

OAKLAND CUSD #5

# INTRO TO AG

APRIL 20-24, 2020

JEFF COON

# Week of April 20-24, 2020

All of these assignments are on google classroom. You must pick one of the 3 listed and complete by next Monday April 20 for credit. If you would like to use google docs to complete the work that would be most efficient, just remember to start a new copy with your own work please. Paper copies can be returned to the school.

Class	Choice 1	Choice 2	Choice 3 (Enrichment)
Ag Science	Common Breeding	Starting an sae	FFA Official dress
Ag Business Mang	MaInvestments	Life Insurance	Business Plan
BSAA	Advanced DNA	Animal Repro Systems	Domestic Animals
Landscape Design	Environment	Landscape tools	Landscape IPM
Intro To Ag	FFA Creed	Parly pro	World food supply
Ag Mech.	Profile Leveling	Power tools	Precision Ag

Mr. Coon

Intro to Ag

FFA Creed

April 20-24

Checking Your Knowledge:

1. What are the three segments of the FFA mission statement?
2. What is the FFA motto?
3. What are the first two words in every paragraph of the FFA Creed?
4. Summarize each paragraph of the creed, using just one sentence per paragraph.

# FFA Mission, Motto, and Creed

**A**N ORGANIZATION with a rich heritage, such as the National FFA Organization, usually has many symbolic images and statements that have great meaning to the past, present, and future direction of the organization. The FFA mission statement, motto, and Creed create an image in the minds of members and supporters of what the organization represents.

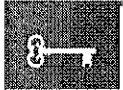


## Objectives:



1. Explain the FFA mission.
2. Explain the FFA motto.
3. Explain the FFA Creed.

## Key Terms:



career development  
events (CDEs)  
creed

FFA Creed  
FFA mission statement  
FFA motto

mission statement  
motto  
E. M. Tiffany

## The FFA Mission

A **mission statement** is a formal summary of the aims and values of a company, organization, or individual. The National FFA Organization has developed a very clear and direct mission. The **FFA mission statement** is as follows: *“FFA makes a positive difference in the lives of students by developing their potential for premier leadership, personal growth, and career success through agricultural education.”*

To accomplish its mission, the National FFA Organization gives its members many opportunities and benefits while they are enrolled in agricultural education. The three segments of the mission statement identify the primary drivers behind everything the organization does.

## PREMIER LEADERSHIP

Members of FFA have the opportunity to attend many different conferences and conventions. Most of these are built around becoming better leaders in the community and local chapter. Examples of conferences are the 212° conferences, 360° conferences, and Washington Leadership Conference (WLC). Many state conventions and the national convention have workshops that students can attend to strengthen their leadership skills. Effective leaders can guide other people toward individual or group goals. They can visualize goals and utilize a team to accomplish them. Leaders gain skills that make them well prepared to accept new challenges.



FIGURE 1. The FFA emblem. (Courtesy, National FFA Organization)

## PERSONAL GROWTH

FFA is focused not only on its members being great leaders but also better individuals and citizens. Many states have leadership camps where young members learn that becoming a great leader starts with growing the individual and discovering how different personalities and different people can work better together once they understand themselves. **Career development events (CDEs)** are FFA contests that focus on knowledge and skills learned in a student's agricultural education program. By using all they have learned, members can compete in different CDEs and even grow more by acknowledging areas they need to improve.

## CAREER SUCCESS

Premier leadership and personal growth are the first two steps in the mission that can lead to career success. Everything FFA offers its members is to help them gain the careers they want and succeed in them. CDEs, such as Prepared Public Speaking, Parliamentary Procedure, and Job Interview, are focused on skills a member will need in any career he or she may have.



FIGURE 2. Everything FFA offers its members is to help them gain the careers they want and succeed in them.

Career success is achieved by taking part in the wide range of career-related opportunities at various conferences and by participating in competitions and activities. The agriculture industry accounts for one in every five job opportunities in the United States. Some of the most high tech jobs in research and development, biotechnology, and food and fuel sources are directly tied to agriculture. Students who study agriculture at the middle and high school levels are exposed to career opportunities that others may not be aware of.

## The FFA Motto

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A **motto** is a short sentence or phrase chosen to summarize the beliefs or ideals guiding a company, organization, or individual. The **FFA motto** is "*Learning to Do, Doing to Learn, Earning to Live, Living to Serve.*"

### LEARNING TO DO

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In FFA, before competing or going out on a field trip, members learn about the essential topics in their classrooms.

### DOING TO LEARN

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In FFA, members do not just go on field trips, participate in competitions, or attend conferences to get out of school. They take part in these events to put to use what they learned in class, get better at the skills they learned in class, or dig deeper into conversations they had in class.

### EARNING TO LIVE

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In FFA, students learn that they must develop their skills and knowledge to be able to support themselves, their families, and their communities through their careers.

### LIVING TO SERVE

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In FFA and through agricultural education, members also learn that giving back to their families and communities should be one of their main goals. Members' volunteering in their homes, local communities, states, and nation is very important to FFA. Most state conventions offer some way to volunteer, whether it be in a courtesy corps or in the day of service. Similar opportunities are provided at the National FFA Convention.

## The FFA Creed

A **creed** is any system or statement of beliefs or principles. The **FFA Creed** is a five-paragraph statement of what FFA stands for and believes. The FFA Creed was written by **E. M. Tiffany** and adopted at the 3rd National FFA Convention. The FFA Creed was revised at the 38th convention and again at the 63rd.

Each paragraph represents a different principle the organization believes. The first paragraph of the creed emphasizes that in FFA, members do not just talk about what needs to get done but actually do the tasks. This relates to the need of those in the agriculture industry to solve problems. Developing new products, feeding more people, and keeping food affordable are some challenges the industry faces.

The second paragraph not only focuses on farming and living on a farm but also recognizes other facets of the agriculture industry. Although there are many positives to being in the agriculture industry, it is still a hard-working industry that comes with many trials. These challenges bring about many associations that can help the agriculture industry.

The third paragraph is a very important and powerful message. FFA members believe in themselves and in earning the respect of others. Members should be able to work smarter and to problem solve. They should continue to progress in the agriculture industry and work not just for themselves but also for their communities and nation in producing food and marketing it.

The fourth paragraph revolves around helping others. Members should learn to provide for themselves, limiting their reli-

**The FFA Creed**

I believe in the future of agriculture, with a faith born not of words but of deeds—achievements won by the present and past generations of agriculturists; in the promise of better days through better ways, even as the better things we now enjoy have come to us from the struggles of former years.

I believe that to live and work on a good farm, or to be engaged in other agricultural pursuits, is pleasant as well as challenging; for I know the joys and discomforts of agricultural life and hold an inborn fondness for those associations which, even in hours of discouragement, I cannot deny.

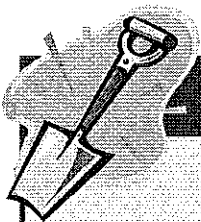
I believe in leadership from ourselves and respect from others. I believe in my own ability to work efficiently and think clearly, with such knowledge and skill as I can secure, and in the ability of progressive agriculturists to serve our own and the public interest in producing and marketing the product of our toil.

I believe in less dependence on begging and more power in bargaining; in the life abundant and enough honest wealth to help make it so—for others as well as myself; in less need for charity and more of it when needed; in being happy myself and playing square with those whose happiness depends upon me.

I believe that American agriculture can and will hold true to the best traditions of our national life and that I can exert an influence in my home and community which will stand solid for my part in that inspiring task.

Source: Official FFA Manual.

FIGURE 3



### DIGGING DEEPER...

#### UNCOVERING ADDITIONAL FACTS: Explore the Creed

Pick one paragraph of the FFA Creed, and write a one-page report on how you interpret its meaning in your life. Discuss with a classmate.

ance on others. Members should help others, but they should also not be afraid to ask for help when it is really needed.

Finally, the fifth paragraph says that the agriculture industry will focus on the need to produce food and will be family oriented even with the new challenges faced. Members know they can influence not only their families but also those around them, and they will do so in a positive way.

### Summary:



The National FFA Organization has symbols, traditions, and statements that reflect the past, present, and future direction of the organization. These reveal the proud heritage and bright future of agriculture, agricultural education, and FFA. By understanding these symbols, traditions, and statements, students can appreciate the heritage and the future they represent as FFA members.

### Checking Your Knowledge:



1. What are the three segments of the FFA mission statement?
2. What is the FFA motto?
3. What are the first two words in every paragraph of the FFA Creed?
4. Summarize each paragraph of the creed, using just one sentence per paragraph.

### Expanding Your Knowledge:



Visit <https://www.ffa.org/participate/cdes>, and explore career development events related to your career goals. Discuss these with your instructor, and plan for participation, if appropriate.

### Web Link:



**National FFA Organization**

<https://www.ffa.org>



Mr. Coon

Intro to Ag

Parly Pro

April 20 -24

Checking Your Knowledge:

1. Explain the voting methods and voting types used in parliamentary procedure.

2. How are main motions handled in a meeting?

3. List and explain the types of subsidiary motions used in a meeting.

4. List and explain the types of incidental motions used in a meeting.

5. List and explain the types of privileged motions used in a meeting.

# Parliamentary Law

**L**EADING a successful meeting can be a rewarding experience. Parliamentary procedure is an efficient and fun way to run a successful meeting. By knowing the basics of parliamentary procedure and having knowledge of motions to use, meeting goals can be accomplished. Parliamentary procedure ensures all sides of an issue are equal and that everyone has the opportunity to voice their opinion and vote.



## Objective:



Identify how to effectively use motions and voting procedures in parliamentary procedure.

## Key Terms:



- |                      |                       |                     |
|----------------------|-----------------------|---------------------|
| adjournment          | parliamentary inquiry | right to vote       |
| amendment            | point of order        | rising vote         |
| appeal               | postpone definitely   | roll call           |
| division of assembly | postpone indefinitely | secret ballot       |
| incidental motions   | previous question     | subsidiary motions  |
| lay on the table     | privileged motions    | two-thirds majority |
| main motion          | question of privilege | voice vote          |
| majority             | recess                |                     |
| motion               | refer to a committee  |                     |

## Understanding Parliamentary Law

In a democratic society, all meeting members have the right to vote. The **right to vote** is an assembly's way of allowing all members to decide an issue—in a democratic manner—after they have assembled and heard their fellow members' opinions and concerns. In parliamentary procedure, several voting methods and voting types exist.

## VOTING METHODS

Various voting methods are used in parliamentary procedure.

- ◆ A **voice vote** is a situation in which the chair asks those in favor to say, “Aye” or “Yes.” Those who are opposed are asked to say, “Nay” or “No.”
- ◆ A **rising vote** is a situation in which the chair asks for a show of hands or a standing vote. A show of hands is recommended for small groups. The chair asks members who are in favor to raise their right hands. After the count is taken, those who are opposed are asked to raise their right hands. Standing or rising is used to verify a voice vote and on motions requiring a  $\frac{2}{3}$  majority vote. The chair asks those in favor of the motion to rise. After counting, these members are asked to sit. Then the chair asks those opposed to rise.
- ◆ A **secret ballot** is a method of voting that involves writing a vote on a slip of paper. It is a useful way to vote for officers and to vote on controversial motions. The chair should appoint individuals to distribute, collect, and tally the ballots.
- ◆ A **roll call** is a method that has the effect of placing on record how each member votes. The secretary polls the members, and they respond verbally.

### Voting Types

Two main voting types are used in parliamentary procedure.

**Majority** is the number or percentage of members within an assembly required to represent the will and opinion of the assembly. A majority vote requires more than half of the number of votes cast. **Two-thirds majority** is a number used when a motion requires a greater level of confidence to pass. If a tie vote occurs, the chair or presiding officer is permitted to vote in the following circumstances: His or her vote will break the tie and pass the

motions. His or her vote will make a tie and defeat the motion. The final step in handling a motion is the formal announcement by the chair of the result of the vote. A single tap of the gavel symbolizes that the transaction is finished. If the vote is final, the chair may make a statement, such as: “There were 18 votes in favor and 7 votes opposed. Motion passed.”

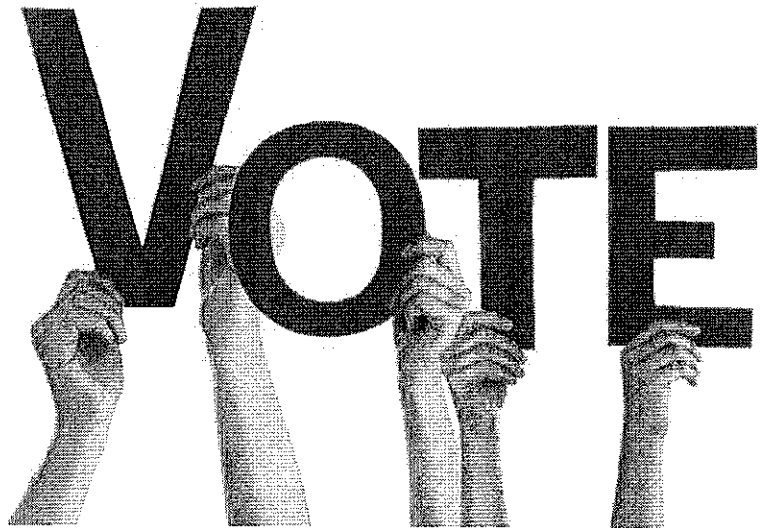


FIGURE 1. Everyone has the opportunity to voice an opinion and vote when following parliamentary procedure.

## MAIN MOTIONS

Business is accomplished through the use of motions. A **motion** is a proposal that the group take certain action. A **main motion** is a proposal used to obtain group approval on any particular subject. Every main motion should follow these steps:

- ◆ A member is recognized by the chair or presiding officer. Then he or she stands and makes a motion. The motion must use the words “I move that...” and then state the proposed action.
- ◆ All main motions need a second before they can be voted upon. A motion is seconded by a member saying, “I second the motion.” A second can be made without obtaining the floor, and, in small assemblies, it can be made without rising.
- ◆ Without rewording, the chair or presiding officer restates the motion to the assembly (e.g., “It has been moved and seconded that we...”). It is important that the motion is not restated differently from the original motion.
- ◆ The chair or presiding officer asks for discussion, and the members debate the motion. The members will discuss in favor or against the motions. Every member of the assembly has a voice, and their opinions are heard.
- ◆ The chair or presiding officer explains the method of voting and type of vote required. He or she asks for a vote for or against the motion.
- ◆ The chair or presiding officer announces the result of the voting.

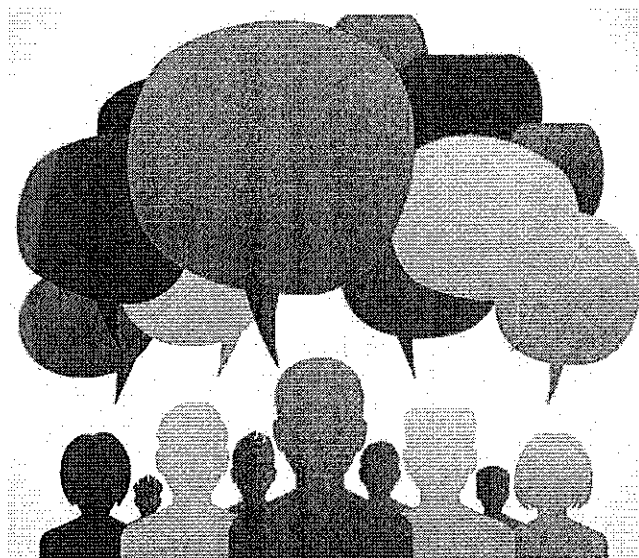


FIGURE 2. Main motions allow group approval on a particular subject through the help of discussion and voting.

## SUBSIDIARY MOTIONS

**Subsidiary motions** are proposals related to the main motion. Through the use of subsidiary motions, the original motion may be modified, postponed, or referred to a committee for further investigation. The types of subsidiary motions are:

### **Amendment**

An **amendment** is an alteration of or addition to a motion. After an amendment has been offered, it requires a second. Three ways to amend a motion are by addition, by substitution, and by striking out. An amendment is debatable and amendable (within limits). Also, it requires a majority vote (e.g., “I move to amend the main motion by striking the word ‘five’

and inserting the word 'three' so the amended motion would read, 'I move the chapter purchase three copies of the FFA handbook.'").

### ***Lay on the Table***

**Lay on the table** is a motion to postpone the pending question in such a way that its consideration may be resumed at the will of the group as easily as if it were a new question. It enables the group to attend to more urgent business. Lay on the table requires a second, is not debatable, and is not amendable. Also, it requires a majority vote. Someone may say, for instance: "Since more important business is at hand, I move to lay this motion on the table."

### ***Postpone Definitely***

**Postpone definitely** is a motion to delay an action until a definite time (e.g., the next meeting, a specific hour, or after a certain event). Postpone definitely requires a second, is debatable and amendable, and requires a majority vote. Someone may say, for example: "I move to postpone this motion until the next regularly scheduled meeting."

### ***Postpone Indefinitely***

**Postpone indefinitely** is a motion to reject the main motion without incurring the risk of a direct vote. The motion is made by those opposed to the main motion when they are in doubt as to their being in the majority. Postpone indefinitely requires a second, is debatable and not amendable, and requires a majority vote. An example is: "I move to postpone this motion indefinitely."

### ***Previous Question***

**Previous question** is a motion to bring the assembly to a vote without delay on the immediately pending question. Preview question requires a second, is not debatable and not amendable, and requires a  $\frac{2}{3}$  vote. Someone may say, for instance, "I call for the previous question on all pending matters."

### ***Refer to a Committee***

**Refer to a committee** is a motion to allow a question to be more carefully investigated before the group takes action. Refer to a committee requires a second, is debatable and amendable, and requires a majority vote. An example of refer to a committee is: "I move to refer this matter to a committee of three appointed by the chair with full power to act."

## **INCIDENTAL MOTIONS**

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**Incidental motions** are proposals used to provide proper and fair treatment to all members. The types of incidental motions are appeal, division of assembly, parliamentary inquiry, and point of order.

### **Appeal**

An **appeal** is a proposal used to challenge the ruling of the chair. An appeal requires a second, is debatable but not amendable, and requires a majority vote. A member who wishes to appeal a decision of the chair rises as soon as the decision is made and, without waiting to be recognized by the chair, says, "I appeal the decision of the chair."

### **Division of Assembly**

**Division of assembly** is a motion used if a member doubts a voice vote or a show of hand vote. The vote will be taken by rising so every member can visually see the majority. It may be called for without obtaining the floor and even after a vote has been announced. Division of assembly does not require a second. In addition, it is not debatable and is not amendable. This motion is made by saying, "I call for a division," "I doubt the vote," or "Division."

### **Parliamentary Inquiry**

**Parliamentary inquiry** is a motion that relates to a question that requires immediate attention and may be made while another member has the floor. Parliamentary inquiry does not require a second, is not debatable, and is not amendable. The inquirer does not need to obtain the floor. He or she rises and says, "I rise to a parliamentary inquiry." The chair asks the person to state his or her inquiry. If the chair believes it is relevant, he or she answers it.

### **Point of Order**

**Point of order** is a motion used when a member believes a parliamentary error has been made. Point of order does not require a second, is not debatable and is not amendable, and the chair responds for the vote. Point of order can be made when another member has the floor, even if it means interrupting someone who is speaking. The motion is stated by saying, "I rise to a point of order" or "Point of order." The chair will have the member state his or her point and will make a decision to rule.

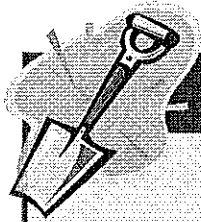
## **PRIVILEGED MOTIONS**

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**Privileged motions** are proposals unrelated to the main motion and are granted precedence over ordinary business. The types of privileged motions are adjournment, question of privilege, and recess.

### **Adjournment**

**Adjournment** is a motion used when it is time to close a meeting (e.g., "I move to adjourn this meeting."). Adjournment requires a second, is not debatable and is not amendable, and requires a majority vote.



## DIGGING DEEPER...

### UNCOVERING ADDITIONAL FACTS: Evaluate Motions at a Business Meeting

Attend a local community or civic organization meeting to evaluate the way business is conducted. Document the main motions, subsidiary motions, incidental motions, and privileged motions presented. Explain how each motion was used. Be sure to note if the motion required a second and if it was debatable or amendable.

### Question of Privilege

**Question of privilege** is a motion that concerns the rights and privileges of the assembly or any of its members (e.g., "I rise to a question of privilege."). Question of privilege does not require a second, is not debatable and is not amendable, and does not require a vote. Examples include level of comfort for the members (e.g., heating, cooling, lighting, freedom from noise and disturbances, and officer conduct).

### Recess

**Recess** is an intermission during a meeting (e.g., "I move that we recess from now until 8 p.m."). It may be taken for meals, a quick break, or for counting ballots. If the meeting is a convention or longer in length, the recess may be extended. Recess requires a second. It is not debatable, and time is amendable. Also, a recess requires a majority vote.

### Summary:



Effective meetings require planning and an understanding of parliamentary procedure. Parliamentary procedure gives members the right to participate and discuss opinions. With the help of parliamentary procedure rules, the chairperson, and an educated assembly, meeting goals can be accomplished successfully.

### Checking Your Knowledge:



1. Explain the voting methods and voting types used in parliamentary procedure.
2. How are main motions handled in a meeting?
3. List and explain the types of subsidiary motions used in a meeting.
4. List and explain the types of incidental motions used in a meeting.
5. List and explain the types of privileged motions used in a meeting.

## Expanding Your Knowledge:

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Prepare for the FFA Parliamentary Procedure Career Development Event. Learn all the motions that are part of the event, and prepare by practicing with your classmates. After some practice, prepare further by demonstrating your skills at a school board meeting, at a civic organization, or for an FFA alumni chapter.

## Web Links:

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### Robert's Rules Online

<http://www.rulesonline.com/index.html>

### Parliamentary Procedure

<https://web.extension.illinois.edu/cfiv/downloads/46316.doc>

### Parliamentary Procedure

<http://www.mjc.edu/governance/curriculum/documents/manual/parliamentaryprocedureinfo.pdf>

### Robert's Rules

<http://www.dummies.com/how-to/business-careers/Running-Your-Business/Business-Travel-Events/Robert-s-Rules.html>

### Understanding and Using Parliamentary Procedure

<http://ianrpubs.unl.edu/live/g1969/build/g1969.pdf>



Mr. Coon

Intro

World Food Supply

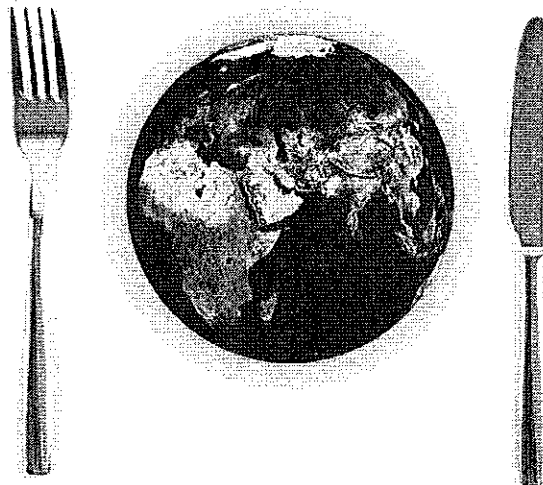
April 20 -24

Checking Your Knowledge:

1. Summarize the progression of the human population.
2. Explain exponential growth or logistic growth.
3. How do predictions of population growth compare between developed and developing countries?
4. What is the Malthusian theory?
5. How have scientific advances contributed to agricultural production?

# World Food Supply

**S**OME PEOPLE are alarmed at the rate of the world's population growth, which recently hit 7 billion. Others say there is nothing to be concerned about, as technology will provide answers needed to provide for additional people. What do you think? Can the human population continue to grow forever? Will agriculture keep up with human needs?



## Objective:



Examine the world's population and how agriculture will meet growing food demands.

## Key Terms:



- |                           |                                 |                                |
|---------------------------|---------------------------------|--------------------------------|
| aquaculture               | estrous cycle                   | plant tissue culture           |
| arable land               | estrus                          | population crash               |
| artificial insemination   | exponential growth              | porcine somatotropin (pST)     |
| bovine somatotropin (bST) | genetic engineering             | site-specific farming          |
| carrying capacity         | Global Positioning System (GPS) | superovulation                 |
| cloning                   | implants                        | transgenic animals             |
| conservation tillage      | logistic growth                 | variable-rate technology (VRT) |
| embryo splitting          | Malthusian theory               |                                |
| embryo transfer           | natural selection               |                                |

## Understanding the World Food Supply Situation

As more and more people populate Earth, the agriculture industry is challenged to produce enough quality food to feed a growing world population.

## HUMAN POPULATION GROWTH

Modern humans have been on Earth for about 200,000 years. For many years, population growth was slow. Yet after the Stone Age, about 10,000 years ago, human population growth became exponential. Around 1800, the human population reached 1 billion. In roughly another 130 years, or by 1930, the world's population hit 2 billion. By 1960, only 33 years later, it reached 3 billion. It took 14 more years (until 1974) to reach 4 billion. In another 13 years (1987), the population hit 5 billion. By 1999, there were 6 billion people. By 2011, there were 7 billion people on Earth.

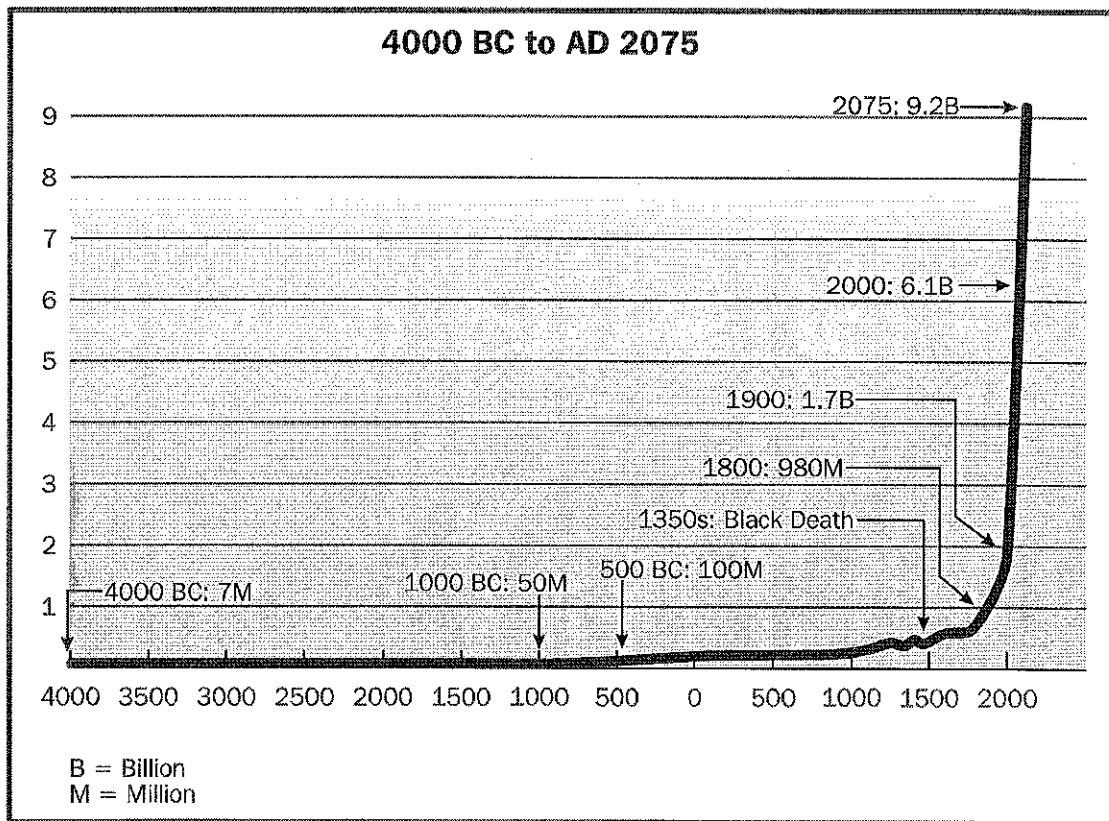


FIGURE 1. Total world population: past, present, and future.

Continued human population growth is attributed to longer life spans or a decreased rate of death. While birth rates have decreased, births still exceed deaths. Some of the reasons for a decreased death rate are improved sanitation, better medical care, and sufficient food.

### Charting Population Growth

Population growth over time can be plotted on a graph. A J-shaped curve represents exponential growth. **Exponential growth**, or unrestricted growth, is a type of growth whereby the larger a population gets, the faster it grows. Exponential growth occurs with all organisms. The difference is the amount of time it takes for the organisms to reach a certain point.

In nature, exponential growth is halted because of environmental resistance. Food sources, fresh water, disease, and habitat are examples of things that can restrict growth. Over time, the populations of every species will level off because of environmental resistance. **Carrying capacity** is the largest population that can be supported in a geographic area. The population growth of humans follows the same limits as that of other living organisms.

A population over a long period exhibits an S-shaped growth curve. This is a logistic model of population growth. **Logistic growth**, or restricted growth, is population growth in which there is a gradual increase at first, more rapid growth in the middle, and slower growth at the end, with a distinctive leveling off of the population. At some point during the process, the carrying capacity is approached, causing the growth to slow and level off. Occasionally, a population will continue to grow instead of leveling off. However, a **population crash** is a situation that occurs when a resource (e.g., food) is gone, and the population plummets.

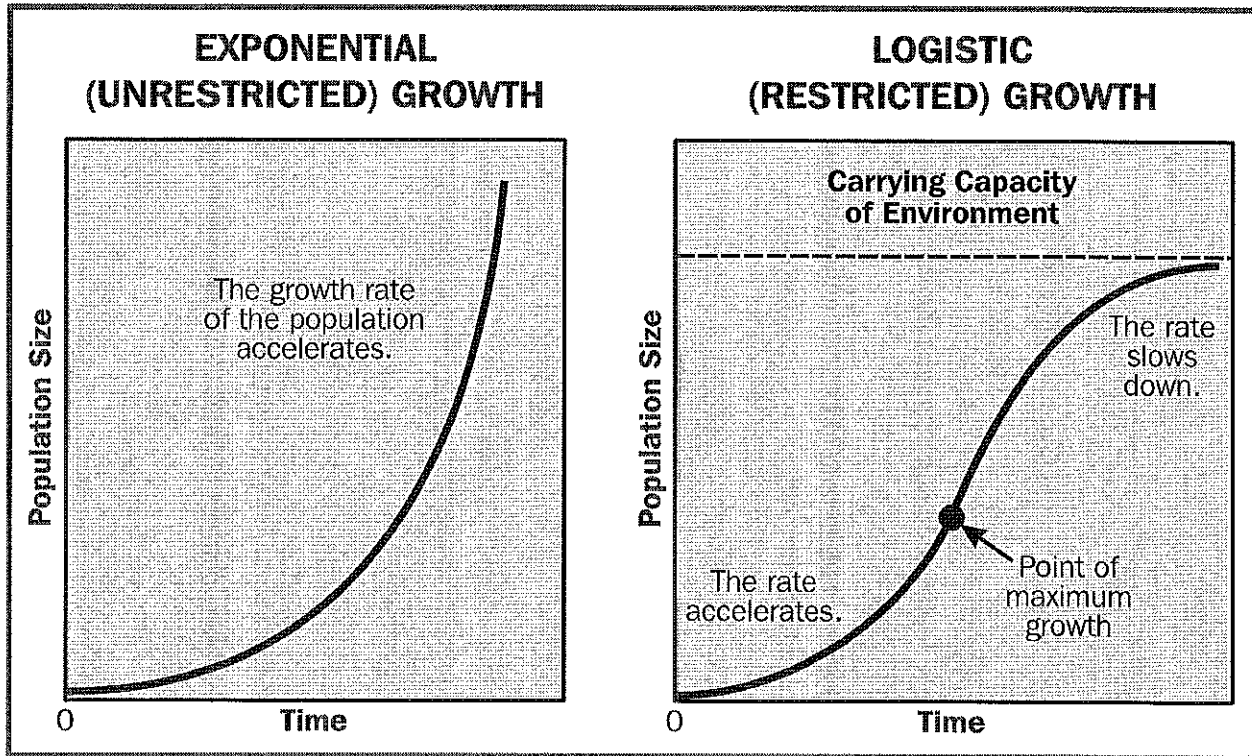


FIGURE 2. Exponential growth and logistic growth curves.

### Predicted Growth

Obviously, the human population cannot continue to grow exponentially any more than the population of any other organism can maintain exponential growth. Earth simply does not have the resources or space to support constant growth.

Population experts associated with the United Nations Department of Economic and Social Affairs / Population Division predict that human population growth will slow and reach a point of zero population growth. They expect that the world population will not vary greatly after reaching 8.92 billion in 2050. By 2075, it is projected to peak at 9.22 billion.

Developed and developing countries have different population growth rates. In general, developed countries, such as European nations and the United States, are predicted to grow slightly until 2300. Developing countries (e.g., those in Africa, Latin America, and Asia) are predicted to see rapid population growth until about 2050 and then level off.

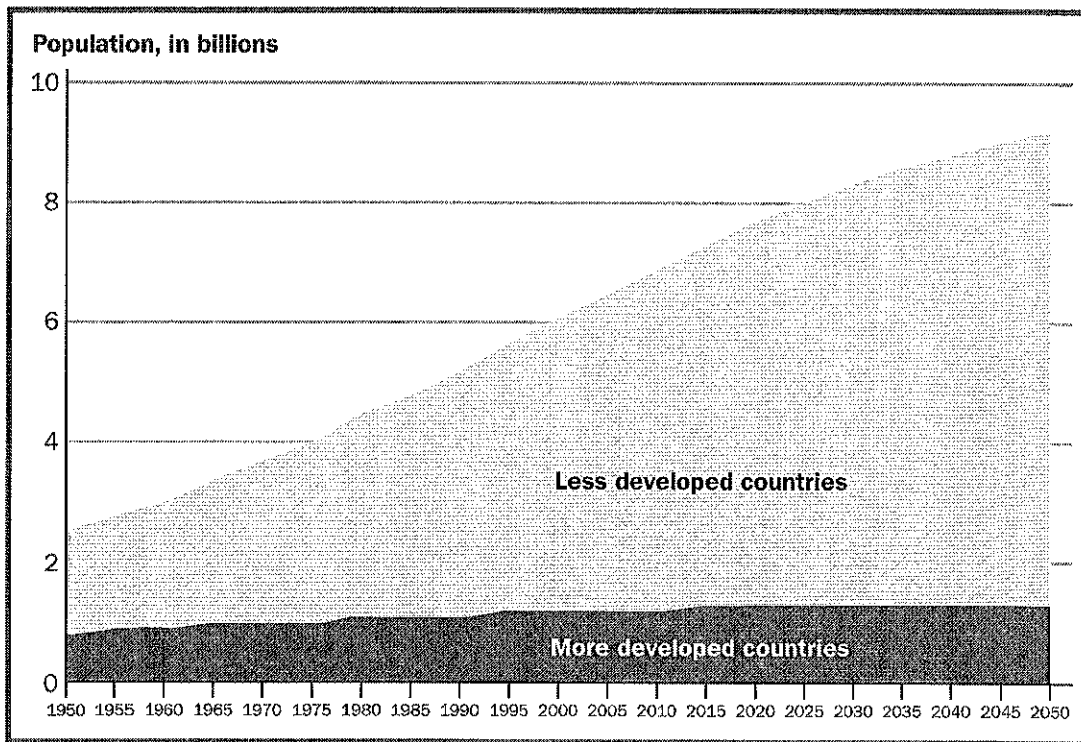


FIGURE 3. Population growth in developed and developing countries.

## MALTHUSIAN THEORY

In the 18th century, British economist Thomas Malthus theorized that human population growth was not sustainable. He believed the human population would outpace the food supply and—as a consequence—war, famine, and disease would decimate the population.

The **Malthusian theory** is an idea that states the world's population will grow faster than agriculture's ability to keep up with its needs. The theory was proposed in 1789. Malthus overlooked the role of technology in the production of food. He believed the world's population would exceed its supply of **arable land**—acreage that can be cultivated and farmed.

## TECHNOLOGICAL ADVANCEMENTS

To keep up with population growth, food scientists turn to technology. Scientists are working with new technologies to increase animal and crop productivity. In addition, new technologies offer improvements in processing and preserving foods, resulting in food items available to people who could not previously benefit from them.

## Advances in Animal Production

Advancements in science have led to higher-quality animal products being produced more efficiently. Before the 1960s, the role of breeding and selection in animal improvement was primarily limited to **natural selection**—a process in which animals with less vigorous traits are naturally eliminated from a population. Reproductive developments since then have increased the speed of animal improvements.

### Artificial Insemination

**Artificial insemination** is the placing of sperm cells in contact with female reproductive cells by a method other than natural breeding. It began during the 1960s and allowed the use of a superior male to father many more offspring than would be possible naturally.

### Embryo Splitting

**Embryo splitting** is a process that involves removing the embryo from an animal after conception, splitting or cutting the embryo in half, and placing each half in the uterus of another animal.

### Embryo Transfer

**Embryo transfer** is a process that removes fertilized eggs from a female and places them in another female who carries them until birth.

### Superovulation

The reproductive potential of a female can be increased through **superovulation**, which is an increase in the number of ovulations during the estrous cycle induced by the injection of certain hormones. The **estrous cycle** is the reproductive cycle and is measured from the beginning of one cycle to the next. **Estrus** is the period during which a female animal will mate. After fertilization, the developing eggs are flushed from the animal and placed in a recipient animal.

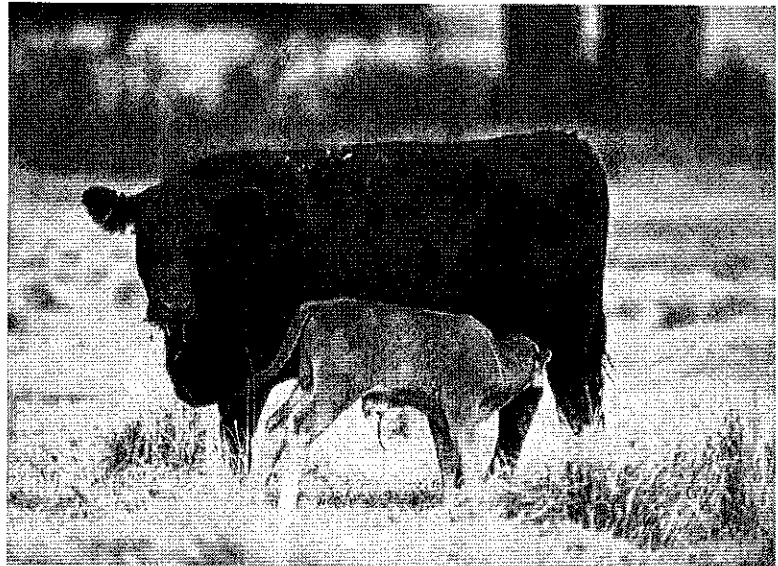


FIGURE 4. An Angus surrogate mother nurses her Romosinuano embryo transfer calf. (Courtesy, Agricultural Research Service, USDA)

### Genetic Engineering

During the 1980s, scientists developed the process of **genetic engineering**, which is the modification of the characteristics of an organism by manipulating its genetic material. **Transgenic animals** are animals whose genes have been changed or manipulated.



## FURTHER EXPLORATION...

### ONLINE CONNECTION: The Rule of 70

An understanding of exponential growth is essential when discussing population growth. An important concept of exponential growth is that the growth will occur in proportion to what is already present. For example, if a grizzly bear population of 100 grows at an annual rate of 7 percent, after 10 years the population will have doubled. In another 10 years, the population will have doubled again (up to 400).

The Rule of 70 is used to determine the doubling time of a quantity growing at a given annual percentage rate. Doubling rates can be calculated by dividing the percentage of growth into 70 to obtain the approximate number of years required for the population to double. For example, if the grizzly bear population is growing at an annual rate of 3.5 percent, divide 70 by 3.5. The answer is that it will take 20 years for the population to double. If the annual rate is 14 percent, the doubling time will be five years. Read more about the Rule of 70 at <http://www.ecofuture.org/pop/facts/exponential70.html>.

**TABLE 1. Some Doubling Times for the Rule of 70**

Growth Rate (% per Year)	Doubling Time in Years	Growth Rate (% per Year)	Doubling Time in Years
0.1	700	4	18
0.5	140	5	14
1	70	6	12
2	35	7	10
3	23	10	7

### Biotechnological Techniques

Biotechnological techniques are used to increase animal production.

#### Bovine Somatotropin

**Bovine somatotropin (bST)** is a hormone that can be given to cows to increase the amount of milk they produce. This hormone naturally occurs in cows and is present in all milk. Scientists have transferred the gene that codes for the production of the hormone from cattle to a bacterium. This bacterium acts like a tiny factory and produces large amounts of bST in controlled laboratory conditions. The bST produced is purified and is then injected into cattle.

#### Porcine Somatotropin

**Porcine somatotropin (pST)** is a hormone that regulates the growth of hogs, causing them to produce more muscle cells. This hormone is produced naturally in the pituitary glands of hogs. Mass production of pST is accomplished through the genetic engineering of bacteria similar to the process for bST.



## Implants

**Implants** are small pellets placed under the skin of animals. They primarily provide a substance that will promote growth.

## Aquaculture

**Aquaculture** is the cultivation of fish and other aquatic organisms for food. Aquaculture is a response to increased consumer demand for fish. It has grown rapidly throughout the world.

## Advances In Crop Production

The use of technology has led to smaller numbers of producers raising more crops for a growing world population. During the 1920s, agricultural scientists discovered that certain chemicals could change the growth of plants. Commercial fertilizers, fungicides, weed killers, and insecticides were discovered and put to use.

The change from horses to tractors and the adoption of a group of technological practices characterized the second American agricultural revolution in 1945. By 1954, the number of tractors on farms exceeded the number of horses and mules for the first time.

## Conservation Tillage

**Conservation tillage** is a way of growing crops from year to year with minimal soil disturbance. Conservation tillage practices began to take hold in 1970. Also, more farmers use low-input sustainable agriculture (LISA) techniques to decrease chemical applications.

## Genetic Engineering

Genetic engineering has brought much advancement to plant production. New plant varieties are resistant to certain herbicides, insects, climatic conditions, and diseases. For example, plants have been developed to be more resistant to frost, be drought-resistant, and produce fruit with a longer shelf life. Through biotechnology, foods with increased nutritional value are being produced.

- ◆ People in developing countries of Southeast Asia have diets poor in vitamin A, which is a vitamin necessary to prevent blindness. As a result, many children in these countries develop blindness, and rice is a staple in their diet. Golden Rice is a transgenic plant

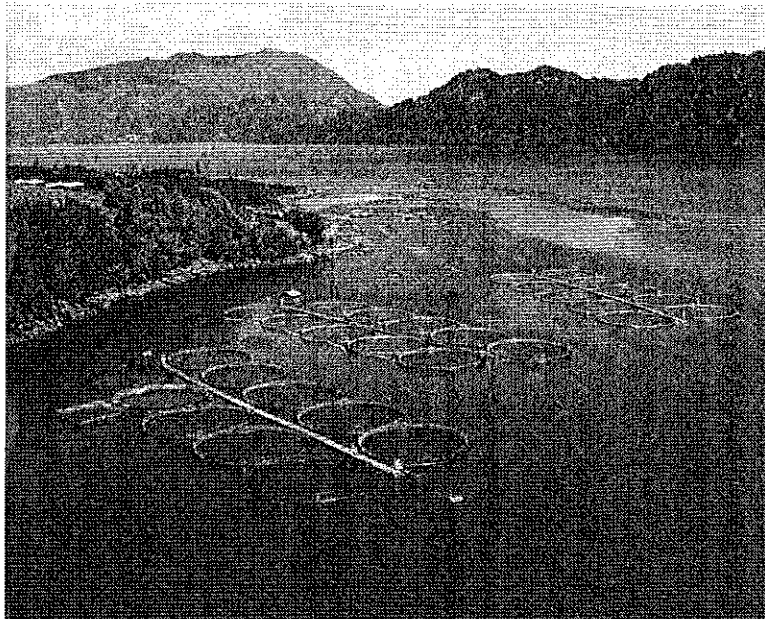


FIGURE 5. Caged salmon production is a growing aquaculture practice.



developed to help these countries. It is enriched with betacarotene, which is a vital substance needed for bodies to produce vitamin A.

- ◆ **Cloning** is a process of asexually reproducing organisms; there is no union of male and female sex cells.
- ◆ **Plant tissue culture** is a process that involves propagating plants using single cells or small groups of cells.
- ◆ Changing plants by introducing salt tolerance is a way to address the problem of maintaining the level of soil nutrients for crops.
- ◆ Plants (e.g., corn, wheat, and rice) could be engineered to have the same nitrogen-fixing ability as legumes, allowing them to survive in nitrogen-poor soils and greatly reducing the use of fertilizers.

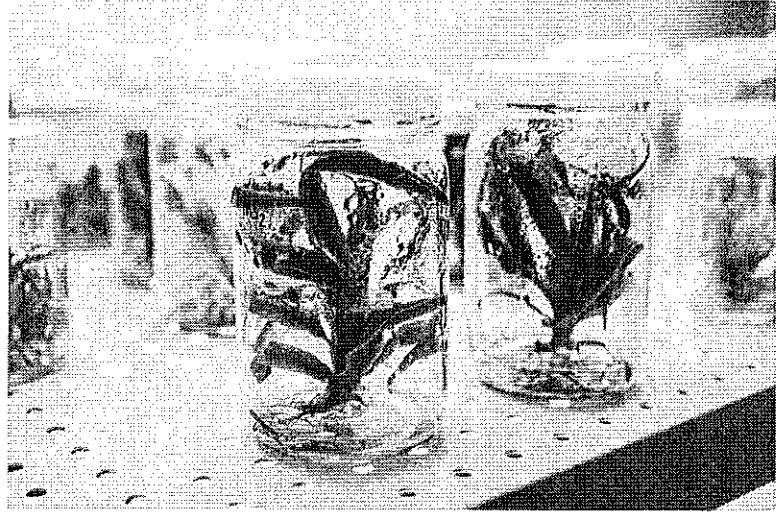


FIGURE 6. Plant tissue culture involves propagating plants using single cells or small groups of cells in the laboratory.

### Information Age

The 1990s brought the Information Age to agriculture.

- ◆ **Site-specific farming** is a process that involves using practices based on the specific needs of a location.
- ◆ The **Global Positioning System (GPS)** is a satellite-based approach to find exact positions in fields. Farmers began using GPS for soil sampling and soil-type mapping.
- ◆ **Variable-rate technology (VRT)** is an application that involves applying fertilizers and pesticides to specific spots in a field. It allows tracking of yields with on-the-go monitors. These monitors allow the collection of site-specific yield data during harvesting.

### Summary:



Modern humans have been on Earth for about 200,000 years. Around 10,000 years ago, human population growth exploded. By 2011, there were 7 billion people on Earth. Population growth over time can be plotted on a graph. At some point as a population grows, the carrying capacity is approached, causing the growth to slow, level off, or crash. Developed countries are predicted to grow slightly until 2300. Developing countries are predicted to see rapid population growth until about 2050 and then level off.

In the 18th century, Thomas Malthus theorized that human population growth was not sustainable. He believed that the human population would outpace the food

supply and, as a consequence, war, famine, and disease would decimate the population. To keep up with population growth, food scientists turn to technology. Scientists are working with new technologies to increase animal and crop productivity. In addition, new technologies offer improvements in processing and preserving foods.

### Checking Your Knowledge:

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1. Summarize the progression of the human population.
2. Explain exponential growth or logistic growth.
3. How do predictions of population growth compare between developed and developing countries?
4. What is the Malthusian theory?
5. How have scientific advances contributed to agricultural production?

### Expanding Your Knowledge:

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Go to U.S. and World Population Clock at <https://www.census.gov/popclock/>. Analyze the information provided. Draw some conclusions.

### Web Links:

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#### Population Growth

[http://www.globalchange.umich.edu/globalchange2/current/lectures/human\\_pop/human\\_pop.html](http://www.globalchange.umich.edu/globalchange2/current/lectures/human_pop/human_pop.html)

#### Seven Billion

<http://ngm.nationalgeographic.com/7-billion>

#### The Future of Farming

<http://www.popsi.com/environment/article/2009-07/8-farming-solution-help-stop-world-hunger>

#### Agricultural Career Profiles

<http://www.myaert.com/career-profiles>