

# AFNR - Animal Systems

Analyze historic and current trends impacting the animal systems industry. AS.01.

- 1 Evaluate the development and implications of animal origin, domestication and distribution on production practices and the environment.** AS.01.01.
  - 1a** Identify and summarize the origin, significance, distribution and domestication of different animal species. AS.01.01.01.A.
  - 1b** Evaluate and describe characteristics of animals that developed in response to the animal's environment and led to their domestication. AS.01.01.01.B.
  - 1c** Evaluate the implications of animal adaptations on production practices and the environment. AS.01.01.01.C.
- 2a** Research and summarize major components of animal systems (e.g., livestock, companion animal, etc.). AS.01.01.02.A.
- 2b** Describe the historical and scientific developments of different animal industries and summarize the products, services and careers associated with each. AS.01.01.02.B.
- 2c** Predict trends and implications of future developments within different animal industries on production practices and the environment. AS.01.01.02.C.

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## **2 Assess and select animal production methods for use in animal systems based upon their effectiveness and impacts.** AS.01.02.

- 1a Identify and categorize terms and methods related to animal production (e.g., sustainable, conventional, humanely raised, natural, organic, etc.). AS.01.02.01.A.
- 1b Analyze the impact of animal production methods on end product qualities (e.g., price, sustainability, marketing, labeling, animal welfare, etc.). AS.01.02.01.B.
- 1c Evaluate the effectiveness of different production methods and defend the use of selected methods using data and evidence. AS.01.02.01.C.
- 2a Research and examine marketing methods for animal products and services (e.g., conventional, niche markets, locally grown, etc.). AS.01.02.02.A.
- 2b Calculate costs of marketing versus predicted increases in sales. AS.01.02.02.B.
- 2c Devise and evaluate marketing plans for an animal agriculture product or service. AS.01.02.02.C.
- 3a Summarize the types, purposes, and characteristics of effective record keeping and documentation practices for animal systems enterprises (e.g., managing records for animal identification, feeding, breeding, treatment, income/expense, etc.). AS.01.02.03.A.
- 3b Analyze and evaluate the accuracy and effectiveness of records used in an animal system business. AS.01.02.03.B.
- 3c Select and defend the use of a specific record management system based upon its effectiveness for a business related to animal systems. AS.01.02.03.C.
- 4a Identify and summarize wildlife management methods. AS.01.02.04.A.
- 4b Research and summarize local wildlife populations, challenges and ecological measures that are being utilized. AS.01.02.04.B.
- 4c Devise and evaluate plans to manage wildlife populations to achieve optimal ecological health. AS.01.02.04.C.

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## **3 Analyze and apply laws and sustainable practices to animal agriculture from a global perspective.** AS.01.03.

- 1a Distinguish between the types of laws pertaining to animal systems. AS.01.03.01.A.
  - 1b Analyze the structure of laws governing animal industries, international trade and animal production policies. AS.01.03.01.B.
  - 1c Evaluate the impact of laws pertaining to animal agriculture (e.g., pros, cons, effect on individuals, effect on businesses, etc.) and assess the compliance of production practices with established regulations. AS.01.03.01.C.
  - 2a Research and summarize sustainability in animal systems. AS.01.03.02.A.
  - 2b Analyze the local and global impact of sustainable animal agriculture practices. AS.01.03.02.B.
  - 2c Select, evaluate and defend the use of sustainable practices in animal agriculture. AS.01.03.02.C.
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**Utilize best-practice protocols based upon animal behaviors for animal husbandry and welfare.** AS.02.

- 1 Demonstrate management techniques that ensure animal welfare.** AS.02.01.
  - 1a** Explain the implications of animal welfare and animal rights for animal systems. AS.02.01.01.A.
  - 1b** Design programs that assure the welfare of animals and prevent abuse or mistreatment. AS.02.01.01.B.
  - 1c** Implement and evaluate quality-assurance programs and procedures for animal production. AS.02.01.01.C.
  - 2a** Research and summarize the challenges involved in working with animals and resources available to overcome them (e.g., tools, technology, equipment, facilities, animal behavior signals, etc.). AS.02.01.02.A.
  - 2b** Analyze and document animal welfare procedures used to ensure safety and maintain low stress when moving and restraining animals. AS.02.01.02.B.
  - 2c** Devise, implement and evaluate safety procedures and plans for working with animals by species using information based on animal behavior and responses. AS.02.01.02.C.
  - 3a** Distinguish between animal husbandry practices that promote animal welfare and those that do not. AS.02.01.03.A.
  - 3b** Analyze and document animal husbandry practices and their impact on animal welfare. AS.02.01.03.B.
  - 3c** Devise economical recommendations to increase the welfare of animals in animal systems. AS.02.01.03.C.

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**2 Analyze procedures to ensure that animal products are safe for consumption (e.g., use in food system, etc.).** AS.02.02.

- 1a Identify and categorize tools, technology and equipment used in animal husbandry and welfare to help provide an abundant and safe food supply. AS.02.02.01.A.
- 1b Utilize tools, technology and equipment to perform animal husbandry and welfare tasks. AS.02.02.01.B.
- 1c Select, evaluate and defend the use of specific tools, technology or equipment used to perform animal husbandry and welfare tasks. AS.02.02.01.C.
- 2a Research and summarize animal production practices that may pose health risks. AS.02.02.02.A.
- 2b Analyze consumer concerns with animal production practices relative to human health. AS.02.02.02.B.
- 2c Research and evaluate programs to assure the safety of animal products for consumption. AS.02.02.02.C.
- 3a Identify and describe animal tracking systems used in animal systems (e.g., livestock, companion animal, exotics, etc.). AS.02.02.03.A.
- 3b Analyze and summarize the impact of animal trace-back capabilities on producers and consumers. AS.02.02.03.B.
- 3c Evaluate the effectiveness of animal and/or premise identification programs for a given species. AS.02.02.03.C.

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**Design and provide proper animal nutrition to achieve desired outcomes for performance, development, reproduction and/or economic production.** AS.03.

**1 Analyze the nutritional needs of animals.** AS.03.01.

- 1a Identify and summarize essential nutrients required for animal health and analyze each nutrient's role in growth and performance. AS.03.01.01.A.
- 1b Differentiate between nutritional needs of animals in different growth stages and production systems (e.g., maintenance, gestation, natural, organic, etc.). AS.03.01.01.B.
- 1c Assess nutritional needs for an individual animal based on its growth stage and production system. AS.03.01.01.C.
- 2a Differentiate between nutritional needs of animal species. AS.03.01.02.A.
- 2b Correlate a species' nutritional needs to feedstuffs that could meet those needs. AS.03.01.02.B.
- 2c Design and defend the use of a nutritional program by demonstrating the relationship between the nutrient requirements and the feedstuffs provided. AS.03.01.02.B.

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## **2 Analyze feed rations and assess if they meet the nutritional needs of animals.** AS.03.02

- 1a** Compare and contrast common types of feedstuffs and the roles they play in the diets of animals. AS.03.02.01.A.
- 1b** Determine the relative nutritional value of feedstuffs by evaluating their general quality and condition. AS.03.02.01.B.
- 1c** Select appropriate feedstuffs for animals based on a variety of factors (e.g., economics, digestive system and nutritional needs, etc.). AS.03.02.01.C.
- 2a** Examine the importance of a balanced ration for animals based on the animal's growth stage (e.g., maintenance, newborn, gestation, lactation, etc.). AS.03.02.02.A.
- 2b** Appraise the adequacy of feed rations using data from the analysis of feedstuffs, animal requirements and performance. AS.03.02.02.B.
- 2c** Select and utilize animal feeds based on nutritional requirements, using rations for maximum nutrition and optimal economic production. AS.03.02.02.C.
- 3a** Examine the purpose, impact and mode of action of feed additives and growth promotants in animal production. AS.03.02.03.A.
- 3b** Compare and contrast methods that utilize feed additives and growth promotants with production practices that do not, (e.g., organic versus conventional production methods). AS.03.02.03.B.
- 3c** Make and defend decisions regarding whether to use feed additives and growth promotants after researching and considering scientific evidence, production system needs and goals, and input from industry professionals. AS.03.02.03.C.

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### **3 Utilize industry tools to make animal nutrition decisions.** AS.03.03.

- 1a Identify and categorize tools and equipment used to meet animal nutrition needs and ensure an abundant and safe food supply AS.03.03.01.A.
- 1b Utilize tools and equipment to perform animal nutrition tasks. AS.03.03.01.B.
- 1c Select, evaluate and defend the use of specific tools or equipment used to perform animal nutrition tasks. AS.03.03.01.C.
- 2a Examine and summarize the meaning of various components of feed labels and feeding directions. AS.03.03.02.A.
- 2b Analyze and apply information from a feed label and feeding directions to feed animals. AS.03.03.02.B.
- 2c Evaluate and summarize the potential impacts, positive and negative, of compliance and/or noncompliance with a feed label and feeding directions. AS.03.03.02.C.
- 3a Examine the use of technology to provide animal nutrition. AS.03.03.03.A.
- 3b Analyze technologies used to provide animal nutrition and summarize their potential benefits and consequences. AS.03.03.03.B.
- 3c Research and recommend technology improvements to provide proper nutrition to animals. AS.03.03.03.C.

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### **Apply principles of animal reproduction to achieve desired outcomes for performance, development and/or economic production.** AS.04.

#### **1 Evaluate animals for breeding readiness and soundness.** AS.04.01.

- 1a Identify and categorize the male and female reproductive organs of the major animal species. AS.04.01.01.A.
- 1b Analyze the functions of major organs in the male and female reproductive systems. AS.04.01.01.B.
- 1c Select breeding animals based on characteristics of the reproductive organs. AS.04.01.01.C.
- 2a Compare and contrast how age, size, life cycle, maturity level and health status affect the reproductive efficiency of male and female animals. AS.04.01.02.A.
- 2b Assess and describe factors that lead to reproductive maturity. AS.04.01.02.B.
- 2c Evaluate and select animals for reproductive readiness. AS.04.01.02.C.
- 3a Summarize the importance of efficient and economic reproduction in animals. AS.04.02.03.A.
- 3b Evaluate reproductive problems that occur in animals. AS.04.02.03.B.
- 3c Treat or cull animals with reproductive problems. AS.04.02.03.C.

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**2 Apply scientific principles to select and care for breeding animals.** AS.04.02.

- 1a Summarize genetic inheritance in animals. AS.04.02.01.A.
- 1b Compare and contrast the use of genetically superior animals in the production of animals and animal products. AS.04.02.01.B.
- 1c Select and evaluate a breeding system based on the principles of genetics. AS.04.02.01.C.
- 2a Identify and summarize inheritance and terms related to inheritance in animal breeding (e.g., dominant, co-dominant, recessive, homozygous, heterozygous, etc.). AS.04.02.02.A.
- 2b Demonstrate how to determine probability trait inheritance in animals. AS.04.02.02.B.
- 2c Select and evaluate breeding animals and determine the probability of a given trait in their offspring. AS.04.02.02.C.
- 3a Identify and summarize genetic defects that affect animal performance. AS.04.02.03.A.
- 3b Analyze how DNA analysis can detect genetic defects in breeding stock. AS.04.02.03.B.
- 3c Perform a DNA analysis and use the data to make and defend breeding decisions. AS.04.02.03.C.
- 4a Identify and summarize different needs of breeding animals based on their growth stages (e.g., newborn, parturition, gestation, gestation lengths, etc.). AS.04.02.04.A.
- 4b Analyze the care needs for breeding stock in each stage of growth. AS.04.02.04.B.
- 4c Create a plan to differentiate care of a species of breeding animals throughout their growth stages. AS.04.02.04.C.

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### **3 Apply scientific principles to breed animals.** AS.04.03.

- 1a** Identify and categorize natural and artificial breeding methods (e.g., natural breeding, artificial insemination, estrous synchronization, flushing, cloning, etc.). AS.04.03.01.A.
  - 1b** Calculate the potential economic benefits of natural versus artificial breeding methods. AS.04.03.01.B.
  - 1c** Select animal breeding methods based on reproductive and economic efficiency AS.04.03.01.C.
  - 2a** Analyze the materials, methods and processes of artificial insemination. AS.04.03.02.A.
  - 2b** Demonstrate artificial insemination techniques. AS.04.03.02.B.
  - 2c** Evaluate the implementation and effectiveness of artificial insemination techniques. AS.04.03.02.C.
  - 3a** Identify and summarize the advantages and disadvantages of major reproductive management practices, including estrous synchronization, superovulation, flushing and embryo transfer (e.g., cost, labor, equipment, etc.). AS.04.03.03.A.
  - 3b** Analyze the processes of major reproductive management practices, including estrous synchronization, superovulation, flushing and embryo transfer. AS.04.03.03.B.
  - 3c** Create and evaluate plans and procedures for estrous synchronization, superovulation, flushing, embryo transfer and other reproductive management practices. AS.04.03.03.C.
  - 4a** Examine the use of quantitative breeding values (e.g., EPDs, Performance records, pedigrees) in the selection of genetically superior breeding stock. AS.04.03.04.A.
  - 4b** Compare and contrast quantitative breeding value differences between genetically superior animals and animals of average genetic value. AS.04.03.04.B.
  - 4c** Select and assess animal performance based on quantitative breeding values for specific characteristics. AS.04.03.04.C.
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**Evaluate environmental factors affecting animal performance and implement procedures for enhancing performance and animal health.** AS.05.

**1 Design animal housing, equipment and handling facilities for the major systems of animal production.** AS.05.01.

- 1a Differentiate between the types of facilities needed to house and produce animal species safely and efficiently. AS.05.01.01.A.
- 1b Critique designs for an animal facility and prescribe alternative layouts and adjustments for the safe, sustainable and efficient use of the facility. AS.05.01.01.B.
- 1c Design an animal facility focusing on animal requirements, economic efficiency, sustainability, safety and ease of handling. AS.05.01.01.C.
- 2a Identify and summarize equipment, technology and handling facility procedures used in modern animal production (e.g., climate control devices, sensors, automation, etc.). AS.05.01.02.A.
- 2b Analyze the use of modern equipment, technology and handling facility procedures and determine if they enhance the safe, economic and sustainable production of animals. AS.05.01.02.B.
- 2c Select, use and evaluate equipment, technology and handling procedures to enhance sustainability and production efficiency. AS.05.01.02.C.

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**2 Comply with government regulations and safety standards for facilities used in animal production.** AS.05.02.

- 1a Identify and summarize the general standards that must be met in facilities for animal production (e.g., environmental, zoning, construction, etc.). AS.05.02.01.A.
  - 1b Analyze animal facilities to determine if standards have been met. AS.05.02.01.B.
  - 1c Evaluate facility designs and make recommendations to ensure that it meets standards for the legal, safe, ethical, economical and efficient production of animals. AS.05.02.01.C.
  - 2a Distinguish between the types of laws and regulations pertaining to animal systems. AS.05.02.02.A.
  - 2b Analyze the structure of laws pertaining to animal systems. AS.05.02.02.B.
  - 2c Evaluate the impact of laws pertaining to animal systems. AS.05.02.02.C.
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**Classify, evaluate and select animals based on anatomical and physiological characteristics.** AS.06.

- 1 Classify animals according to taxonomic classification systems and use (e.g. agricultural, companion, etc.).** AS.06.01.
  - 1a** Explain the importance of the binomial nomenclature system for classifying animals. AS.06.01.01.A.
  - 1b** Explain how animals are classified using a taxonomic classification system. AS.06.01.01.B.
  - 1c** Assess taxonomic characteristics and classify animals according to the taxonomic classification system. AS.06.01.01.C.
- 2a** Compare and contrast major uses of different animal species (e.g., agricultural, companion, etc.). AS.06.01.02.A.
- 2b** Appraise and evaluate the economic value of animals for various applications in the agriculture industry. AS.06.01.02.B.
- 2c** Recommend different uses for an animal species based upon an analysis of local market needs. AS.06.01.02.C.
- 3a** Identify and summarize common classification terms utilized in animal systems (e.g., external and internal body parts, maturity, mature male, immature female, animal products, breeds, etc.). AS.06.01.03.A.
- 3b** Analyze the visual characteristics of an animal or animal product and select correct classification terminology when referring to companion and production animals. AS.06.01.03.B.
- 3c** Apply knowledge of classification terms to communicate with others about animal systems in an effective and accurate manner. AS.06.01.03.C.

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**2 Apply principles of comparative anatomy and physiology to uses within various animal systems. AS.06.02.**

- 1a** Research and summarize characteristics of a typical animal cell and identify the organelles. AS.06.02.01.A.
- 1b** Analyze the functions of each animal cell structure. AS.06.02.01.B.
- 1c** Correlate the functions of animal cell structures to animal growth, development, health and reproduction. AS.06.02.01.C.
- 2a** Examine the basic functions of animal cells in animal growth and reproduction. AS.06.02.02.A.
- 2b** Analyze the processes of meiosis and mitosis in animal growth, development, health and reproduction. AS.06.02.02.B.
- 2c** Apply the processes of meiosis and mitosis to solve animal growth, development, health and reproductive problems. AS.06.02.02.C.
- 3a** Identify and summarize the properties, locations, functions and types of animal cells, tissues, organs and body systems. AS.06.02.03.A.
- 3b** Compare and contrast animal cells, tissues, organs, body systems types and functions among animal species. AS.06.02.03.B.
- 3c** Apply knowledge of anatomical and physiological characteristics of animals to make production and management decisions. AS.06.02.03.C.

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**3 Select and train animals for specific purposes and maximum performance based on anatomy and physiology.** AS.06.03.

- 1a Identify and summarize how an animal's health can be affected by anatomical and physiological disorders. AS.06.03.01.A.
  - 1b Compare and contrast desirable anatomical and physiological characteristics of animals within and between species. AS.06.03.01.B.
  - 1c Evaluate and select animals to maximize performance based on anatomical and physiological characteristics that affect health, growth and reproduction. AS.06.03.01.C.
  - 2a Evaluate an animal against its optimal anatomical and physiological characteristics. AS.06.03.02.A.
  - 2b Compare and contrast procedures to sustainably and efficiently develop an animal to reach its highest performance potential with respect to its anatomical and physiological characteristics. AS.06.03.02.B.
  - 2c Choose, implement and evaluate sustainable and efficient procedures (e.g., selection, housing, nutrition and management) to produce consistently high-quality animals that are well suited for their intended purposes. AS.06.03.02.C.
  - 3a Research and summarize the use of products and by-products derived from animals. AS.06.03.03.A.
  - 3b Evaluate and select products from animals based on industry standards. AS.06.03.03.B.
  - 3c Evaluate and select animals to produce superior animal products based on industry standards. AS.06.03.03.C.
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**Apply principles of effective animal health care.** AS.07.

- 1 Design programs to prevent animal diseases, parasites and other disorders and ensure animal welfare.** AS.07.01.
  - 1a Identify and summarize specific tools and technology used in animal health management. AS.07.01.01.A.
  - 1b Describe and demonstrate the proper use and function of specific tools and technology related to animal health management. AS.07.01.01.B.
  - 1c Select and use tools and technology to meet specific animal health management goals. AS.07.01.01.C.
  - 2a Explain methods of determining animal health and disorders. AS.07.01.02.A.
  - 2b Perform simple health-check evaluations on animals and practice basic emergency response procedures related to animals. AS.07.01.02.B.
  - 2c Determine when an animal health concern needs to be referred to an animal health professional. AS.07.01.02.C.
  - 3a List and summarize the characteristics of wounds, common diseases, parasites and physiological disorders that affect animals. AS.07.01.03.A.
  - 3b Identify and describe common illnesses and disorders of animals based on symptoms and problems caused by wounds, diseases, parasites and physiological disorders AS.07.01.03.B.
  - 3c Treat common diseases, parasites and physiological disorders of animals according to directions prescribed by an animal health professional. AS.07.01.03.C.
  - 4a Identify and summarize characteristics of causal agents and vectors of diseases and disorders in animals. AS.07.01.04.A.
  - 4b Research and analyze data to evaluate preventive measures for controlling and limiting the spread of diseases, parasites and disorders among animals. AS.07.01.04.B.
  - 4c Design and implement a health maintenance and a disease and disorder prevention plan for animals in their natural and/or confined environments. AS.07.01.04.C.
  - 5a Explain the clinical significance of common veterinary methods and treatment (e.g., aseptic techniques, antibiotic use, wound management, etc.). AS.07.01.05.A.
  - 5b Assess the safety and effectiveness of facilities and equipment used for surgical and nonsurgical veterinary treatments and procedures. AS.07.01.05.B.
  - 5c Identify and describe surgical and nonsurgical veterinary treatments and procedures to meet specific animal health care objectives. AS.07.01.05.C.

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**2 Analyze biosecurity measures utilized to protect the welfare of animals on a local, state, national, and global level.** AS.07.02.

- 1a Summarize the importance of biosecurity to the animal industry at multiple levels (e.g., local, state, national, global). AS.07.02.01.A.
- 1b Analyze procedures at the local, state and national levels to ensure biosecurity of the animal industry. AS.07.02.01.B.
- 1c Design and evaluate a biosecurity plan for an animal production operation. AS.07.02.01.C.
- 2a Identify and describe zoonotic diseases including their historical significance and potential future implications AS.07.02.02.A.
- 2b Analyze the health risk of different zoonotic diseases to humans and identify prevention methods. AS.07.02.02.B.
- 2c Research and evaluate the effectiveness of zoonotic disease prevention methods and procedures to identify those that are best suited to ensure public safety and animal welfare. AS.07.02.02.C.

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**Analyze environmental factors associated with animal production.** AS.08.

**1 Design and implement methods to reduce the effects of animal production on the environment.** AS.08.01.

- 1a Identify and summarize the effects of animal agriculture on the environment (e.g., waste disposal, carbon footprint, air quality, environmental efficiencies, etc.). AS.08.01.01.A.
- 1b Assess the effectiveness of methods of reducing the effects of animal agriculture on the environment. AS.08.01.01.B.
- 1c Devise a plan that includes measures to reduce the impact of animal agriculture on the environment AS.08.01.01.C.

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**2 Evaluate the effects of environmental conditions on animals and create plans to ensure favorable environments for animals.** AS.08.02.

- 1a Research and summarize environmental conditions that impact animals (e.g., weather, sources of water, food resources, etc.). AS.08.02.01.A.
- 1b Critique the reliability and validity of evidence presented to support claims regarding the effects of environmental conditions on animal populations and performance (e.g., population changes, emerging species, extinction, etc.). AS.08.02.01.B.
- 1c Apply valid and reliable research evidence to predict the potential effects of different environmental conditions for an animal population. AS.08.02.01.C.
- 2a Identify and summarize methods for ensuring optimal environmental conditions for animals. AS.08.02.01.A.
- 2b Implement and evaluate the effectiveness of methods to ensure optimal environmental conditions for animals. AS.08.02.02.B.
- 2c Devise and improve plans to establish favorable environmental conditions for animal growth and performance based on a variety of factors (e.g., economic feasibility, environmental sustainability, impact on animals, etc.). AS.08.02.02.C.