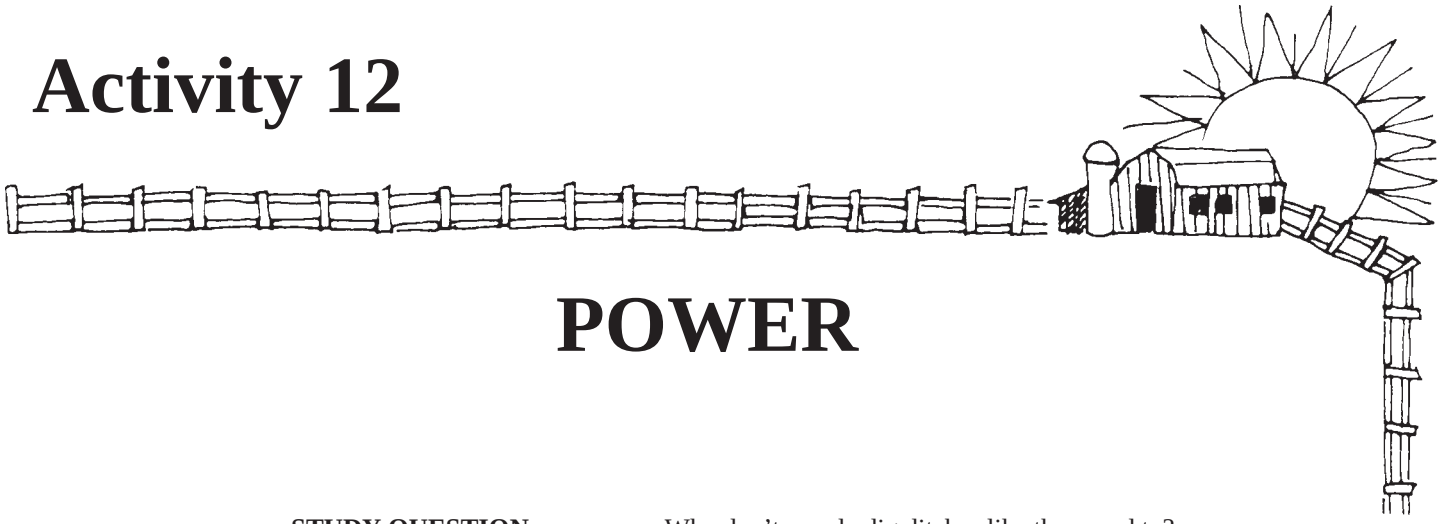
Activity 12



POWER

STUDY QUESTION: Why don't people dig ditches like they used to?

THE ACTIVITY: Students evaluate and compare agricultural power sources as renewable and non-renewable resources.

CURRICULUM FIT:

SCIENCE
- Matter and Energy.
- Energy resources and conservation.

MAJOR CONCEPT
- Energy sources guide industrial and technical development.

LESSON CONCEPT
- Energy has been necessary in the past, is necessary today, and will be necessary in the future. Development of most industries has been strongly influenced by energy sources. The sources of energy to accomplish our work are changing. Are they renewable or non-renewable?

AGRICULTURE CONCEPTS: Capital and Technology Intensive Nature of Agriculture

PURPOSE:
- ○ To compare power and fuels used in the development of the agriculture industry in Alberta.

MATERIALS REQUIRED: Supplied in this lesson.

TIME REQUIRED: 1 class period.

BACKGROUND - For the Teacher

Agriculture is a very energy intensive industry. Because of the energy required by physical working of the land and the chores related to animal production or husbandry, farmers have sought more power from sophisticated machines to assist them with farm labour. In this exercise students will be asked to evaluate some of the forms of power and the fuels they consume as to their efficiency, ease of use, and renewability.

The fuel that we grow is renewable. Some of the materials required to produce this fuel are **not** renewable. Today we require more and more power to do work. Industries of the past depended largely on animals, human labour, or water power. They are now dependent on high energy natural resources such as gas and oil.

In this exercise we will look at the various sources of farm power that have been used in Alberta in the last 100 years.

There are two separate activities outlined in this lesson. One only, or both, will prepare students for the conclusion and discussion questions. In addition, a list of tasks are provided which may be given to groups of students or individuals who wish to explore the question of power in more detail.

PROCEDURE

Part 1

Introduction

Discovering power

1. Begin by asking the class to define Power by answering some of the following questions:
   a) What makes power?
   b) What can it do for us?
   c) What are some capabilities of your own physical powers? (walking, running)
   d) By using tools we can increase our personal power. Examples: rakes, hammers, etc.
   e) All power or energy requires fuel. What is our source of fuel?
   f) Various foods have different amounts of energy content. What is a high energy food? (sugar) Does sugar supply all of our needs? Why not?
   g) We eat food to supply our bodies with energy. This gives us power. Can you think of any other sources of power that humans use, and that they grow food or fuel for? (animals - feed, steam - wood)

Part 2

Making Comparisons

2. Look at the flow chart that illustrates butter making. "Butter Production Compared, 1900 and 1996".

   The processes in butter production are identified by numbered boxes. Notice that the processes are identical in 1900 and 1996. However, the power and fuels used to do the same work are very different.
3. On the work sheet, try to fill in the power and fuel sources for each of the processes used in butter production in 1900 and 1996.

Note: Identify the fuel used to generate power for work done which does not produce the milk. See the example on the work sheet.

Gathering Information

4. Have the students study the historical pictures provided with this lesson. They depict various sources of farm power which have been used on Alberta farms in the past.
5. Ask the students to do the following tasks:
   a) Identify the source of power for each illustration. (fuel)
   b) Describe the activity shown.
   c) Decide if the fuel required in each case is a renewable resource.
   d) Choose which of these power sources are the most efficient and which are the least efficient.

Part 3
Conclusion

6. With the class, show the steps of the production and processing of their break fast cereal.

   This can be a quick flow chart on the black board. Have them identify the areas where power is required and ask them to suggest what fuels are used.

FOR DISCUSSION

1. From a conservation point of view, which of the power sources discussed in this lesson would be best?
2. Why don't we use power sources that are totally renewable?
3. Take a look at the following chart of power used on farms. Notice the various fuel sources and pay particular attention to whether the fuel is a renewable resource or not. How much energy is generated?

RELATED ACTIVITIES

1. Make a collage of pictures of farm activities using various forms of power.
2. Assemble a collection of simple machines and note their efficiency.
3. Try to build a simple machine that uses each of the following for power - hand, wind and water.

Worksheet

Butter Production Compared

Fill in the power source and fuel required for both charts. Number 1 is done for you.

BUTTER PRODUCTION 1900

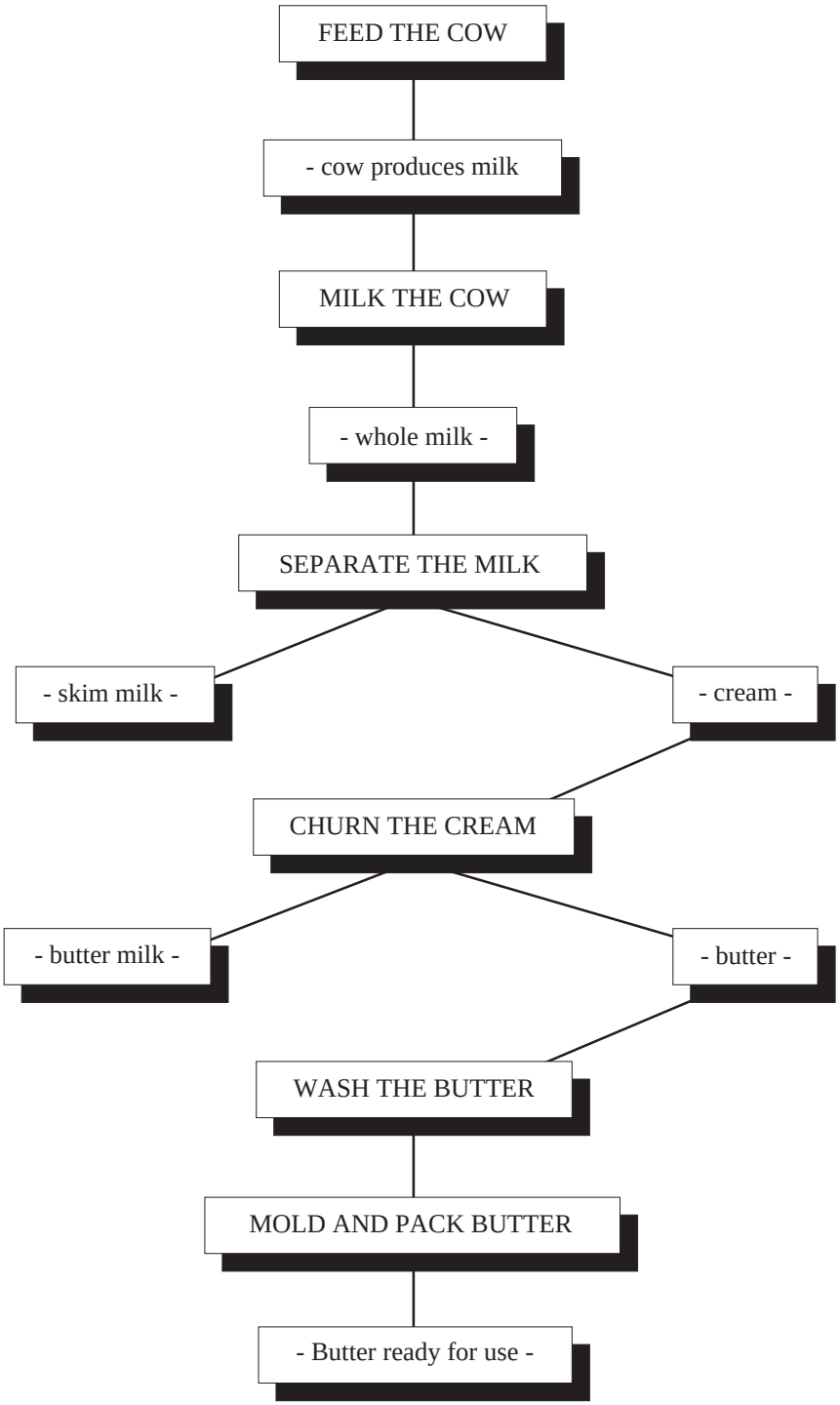
	POWER SOURCE	FUEL REQUIRED
1. Feed the cow	- human labour	- human food
2. Milk the cow		
3. Separate the milk		
4. Churn the cream		
5. Wash the butter		
6. Mold and pack the butter		

BUTTER PRODUCTION 1996

	POWER SOURCE	FUEL REQUIRED
1. Feed the cow	- machine labour (gas, oil)	- fossil fuel
2. Milk the cow		
3. Separate the milk		
4. Churn the cream		
5. Wash the butter		
6. Mold and pack the butter		

STUDENT RESOURCE

Butter Production Process 1900 or 1996



TEACHER RESOURCE

Discover Power

Suggested student projects:

1. Make a list of 3 wind powered machines.

   (Knowledge)

2. Locate the source of power in the pictures provided in the hand book.

   (Knowledge)

3. Explain how one of these machines works. Be sure to discuss power, function, and efficiency.

   (Comprehension)

4. Arrange the pictures of farm work in chronological order. Make a time line to show when each may have been practised on Alberta farms.

   (Application)

5. Compare the cost of modern tractors to the cost of a two yoke team of oxen. Try to make the adjustment of dollar value by finding out the price of some standard item (i.e., 1 dozen eggs in 1900 compared to $1.35 today).

   Compare the work that can be done by each of these power sources in 1 day.
   Team oxen can provide the power to plough _____ per day.
   Medium size diesel tractor can provide the power to plough _____ per day.

   2 yoke of oxen cost $260.00
   Medium size tractor costs $60,000.00

   (Analysis)

6. Build a working model of a wagon out of spools of thread and popsicle sticks. Then recommend a source of power to move it from place to place.

   (Synthesis)

7. Rank the sources of power that are given in the illustrations as to:
   a) the amount of work that can be done in 1 day.
   b) the cost of fuel.
   c) the ease of repair.

   (Evaluation)

8. Recommend a use for solar energy on a farm.

   (Evaluation)

9. Choose the most modern source of power from the pictures in the handbook. What is the most primitive source of power?

   (Evaluation)

TEACHER RESOURCE

Farm Power Compared

Power	Fuel Source or Source	Renewable Fuel	Type of Energy Generated
Human	Food (meat, vegetables)	Yes	Very low power, inefficient
Draft Animal	Hay, Grain	Yes	Low power - slow
Steam	Coal, Gas, Oil Wood	No Yes	Stationary or slow moving - powerful
Electrical	Wind, Water Gas, Oil, Coal	Yes No	Requires generators or electrical hook ups - good stationary power
Internal Combustion Engine	Gas, Oil Alcohol	No Yes	High energy - very mobile

Agriculture and the Provincial Economy

From its inception as a province in 1905, Alberta has been a significant agricultural producing area. As a result of the homestead policies pursued by the federal and provincial governments in the first 30 years of Alberta's history, the number of farms grew rapidly.

But since 1931 the farm population has declined from being over half the total provincial population to being only 10% of that population today.

The trend toward larger farms and the movement off the land has been accompanied by a major shift in the structure of the provincial economy from being basically agricultural to being dominated by mineral development, especially petroleum.

While no longer responsible for the commodity bringing the most revenue to the province, agriculture still occupies a position of major importance in the economy of Alberta and Canada.

Thus although agricultural production (farm receipts) accounts for only 8% of the dollar value of all goods produced in Alberta, processing and transporting these goods and the sale of chemicals, fertilizer, machinery, and providing storage facilities, which are associated with farm output, provides for a great deal of additional economic activity. In the final analysis about one half of the gross provincial product is directly or indirectly related to agriculture. The largest of these agriculture related industries is the food and beverage segment which accounts for 24% of the value of all shipments. As well as being the predominant industry in terms of the value of the goods manufactured, the food and beverage industry has the largest number of employees.

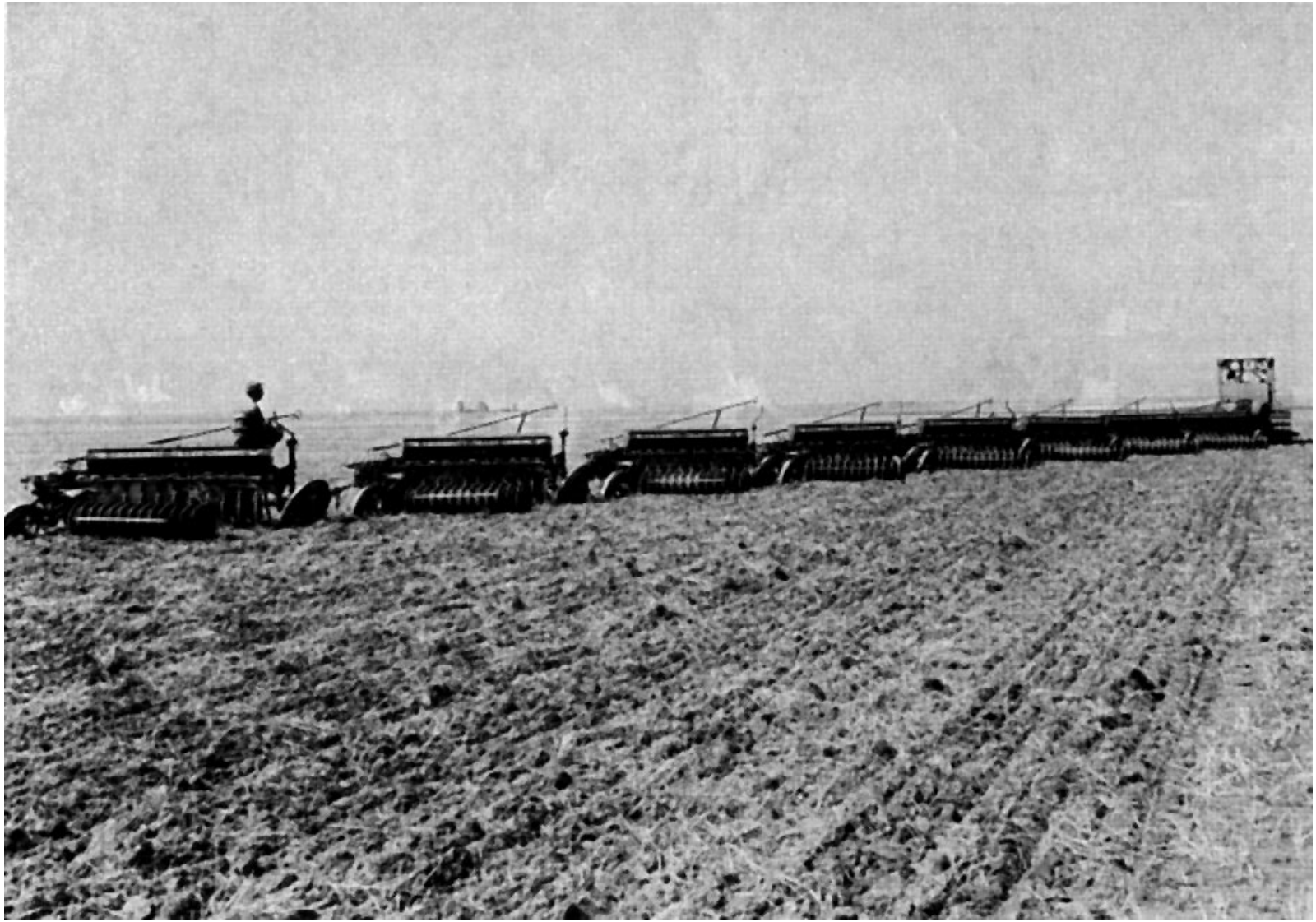
(This Land of Alberta - Alberta Agriculture, Food & Rural Development.)

Net Value of Production in Commodity ProducingIndustries in Alberta and Canada 1982-1983

	ALBERTA		CANADA	
	Millions $	**% of Total**	**Millions $**	**% of Total**
Agriculture	1,767	8	9,187	9
Mining (includes petroleum)	14,436	53	20,689	15
Electric Power	1,195	5	12,198	9
Manufacturing	3,265	14	66,771	50
Construction	3,218	20	16,653	15
Other	20		2,963	2
	23,901	100	128,461	100

INDUSTRY	NO. OF WORKERS	% OF TOTAL PROVINCIAL LABOUR FORCE
Agriculture & Food Processing	106,300	9
Petroleum & Gas	80,600	7
Metal Fabrication	53,600	5
Construction	94,000	8

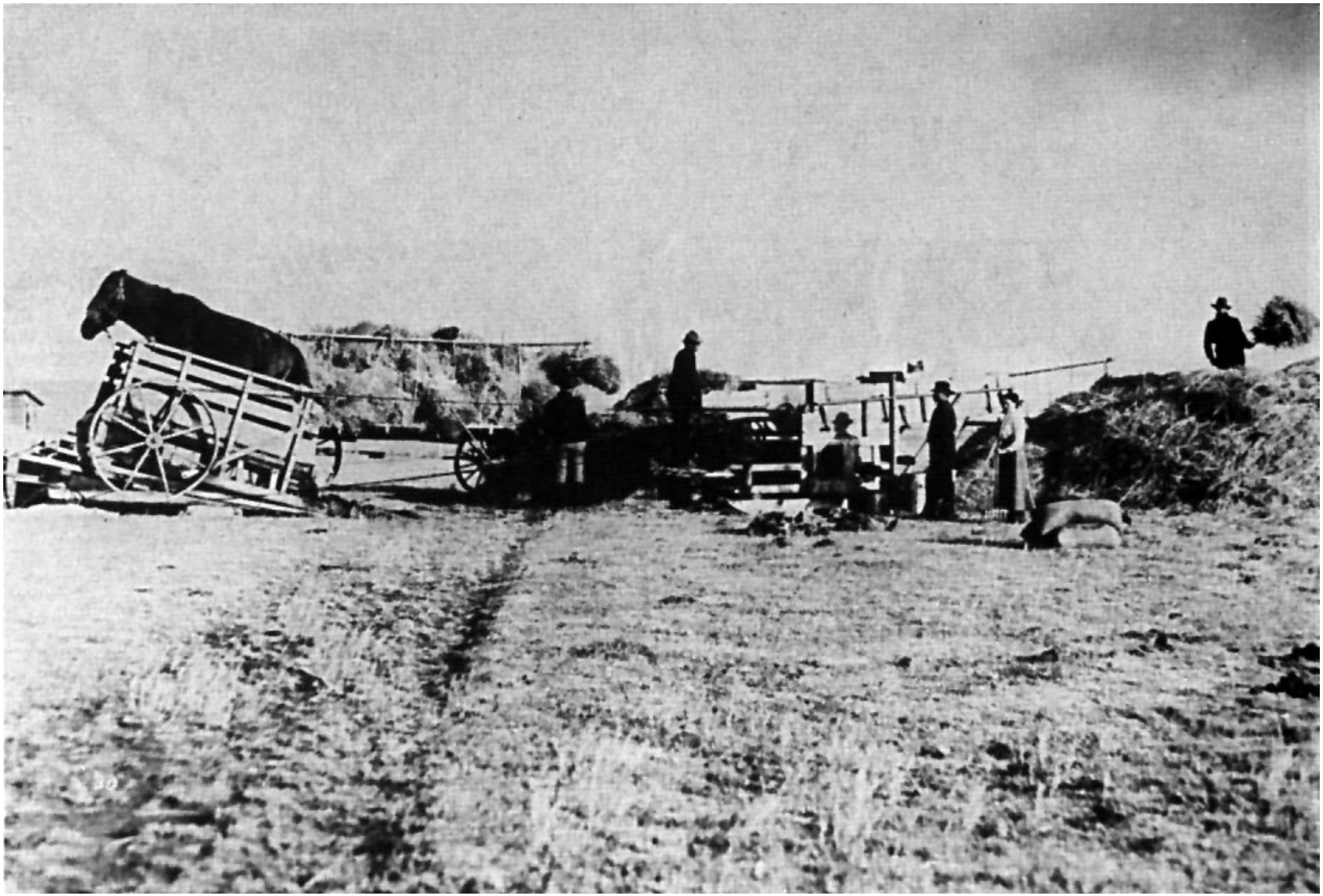
MILKING COWS



TILLING THE LAND

PLOUGHING

CHOPPING WOOD

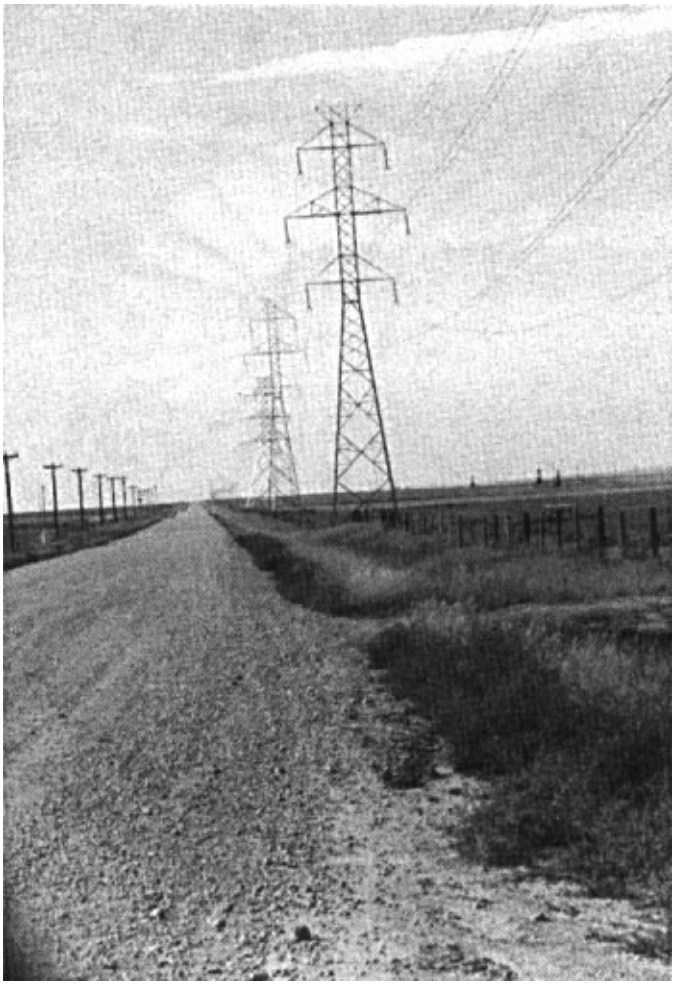


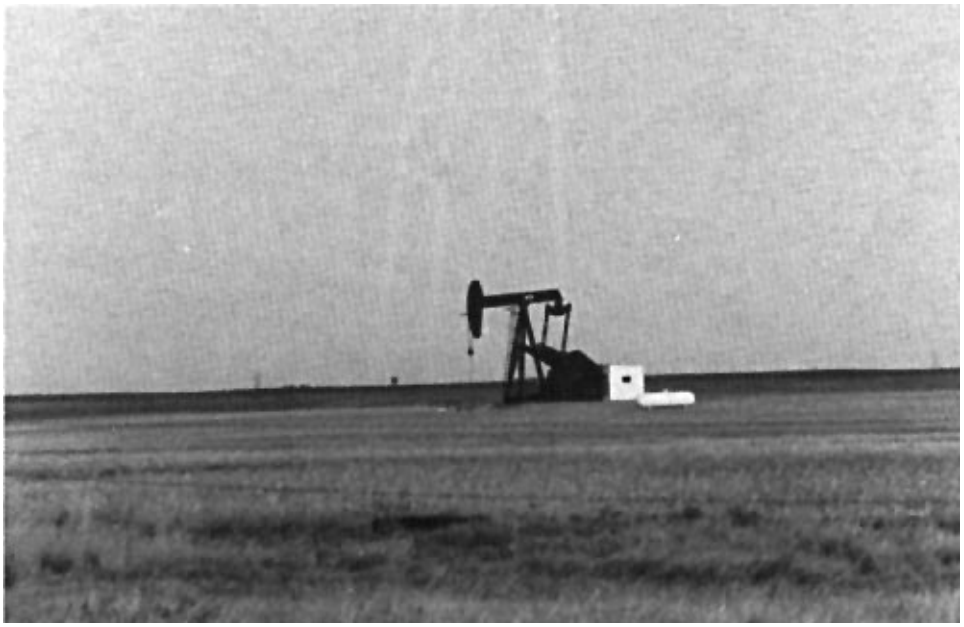
THRESHING GRAIN

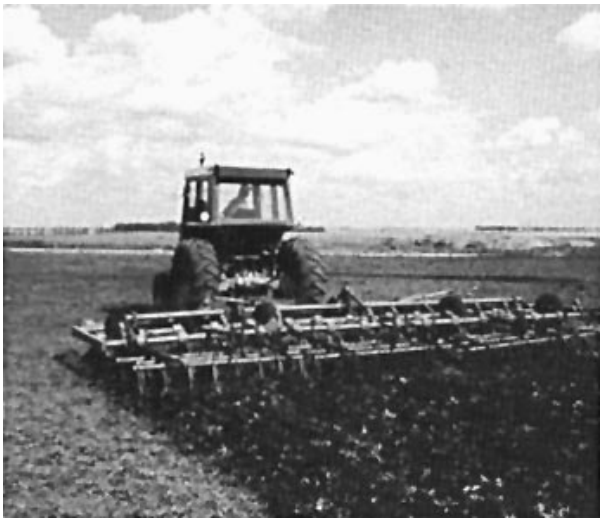
STEAM ENGINE

WINDMILL

FARM POWER







FARM POWER