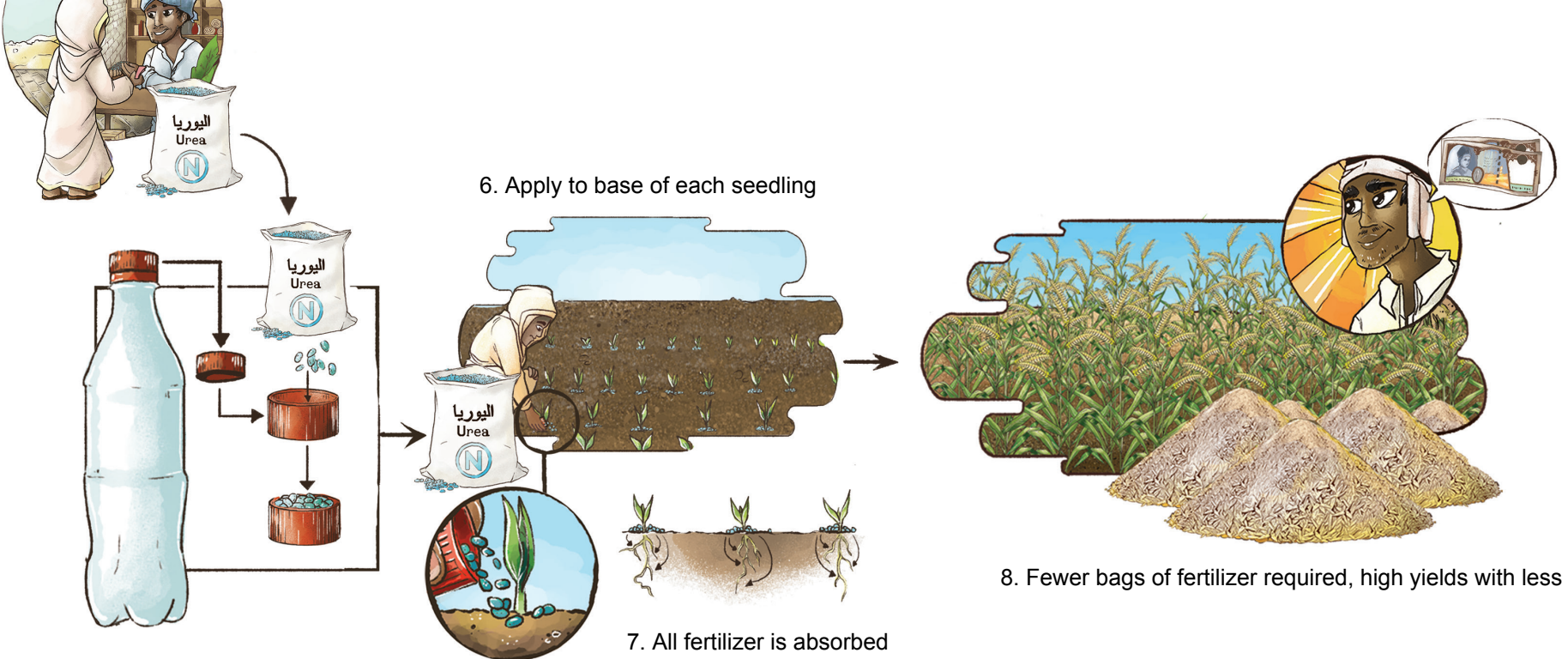


# Lesson: Rather than random broadcasting of fertilizer, adding small amounts using a bottle cap directly to each seed or seedling reduces the total amount of fertilizer required

1. Traditional practice: broadcasting fertilizer

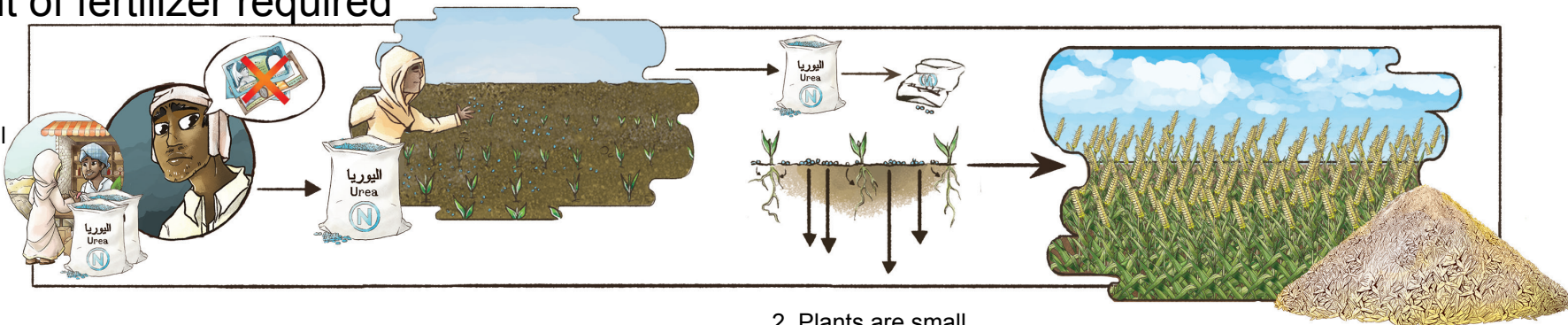


5. Improved practice: Place fertilizer in bottlecap



# Lesson: Rather than applying all fertilizer in a single dose, splitting the doses will reduce the amount of fertilizer required

1. Traditional practice of applying fertilizer in a single dose



2. Plants are small and will not absorb fertilizer

3. Money wasted, lower yield

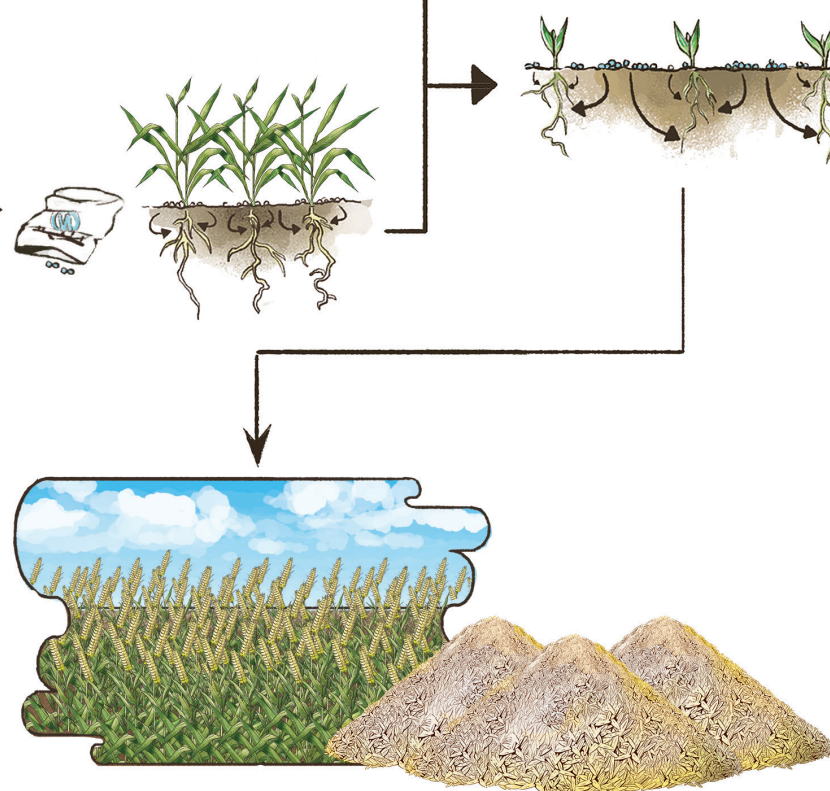
4. Improved practice is initially apply only 1/2 or 1/3 bag of fertilizer



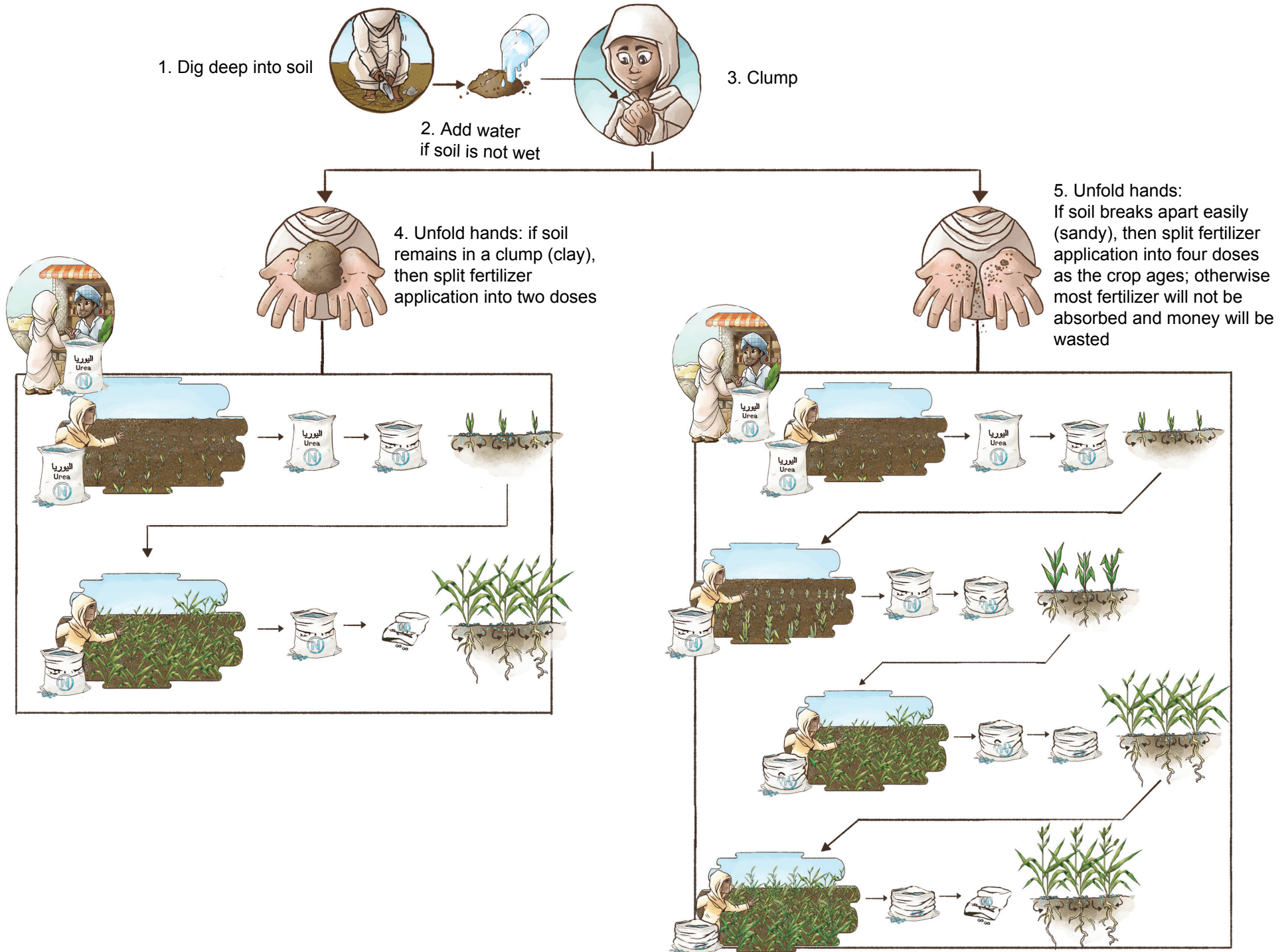
5. At a later stage, apply remaining fertilizer

7. High yields with less fertilizer and hence less money

6. All fertilizer is absorbed

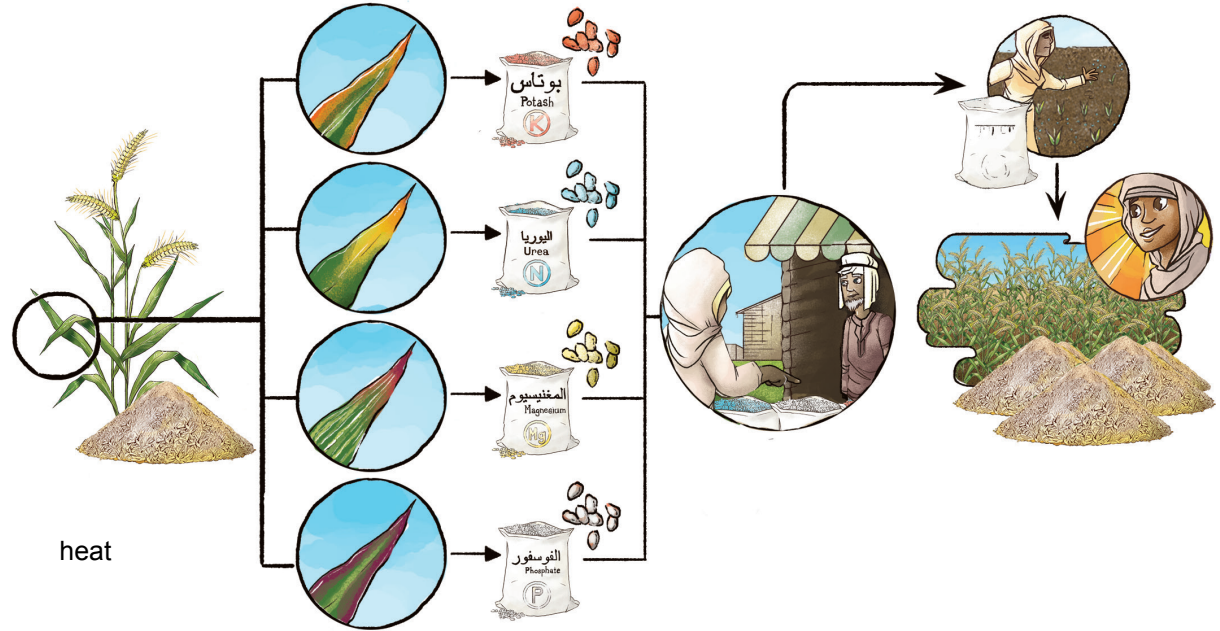


# Lesson: Artificial fertilizers should be applied differently on different soil-texture types

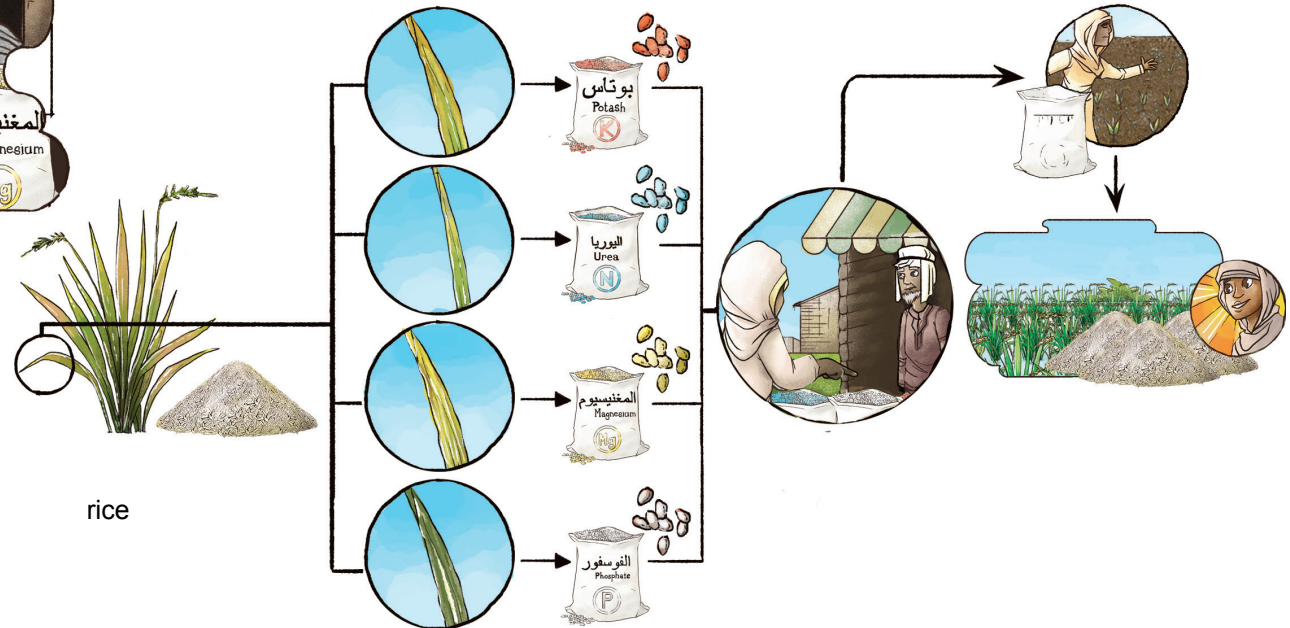


# Lesson: A colour change in crop leaves can potentially indicate that one type of fertilizer is lacking

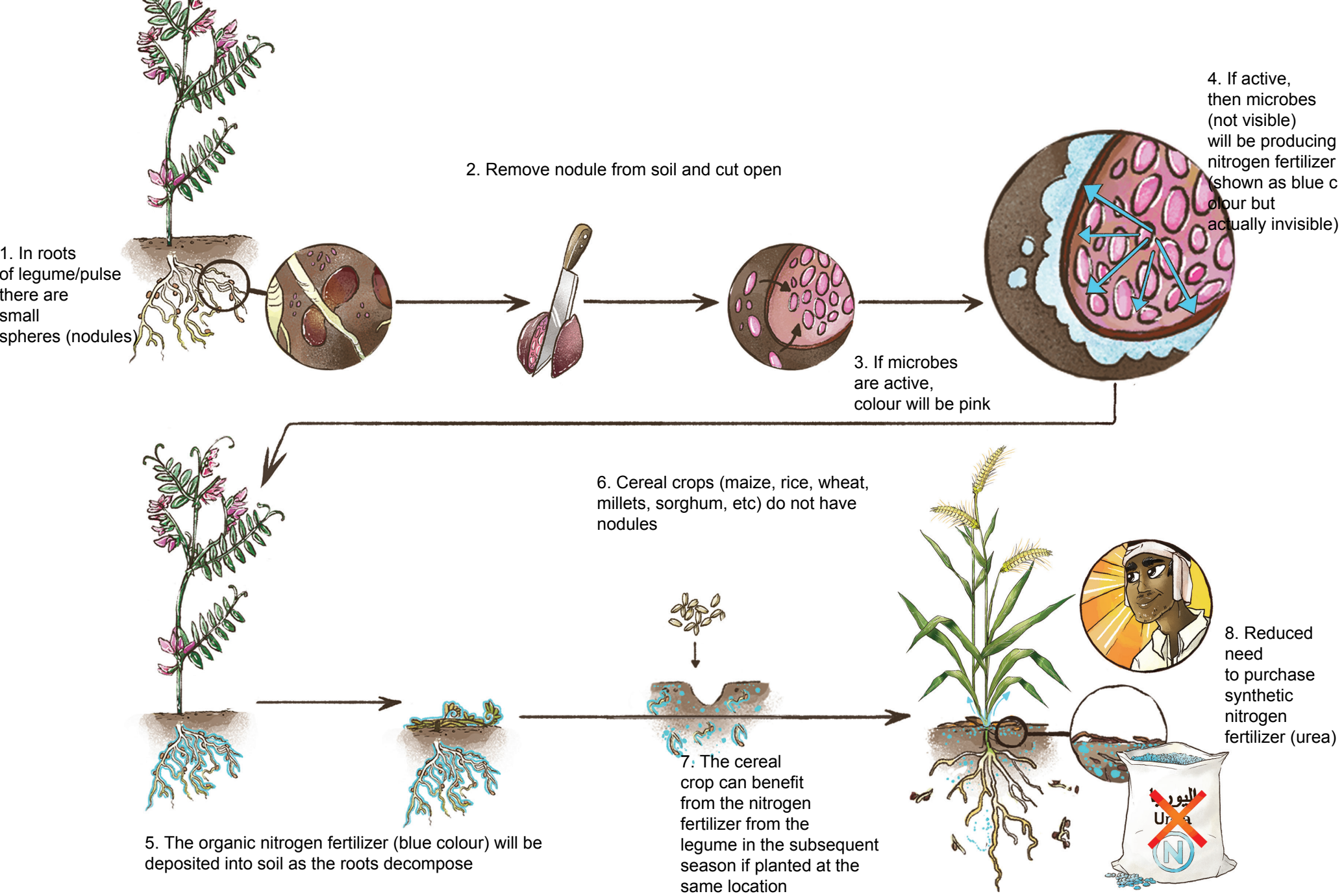
1. Traditional practice: crops are sick but the reason is unknown. To fix, a farmer purchases different fertilizers or pesticides but none may solve the problem.



2. Improved practice is look for a change in the colour and pattern on the leaves, then purchase the appropriate fertilizer if needed to achieve good yields



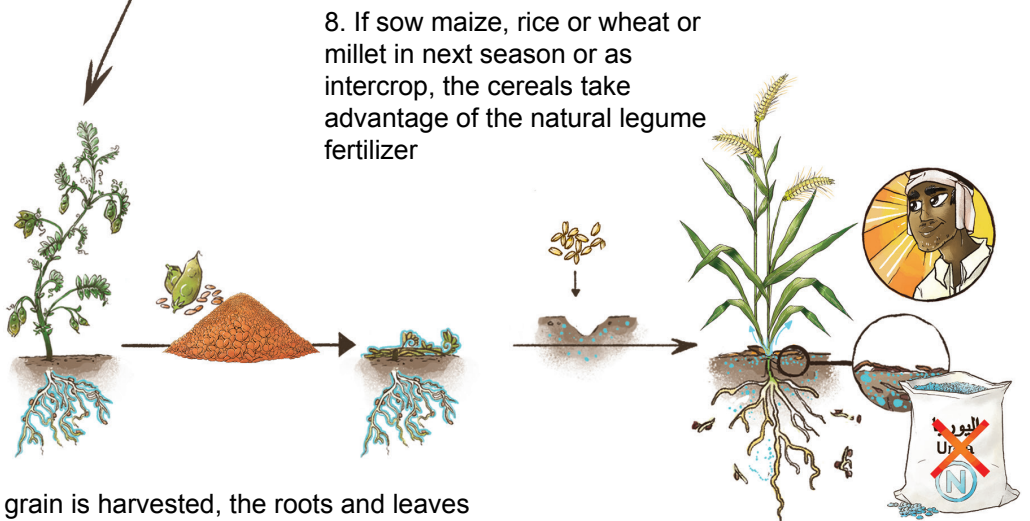
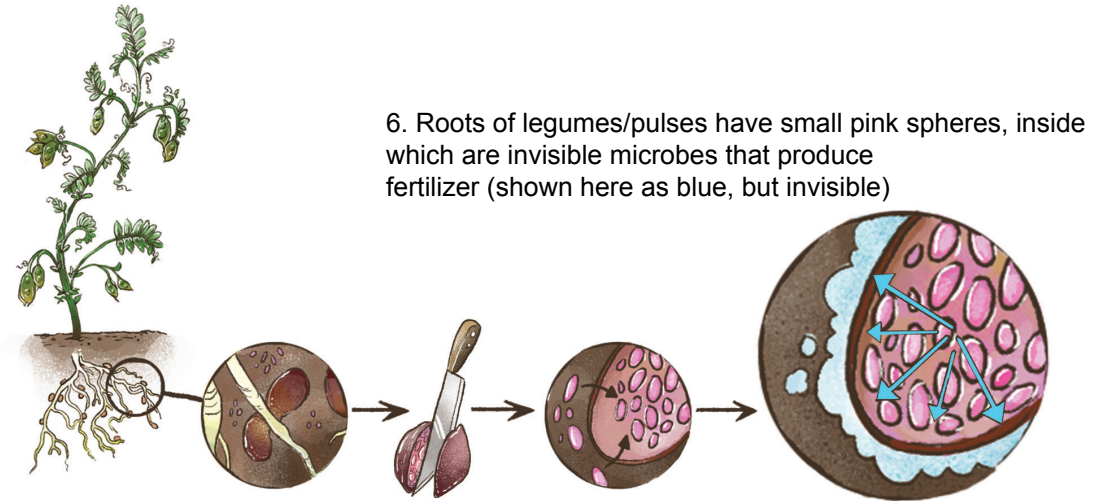
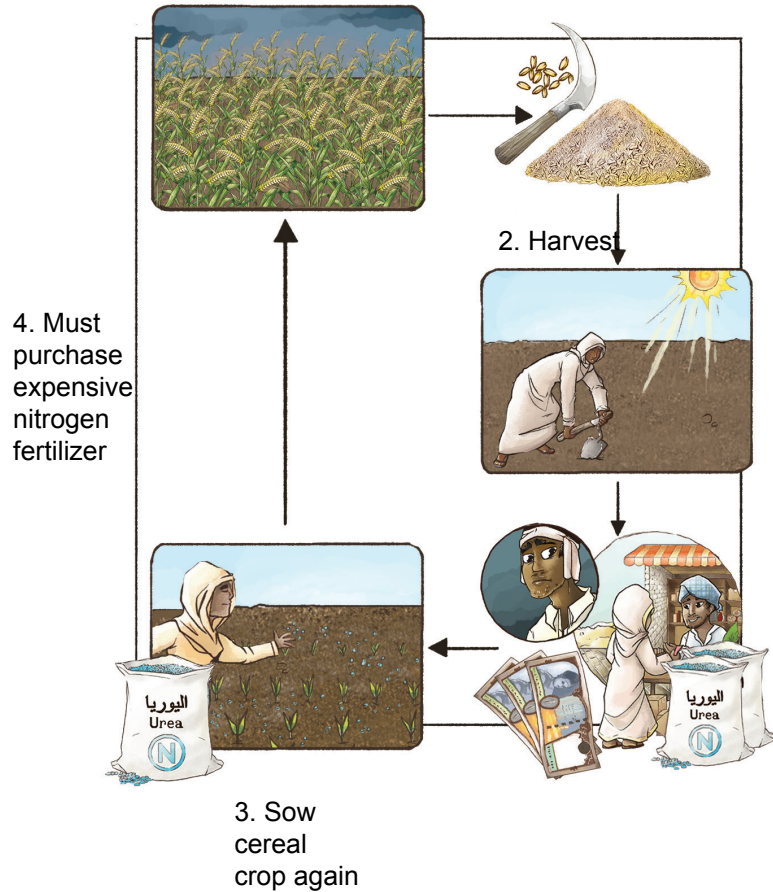
Background educational lesson: A legume (bean) or pulse can produce organic nitrogen fertilizer by associating with beneficial microbes (rhizobia) that inhabit spherical organs in the roots called nodules. If active the nodules are reddish in colour.



# Background educational lesson: The roots of legume and pulses have little spheres in which helpful microbes make natural nitrogen fertilizer to reduce need to purchase artificial fertilizer.

1. Bad practice: plant sole crop of maize wheat, rice, millet in all seasons (no legumes, no pulses)

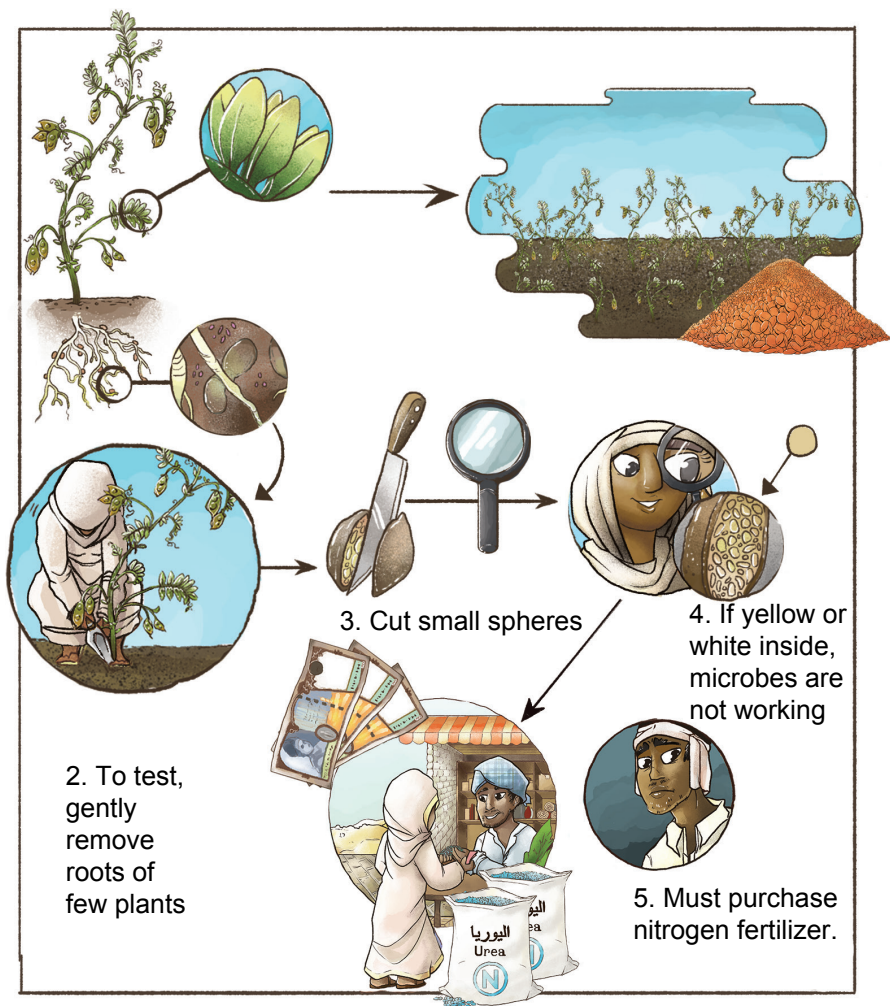
5. Improved practice: Plant legumes or pulses (e.g. lentil) as intercrop or in next season



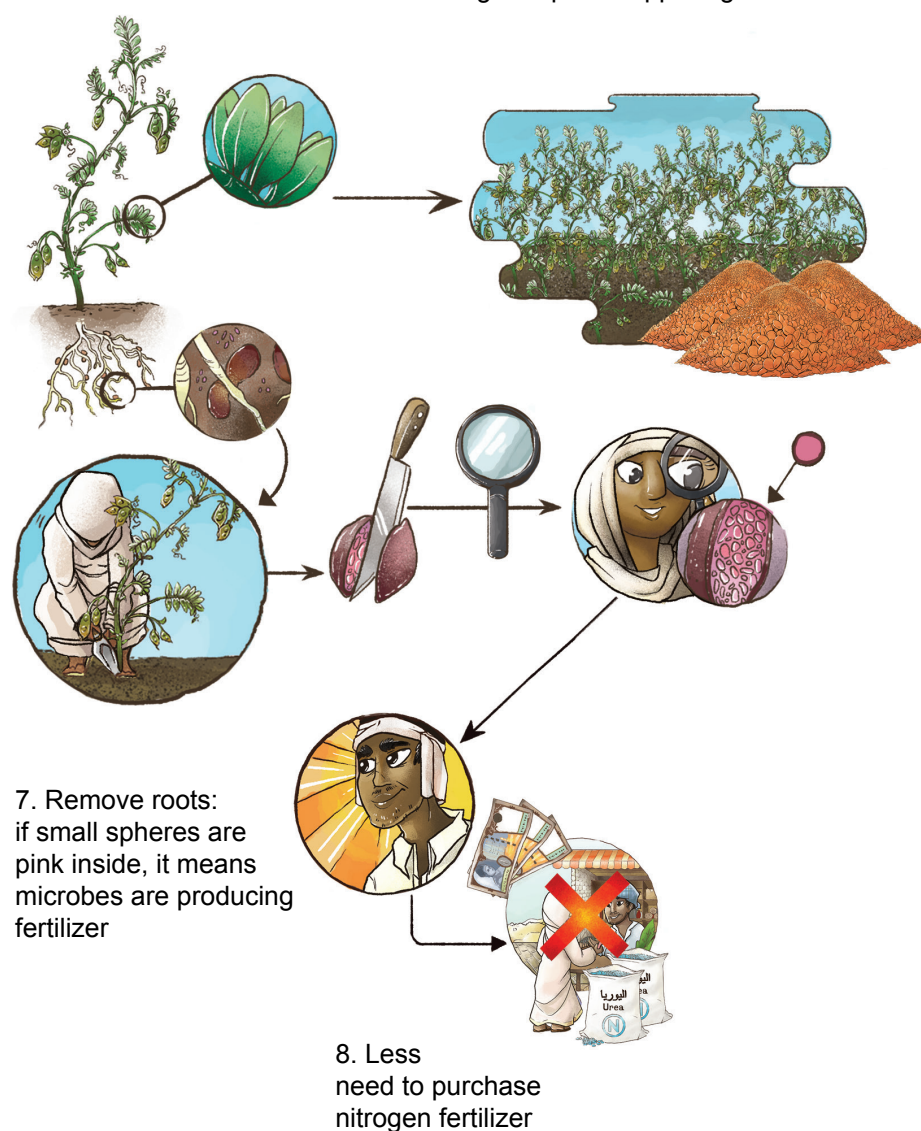
7. After legume grain is harvested, the roots and leaves remain rich in fertilizer (blue) which is deposited into the soil when they decompose

# Lesson: If small spheres on legume roots are only yellow inside, they do not contain healthy microbes to make natural nitrogen fertilizer, but a pink colour inside means they are producing fertilizer

1. Problem: legume leaves such as lentil are yellow causing low yields: might be disease or lack of fertilizer

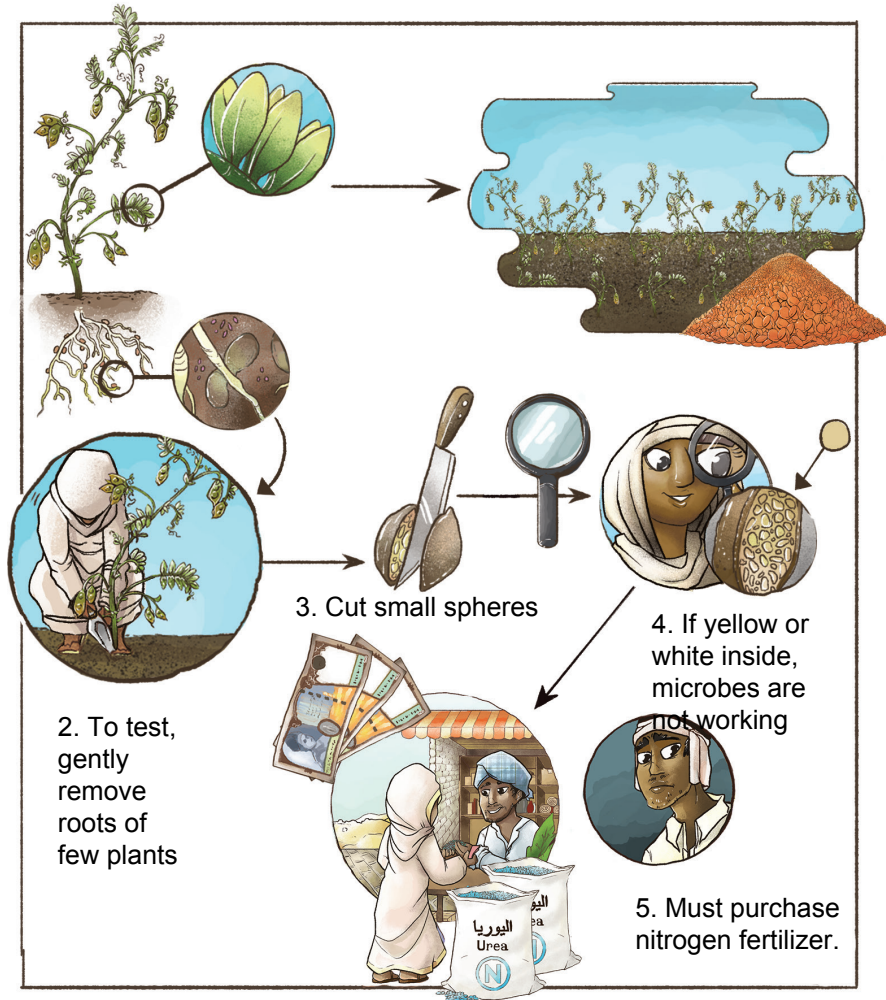


6. Good situation: legume plants appear green.



Lesson: If helpful microbe inside small spheres of legume roots are not making natural nitrogen fertilizer, the problem may be fixed in the future by purchasing healthy microbes called rhizobia and coating onto seeds. Seeds may also be purchased already coated with the microbes.

1. Problem: legumes or pulses are yellow, growing slowly, with low yield



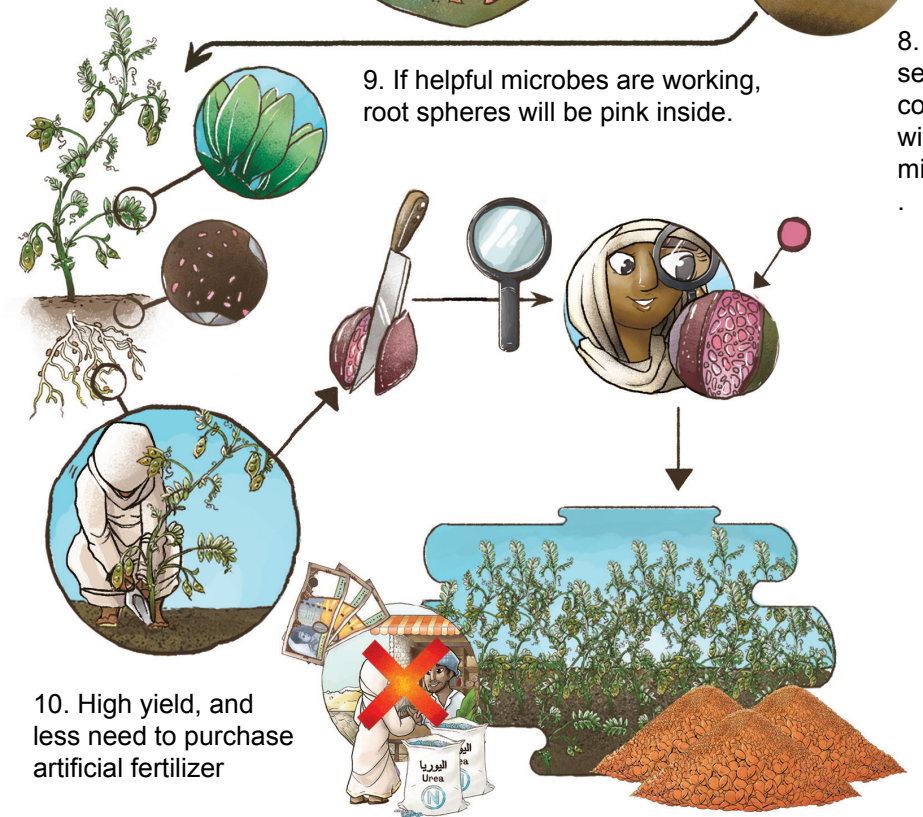
6. Solution: next time, purchase microbes in a bag (shown as pink inside green powder but invisible)

7. To attach microbes onto seeds, add sticky substance (white) to microbes (pink), plus seeds (brown), then shake



8. Sow seeds coated with microbes

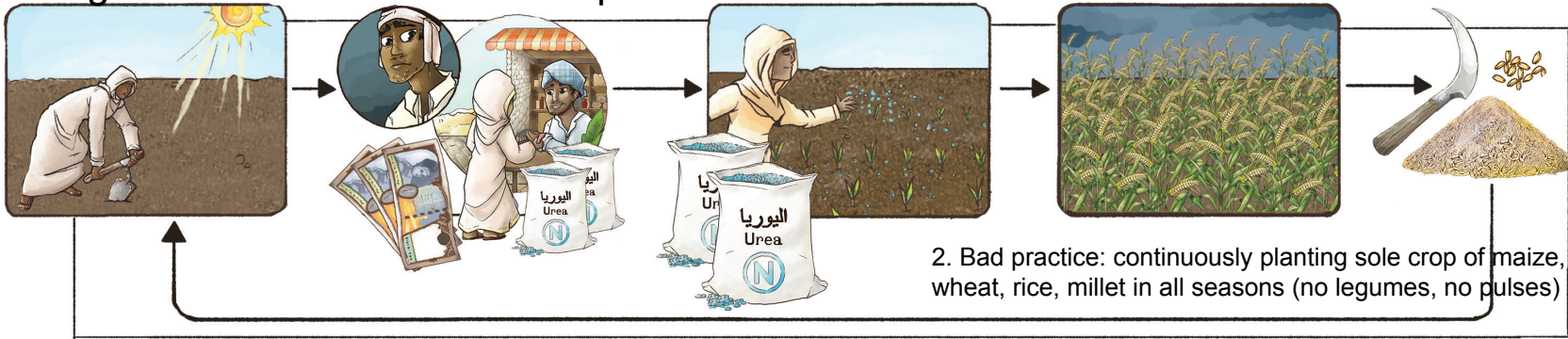
9. If helpful microbes are working, root spheres will be pink inside.





**Lesson: Rotating a cereal crop (e.g. maize) with a legume crop (e.g. beans) will reduce need to purchase artificial nitrogen fertilizer and will reduce pests/disease.**

1. Prepare field and add lots of fertilizer



2. Bad practice: continuously planting sole crop of maize, wheat, rice, millet in all seasons (no legumes, no pulses)

3. Improved practice

4. Prepare field



5. Sow legume (e.g. beans)



6. Harvest legume



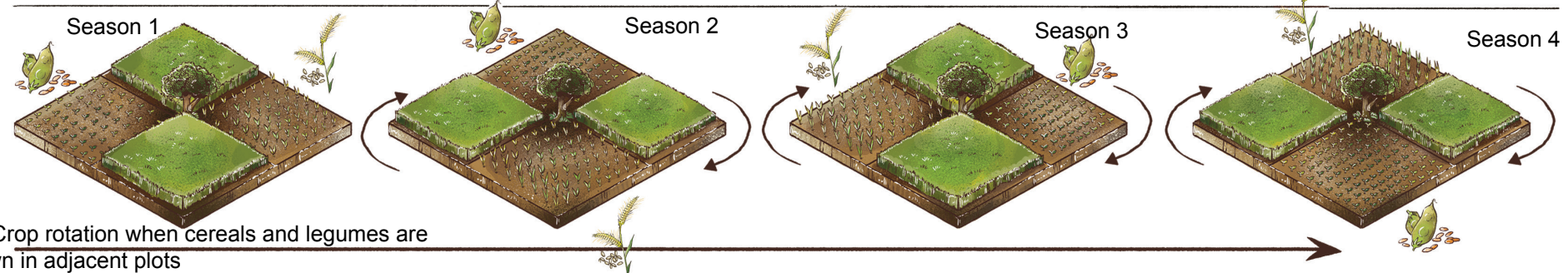
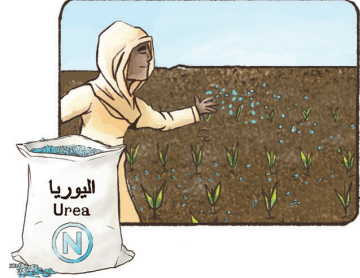
7. Sow cereal (maize, rice, sorghum, millet, etc.)



8. Harvest cereal



9. Purchase reduced amount of nitrogen fertilizer



10. Crop rotation when cereals and legumes are grown in adjacent plots

# Lesson: When soil is poor, it is better to plant pigeon pea first instead of a cereal crop

