

**CAREER  
PATHS**

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# AGRICULTURAL ENGINEERING



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Book

1

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## Scope and Sequence

Unit	Topic	Reading context	Vocabulary	Function
1	The Agricultural Engineer	Newspaper article	agriculture, assess, design, evaluate, farm, harvest, improve, irrigation, plant, produce	Asking for information
2	Crops	Webpage	cereal, crop, fruit, grain, harvest, industrial crop, melon, legume, tuber, vegetable	Asking for an opinion
3	Livestock	Advertisement	calf, cattle, cow, ewe, foal, hog, lamb, livestock, mare, piglet, sow, stallion	Offering an opinion
4	Animal Industries and Products	Announcement	beef, dairy, equine, leather, meat, milk, pork, poultry, protein, sheep, swine, wool	Reporting progress
5	Breeding	Advice column	breeding, breeding value, EPD, feed efficiency, heritability, pedigree, sire summary, trait, rate of gain, trait selection	Asking for an explanation
6	Slaughter and Processing	Textbook excerpt	body length, cattle race, crowd pen, flight zone, flighty, handling, point of balance, process, restraint, sever, slaughter, stun	Giving a list
7	Measurements 1	Conversion chart	acre, foot, hectare, imperial, kilometer, metric, meter, mile, square, yard	Asking about measurements
8	Measurements 2	Order form	Celsius, cubic centimeter, Fahrenheit, fluid ounce, gallon, kilogram, liter, pound, short ton, tonne	Describing degree
9	Numbers and Basic Math	Chart	add, divide by, equal, hundred, less, multiply by, minus, over, plus, subtract, times	Pointing out an error
10	Analyzing Quantities	Textbook excerpt	convert, decimal number, fraction, mixed number, out of, percent, point, quantity, reduce, whole number	Talking about quantities
11	Describing Change	Report	decline, decrease, expand, fluctuate, increase, plummet, rise, shrink, skyrocket, stabilize	Expressing (un)certainty
12	Large Numbers	Memo	cubed, exponent, hundredths, leading zero, tenths, thousandths, to the nth power, rounding error, scientific notation, significant figure, squared	Offering an apology
13	Tables and Graphs	Email	bar chart, column, legend, line graph, pie chart, row, scatter plot, table, x-axis, y-axis	Expressing necessity
14	SI Units	Textbook excerpt	amount, base unit, cubic meter, derived unit, force, kelvin, length, mass, mole, newton, SI, thermodynamic temperature, volume	Expressing pleasure
15	Education	Webpage	accredited, bachelor's degree, calculus, electricity, environmental science, foundation, master's degree, PhD, physics, prerequisite	Asking for/ Giving/Refusing permission

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Book

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## Scope and Sequence

Unit	Topic	Reading context	Vocabulary	Function
1	Problem Solving	Employee manual	analysis, approach, attack, iteration, iterative, problem identification, problem solving, procedure, redefine, solution, synthesis	Describing the order of events
2	Accounting	Report	closed system, consumption, extensive quantity, final, generation, initial, input, intensive quantity, open system, output, system, universal accounting equation	Offering solutions
3	Scientific Method	Textbook excerpt	conclusion, control group, evaluate, experiment, experimental group, hypothesis, independent variable, observation, problem, result, scientific method, testable	Talking about expectations
4	Rate Processes	Performance review	diameter, driving force, flow rate, flux, inlet, outlet, pressure, rate, rate process, viscosity	Asking for an opinion
5	Weather	Advice column	climate, freeze protection, frost, growing degree day, growing season, hardiness zone, heaters, humidity, long-range forecast, precipitation, site selection, temperature	Discussing possibility
6	Soil Classification and Composition	Soil report	classification, clay, coarse-grained, composition, fine-grained, highly-organic, peat, sand, silt, soil structure, soil texture, unified soil classification system	Making a recommendation
7	Salt and Acidity	Newspaper article	acidity, alkaline, dryland salinity, lime, pH value, primary salinity, salinity, secondary salinity, sodicity, sodium, sulfur, toxic	Expressing agreement
8	Planting and Cultivating Equipment	Product listing	broadcast seeder, chisel plow, cultipacker, cultivator, harrow, planter, rototiller, seed drill, stone picker, transplanter	Asking for/ Giving advice
9	Harvest Equipment	Classified ads	bale, bushel, chaff, chaser bin, combine harvester, conveyor belt, forage harvester, gleaner, grain auger, gravity wagon, harvester, hay baler, hay conditioner, reap, threshing	Expressing interest
10	Economics	Purchasing guide	annual ownership cost (AOC), break-even use (BEU), capital recovery factor (CRF), custom rate (CR), consumable, depreciation, fixed cost, insurance, fuel consumption, labor, operating cost (OPC), ownership cost, resale value, salvage value, variable cost	Requesting/ Offering help
11	Engines 1	User's guide	compress, connecting rod, crankcase, crankshaft, cylinder, diesel, engine block, gasoline, glow plug, head, piston, piston ring, spark plug, sump, valves	Making a prediction
12	Engines 2	Magazine article	compression stroke, cycle, exhaust, inlet, exhaust stroke, exhaust valve, four-stroke engine, fuel-to-oil ratio, ignite, intake stroke, intake valve, mix, power stroke, revolution, two-stroke engine, two-stroke oil	Delivering bad news
13	Powertrains	FAQs page	actuator, belt, chain, gear, hose, hydraulic, mechanical, powertrain, pulley, pump, pneumatic, reservoir, sprocket	Clarifying
14	GMOs	Journal article	biotech seed, biotechnology, expression, conventional seed, genetic engineering, genetically modified organism (GMO), herbicide-tolerant, insect-resistant, prohibition, regulation, societal concerns, transgenic	Expressing happiness
15	Career Options	Webpage	advisor, assessor, consultant, design engineer, investigator, management, manufacturing engineer, researcher, professor, public policy, sales engineer, regulator	Talking about plans

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## Scope and Sequence

Unit	Topic	Reading context	Vocabulary	Function
1	Tractors	Product webpage	front wheel assist, four wheel drive articulating steering (4WDAS), four wheel drive four wheel steer (4WD), garden tractor, general purpose tractor, horsepower, industrial tractor, orchard tractor, propulsion system, rear wheel drive, row crop tractor, tracks, tractor, vineyard tractor	Making a recommendation
2	Tractor Power Ratings	Report	advertised power, brake power, continuous load, lugging ability, derate, drawbar power, engine power, gross power rating, intermittent load, net power rating, power rating, PTO power, torque, usable power	Talking about similarities/differences
3	Machine Calibration 1	Seeder manual	calibrate, calibration chart, dispense, excessive, fixed, insufficient, skip, streak, meter, mobile method, pattern, stationary method, unit area, variable	Offering a solution
4	Machine Calibration 2	Textbook excerpt	acceptable, area, application rate, bulk metering, error, fertilizer applicator, flow rate per nozzle, granular, impeller, metering gate, metering unit, sprayer, travel speed, weight	Asking for repetition
5	Equipment Efficiency and Capacity	Evaluation	capacity, component, efficiency, field capacity, field efficiency, quality, machine loss, mechanical efficiency, MOG, performance efficiency, preharvest loss, theoretical field capacity, throughput capacity, utilize	Asking for clarification
6	Land Description	Textbook excerpt	base line, block and lot, dimensions, grid, location, meridian, metes and bounds, parallel, PLSS, POB, quadrangle, quarter section, rectangular system, section, township	Expressing agreement
7	Surveying	Guide	backsight, bench mark, differential leveling, elevation, foresight, GPS, instrument height, leveling, profile leveling, surveying, surveyor's rod, turning point, starting point, ending point	Asking for information
8	Runoff and Erosion	Textbook excerpt	cropping and management factor, culvert, drainage, erosion, perimeter runoff control, rainfall factor, rainfall intensity, runoff, runoff coefficient, soil erodibility, topographic factor, watershed, windbreaks	Making a suggestion
9	Irrigation 1	Webpage	above big gun, center pivot, drip irrigation, flood system, ground, impact, lateral move system, porous, rotor, side wheel roll system, skid-mounted, spray, sprinkler, subsurface, surface	Asking for/ Offering help
10	Irrigation 2	Email	application efficiency, deep percolation, drought-resistant, efficiency, evaporation, infiltrate, infiltration rate, irrigation peak use, root zone, rooting depth, soil depth, subsoil, transpiration, saturation, system capacity, wilting point	Expressing thanks
11	Crop Problems	Pamphlet	agricultural advisor, bacterial, blight, brown, field pattern, fungal, fungicide, herbicide, mulching, pest management, pesticide, pathogen, stippled, stunted, symptom pattern, weed, weed map	Expressing concern
12	Crop Handling and Storage	Webpage	aeration, bunker silo, cool, dry, dry-weight, grain auger, leveling, moisture, mold, pneumatic system, silage, silage bag, silo, storage, tower hopper, wet-weight basis	Expressing (un)certainty
13	Animal Waste Management	Email	aerobic treatment, anaerobic treatment, animal waste, compost, concentrate, contaminate, disposal, flush, handling, lagoon, liquid, manure, scrape, slurry, solid, treatment	Confirming information
14	Animal Housing and Temperature	Textbook excerpt	AC, barn, critical temperature, comfort zone, cold stress, coop, evaporative cooler, heat balance, heat flow, heat stress, pen, space R-value, requirements, U-value, ventilation	Expressing probability
15	Technological Advances	Journal article	air seeding, auto-steer, automated bin management, drip irrigation system, mechanized, overplanting, overwatering, self-propelled, smart irrigation control, technology	Expressing or denying necessity

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## Get ready!

1 Before you read the passage, talk about these questions.

- 1 What does an agricultural engineer do?
- 2 What skills does a good agricultural engineer have?



farm



plant



improve



design

harvest



irrigation

## Reading

2 Read the article. Then, choose the correct answers.

- 1 What is the main idea of the article?
  - A job openings for agricultural engineers
  - advice on becoming an agricultural engineer
  - responsibilities of agricultural engineers
  - recruitment for educational programs in agricultural engineering
- 2 Which of the following is NOT a duty of an agricultural engineer?
  - harvesting crops
  - assessing irrigation
  - designing machinery
  - evaluating waste systems
- 3 According to the article, what is the main focus of agricultural engineers?
  - repairing farm machinery
  - increasing farms' profitability
  - inventing new farm products
  - helping farmers better use their resources

## Vocabulary

3 Match the words (1-6) with the definitions (A-F).

- |              |              |
|--------------|--------------|
| 1 __ assess  | 4 __ produce |
| 2 __ farm    | 5 __ design  |
| 3 __ improve | 6 __ plant   |

- A to make something better
- B to plan out something
- C to examine something closely and make a decision
- D to create or make something
- E to place something in the ground so it will grow
- F to care for plants and animals as an occupation

## AGRICULTURAL ENGINEERS: **Unsung Heroes**

By Geoffrey Goodwin

**Agriculture** is important to us all. Many people work in this field. They're not all farmers, either. Agricultural engineers are important, but not well-known. They help people **farm** better by **producing** more food. Any time a farmer **plants** or **harvests**, an engineer is involved. Agricultural engineers do many different things. But their most important goal is

helping farmers use resources effectively. To this end, some **design equipment** or buildings. They may work with machinery. Others **assess** and **improve irrigation systems**. Land and water management are big concerns. Still others **evaluate** existing **waste management systems**. This includes animal waste and fertilizer runoff.

**4** Read the sentence pairs. Choose which word best fits each blank.

**1 evaluate / harvest**

- A When the crops are ready, he will \_\_\_\_\_ them.
- B The farmer needs someone to \_\_\_\_\_ his current waste system.

**2 agriculture / irrigation**

- A The farmer works in the field of \_\_\_\_\_.
- B Designing a better \_\_\_\_\_ system can improve water conservation.

**5** Listen and read the newspaper article again. What are some things that agricultural engineers design?

## Listening

**6** Listen to a conversation between a reporter and an agricultural engineer. Mark the following statements as true (T) or false (F).

- 1 \_\_\_ The man is working on an irrigation system.
- 2 \_\_\_ The project will help increase absorption.
- 3 \_\_\_ The man will be done by the end of the month.

**7** Listen again and complete the conversation.

**Reporter:** Wonderful. So, what are you **1** \_\_\_\_\_ now?

**Engineer:** I'm currently designing a new **2** \_\_\_\_\_ system.

**Reporter:** What can **3** \_\_\_\_\_ about that?

**Engineer:** It's designed to reduce **4** \_\_\_\_\_. It'll also increase absorption.

**Reporter:** When will it **5** \_\_\_\_\_?

**Engineer:** Hopefully we'll be done **6** \_\_\_\_\_ of this year.

## Speaking

**8** With a partner, act out the roles below based on Task 7. Then, switch roles.

**USE LANGUAGE SUCH AS:**

*What can you tell us about your work?  
What are you working on now?  
When will it be finished?*

**Student A:** You are a reporter. Talk to Student B about:

- his or her occupation
- his or her current project
- when it will be completed

**Student B:** You are an engineer. Talk to Student A about your occupation.

## Writing

**9** Use the conversation from Task 8 to fill out the reporter's notes.

### SUNSHINE VALLEY PAPER: Interview Notes

Date: 10/05

Name of Subject: \_\_\_\_\_

Occupation: \_\_\_\_\_

Current project and goal: \_\_\_\_\_

Expected completion date: \_\_\_\_\_

# 2

## Tractor Power Ratings



WESTVIEW AGRICULTURAL ENGINEERS

POWER RATING REPORT

**Kata Model K2S**

**VS.**

**Dover Model DX4**

Location of Tests: Westview, IA - Dates of Tests: May 1 – May 8

Westport Agricultural Engineers completed power rating tests for two popular tractor models. The goal was to test **usable power** compared to **advertised power**.

**Engine power**, or the **gross power rating**, represents the total amount of power produced. **Net Power rating** measures **PTO power**. Engine power is **derated** at 10% for all accessories except for fans. Power is derated at 5% for fans.

Engine type:	Four cylinder vertical with turbocharger Ratings at 2000 RPM	
Make/Model	Kata K2S	Dover DX4
Gross Power	474 HP	480 HP
Net Power	450 HP	460 HP <b>advertised power</b>
Maximum torque*	2014	2010

\*Engine torque curve measured with no **lugging ability**.

**Drawbar power** for both tractors is variable. Please see the attached charts measuring drawbar performance. Charts compare power, pull and fuel consumption with **intermittent loads** and **continuous loads**. Our engineers did not measure **brake power**. This is no longer considered a useful rating for tractors.

### Conclusion:

The Kata Model K2S and Dover Model DX4 are both good quality tractors. Westview found that the Kata K2S is a better machine overall. The maximum **torque** and **drawbar power** are both higher on the Kata.

### Get ready!

1 Before you read the passage, talk about these questions.

- 1 What is the difference between the gross power rating and the net power rating?
- 2 Why is the PTO power rating important to a tractor?

### Reading

2 Read the report. Then, mark the following statements as true (T) or false (F).

- 1 \_\_\_ The tractors are made by two different companies
- 2 \_\_\_ The maximum torque rate is higher in the Dover DX4.
- 3 \_\_\_ Brake power is a good measure for tractor engines.

### Vocabulary

3 Place the words and phrases from the word bank in the correct box.

**Word BANK**

- intermittent load
- advertised power
- PTO power
- continuous load
- drawbar power
- gross power rating
- usable power
- net power rating

Basic Engine Power	_____
In-Use Engine Power	_____
Load Type	_____

**4** Read the sentence pairs. Choose which word or phrase best fits each blank.

**1 engine power / lugging ability**

- A** \_\_\_\_\_ measures the temporary overload that an engine can withstand.
- B** The cylinder pressure is included when measuring the \_\_\_\_\_.

**2 derated / power rating**

- A** The engine power must be \_\_\_\_\_ by 10% for each accessory.
- B** Engineers calculate the \_\_\_\_\_ to evaluate the size of tractors and engines.

**3 brake power / torque**

- A** The twist that the engine can apply to the drive wheel is called \_\_\_\_\_.
- B** \_\_\_\_\_ is not a useful rating for tractors.

**5** Listen and read the report again. What is the difference between the two types of power compared in the report?

## Listening

**6** Listen to a conversation between an engineer and a farmer. Mark the following statements as true (T) or false (F).

- 1 \_\_\_ The man found an error on the report.
- 2 \_\_\_ Tractors on the report were not derated.
- 3 \_\_\_ The report does not measure brake power.

**7** Listen again and complete the conversation.

**Engineer:** Are there specific parts that are **1** \_\_\_\_\_?

**Farmer:** Yes. First, can you tell me the difference between the gross power rating and the **2** \_\_\_\_\_?

**Engineer:** Sure. The gross power is the engine power with **3** \_\_\_\_\_ attached.

**Farmer:** Such as?

**Engineer:** A muffler and an **4** \_\_\_\_\_, for example.

**Farmer:** Oh ... Okay. So the net power measures the power with those attached.

**Engineer:** Exactly. We've **5** \_\_\_\_\_ the tractors that you are interested in based on the accessories that you will need.

**Farmer:** Got it. Now what about brake power. I remember seeing that somewhere, but it's not listed here.

**Engineer:** That's a rating better suited to **6** \_\_\_\_\_, like irrigation pumps. We don't use it for tractors anymore.

## Speaking

**8** With a partner, act out the roles below based on Task 7. Then, switch roles.

**USE LANGUAGE SUCH AS:**

*I wanted to go over ...*

*I'm afraid I find the numbers ...*

*Can you tell me the difference between ...?*

**Student A:** You are an agricultural engineer. Talk to Student B about:

- the tractor power ratings reports
- the gross power rating
- the net power rating

**Student B:** You are a farmer. Talk to Student A about the tractor engine power ratings.

## Writing

**9** Use the report and the conversation from Task 8 to write a follow-up email to a farmer about tractor power ratings. Include: gross power rating, net power rating, and torque measurements.

# Glossary

- site selection** [N-UNCOUNT-U5] **Site selection** is the act of choosing an area to plant crops in.
- societal concerns** [EXPRESSION-U14] **Societal concerns** are worries people have about how safe or ethical something is.
- sodicity** [N-UNCOUNT-U7] **Sodicity** is the concentration of sodium in soil.
- sodium** [N-UNCOUNT-U7] **Sodium** is a chemical element with the symbol Na that is an ingredient in table salt.
- soil structure** [N-COUNT-U6] **Soil structure** is how the particles in soil are connected to each other and how much space is between them.
- soil texture** [N-COUNT-U6] **Soil texture** is the classification of the size of particles within soil.
- solution** [N-COUNT-U1] A **solution** is a way of solving or fixing a problem.
- spark plug** [N-COUNT-U11] A **spark plug** is a device that uses electricity to create a spark to ignite the fuel.
- sprocket** [N-COUNT-U13] A **sprocket** is a circular component with spikes that engages with a chain to transmit power.
- stone picker** [N-COUNT-U8] A **stone picker** is a farming device that separates rocks from good soil.
- sulfur** [N-UNCOUNT-U7] **Sulfur** is a chemical element with the symbol S that is typically yellow in color and has a powerful smell.
- sump** [N-COUNT-U11] A **sump** is a reservoir that stores oil in the engine.
- synthesis** [N-COUNT-U1] A **synthesis** is a combination of multiple items or elements.
- system** [N-COUNT-U2] A **system** is a set of connected things that work together to produce a result.
- temperature** [N-COUNT-U5] **Temperature** is the measurement of something's heat.
- testable** [ADJ-U3] If something is **testable**, it can be proven or disproven by performing an experiment.
- threshing** [N-UNCOUNT-U9] **Threshing** is the process of removing seeds or grain from a plant.
- toxic** [ADJ-U7] If something is **toxic**, it is harmful to life.
- transgenic** [ADJ-U14] If a living thing is **transgenic**, it has genes from another living thing spliced into its DNA.
- transplanter** [N-COUNT-U8] A **transplanter** is a device pulled behind a tractor that places small plants in the soil.
- two-stroke engine** [N-COUNT-U12] A **two-stroke engine** is a type of internal combustion engine that completes its cycle when the crankshaft makes one revolution.
- two-stroke oil** [N-UNCOUNT-U12] **Two-stroke oil** is a special oil added to the fuel of a two-stroke engine to lubricate it.
- Unified Soil Classification System** [N-UNCOUNT-U6] **The Unified Soil Classification System (USCS)** is a tool for grouping soils into types based on their texture and composition.
- universal accounting equation** [N-UNCOUNT-U2] The **universal accounting equation** is an equation that is used to measure changes in extensive quantities over particular periods of time.
- valves** [N-COUNT-U11] **Valves** are devices that control the flow of fluid by opening and closing.
- variable cost** [N-UNCOUNT-U10] **Variable cost** is a cost that changes with the use of the machine.
- viscosity** [N-UNCOUNT-U4] **Viscosity** is the resistance of a liquid that affects how fast it flows.
- winnowing** [N-UNCOUNT-U9] **Winnowing** is a process of separating the chaff from the grain.

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# AGRICULTURAL ENGINEERING



**Career Paths: Agricultural Engineering** is a new educational resource for agricultural engineering professionals who want to improve their English communication in a work environment. Incorporating career-specific vocabulary and contexts, each unit offers step-by-step instruction that immerses students in the four key language components: reading, listening, speaking, and writing. **Career Paths: Agricultural Engineering** addresses topics including types of crops, irrigation, genetic modification, harvesting, and career options.

The series is organized into three levels of difficulty and offers a minimum of 400 vocabulary terms and phrases. Every unit includes a test of reading comprehension, vocabulary, and listening skills, and leads students through written and oral production.

**Included Features:**

- A variety of realistic reading passages
- Career-specific dialogues
- 45 reading and listening comprehension checks
- Over 400 vocabulary terms and phrases
- Guided speaking and writing exercises
- Complete glossary of terms and phrases

The **Teacher's Guide** contains detailed lesson plans, a full answer key and audio scripts.

The **audio CDs** contain all recorded material.



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