Animal Sciences (ANSC)

ANSC 102. Student Success Techniques - Animal Sciences with Pre-Veterinary Medicine Emphasis. 1 Credit.
This course is designed to ease the transition for new students. Students will learn skills and techniques used by successful college students. Topics will include: an overview of the veterinary school requirements, options within the animal sciences program, professional communication, internship & study abroad opportunities, career opportunities, as well as student success basics. Prereq: Animal Science or Equine Science majors only.

ANSC 114. Introduction to Animal Sciences. 3 Credits.
General principles of the livestock industry and relationships to mankind. 2 lectures, 1 two-hour laboratory.

ANSC 123. Feeds and Feeding. 3 Credits.
Principles of feeding livestock including digestive systems, nutrient requirements, nutrient characteristics, and sources utilized in the formulation of balanced rations. 2 lectures, 1 two-hour laboratory.

ANSC 150. Animal Science Orientation. 1 Credit.
Students will be introduced to opportunities and professional advancement in the animal sciences. Overview of majors, minors, and options offered in the Department of Animal Sciences, activities, and support services.

ANSC 201. Student Success Techniques - Nontraditional & Transfer Students. 1 Credit.
This course is designed to ease the transition for student new to NDSU. The specific focus of this course will be dependent on the interests and needs of enrolled students. Some of the topics will include: an overview of the animal and equine science programs, internship & study abroad opportunities, career opportunities, professional communication, and student success basics. Prereq: Animal Science or Equine Science majors only.

ANSC 210. Introduction to Therapeutic Horsemanship. 3 Credits.
This course will introduce students to perspectives of disabilities, how equine assisted activities may affect individuals with specific disabilities, how to select appropriate horses and adaptive equipment, and will include discussion on the history and current discipline of therapeutic horsemanship and related fields. F.

ANSC 220. Livestock Production. 3 Credits.
General production and management of major meat and dairy animal species. Topics include production systems, feeding, facilities, health, economics, and marketing. 2 lectures, 1 two-hour laboratory.

ANSC 223. Introduction to Animal Nutrition. 2 Credits.
Principles of feeding livestock and pets including digestive systems, nutrient characteristics, nutrient requirements, and feed sources used in formulating balanced rations.

ANSC 230. Meat Grading and Evaluation. 2 Credits.
Evaluation and grading of carcasses and wholesale cuts of beef, pork, and lamb. Written explanation of decisions and comparisons. 2 three-hour laboratories. Prereq: ANSC 240. F.

ANSC 231. Livestock Evaluation. 2 Credits.
The study of evaluating breeding and market livestock based on records, appearance, and soundness. 2 three-hour laboratories. Prereq: ANSC 240. F.

ANSC 232. Dairy Cattle Evaluation. 2 Credits.
Visual appraisal and evaluation of dairy cattle. Type classification of dairy cattle. 2 three-hour laboratories. F.

ANSC 233. Junior Competitive Livestock Evaluation. 2 Credits.
The study of evaluating breeding and market livestock based upon visual appraisal and performance records. The NDSU Junior Livestock Evaluation Team will be selected from students enrolled in ANSC 233. Students are admitted to the course by instructor approval. 2, three-hour laboratories plus hours arranged. Prereq: ANSC 240.

ANSC 235. Equine Evaluation. 2 Credits.
Detailed study of horse conformation, selection criteria, and judging standards for equine competitions. Emphasis will be placed on development of critical thinking, decision making, and oral presentation skills. 2 three-hour laboratories. May be repeated. Prereq: ANSC 260. F.

ANSC 240. Meat Animal Evaluation and Marketing. 3 Credits.
Relationship between live animal composition and meat product values. Introduction to basic muscle biology and effects of livestock practices on meat quality. 2 lectures, 1 two-hour laboratory.

ANSC 260L. Equine Care and Management Practicum. 1 Credit.
A laboratory course designed to supplement lecture material covered in ANSC 260. Students will learn management and husbandry skills relevant to modern horse care practices. 1 two-hour laboratory. F,S.

ANSC 260. Introduction to Equine Studies. 2 Credits.
Introduction to basic aspects of equine studies and general principles surrounding the horse industry. 2 one-hour lectures. F.

ANSC 261. Basic Equitation & Horsemanship. 1 Credit.
Basic grooming, saddling, bridling, mounting, ground work, correct riding position, and proper coordination of the riding aids will be addressed. Horse behavior will also be discussed throughout the course. 1 two-hour laboratory. Lab fee required. Enrollment priority will be given to Equine Studies Major/Minor/Certificate students.

ANSC 300. Domestic Animal Behavior and Management. 3 Credits.
Discussion of animal behavior, with an emphasis on physiology, as it relates to management, handling and housing of domestic animals. Basic methods of measuring behavior are explored. Prereq: ANSC 114, VETS 135.

ANSC 310. Principles of Therapeutic Horsemanship Instruction. 3 Credits.
This course is focused on theoretical knowledge and application of therapeutic horsemanship instruction through experiential learning and teaching techniques of peers, and includes evaluation and training techniques for therapy horses, lesson plan development, and critical reviews of the literature. Prereq: ANSC 210, ANSC 261. S.

ANSC 312. Bovine Pregnancy Diagnosis and Ultrasonography. 1 Credit.
The course will involve the anatomy and physiology of the bovine. Utilization of techniques to determine pregnancy and ultrasonography will be instructed. Prereq: ANSC 463.

ANSC 314. Animal Biotechnology. 3 Credits.
Animal biotechnology, biotechnology in human health, biotechnology in reproduction, and biotechniques. Prereq: BIOL 126 or BIOL 150.

ANSC 323. Fundamentals of Nutrition. 3 Credits.
Fundamentals of nutrition emphasizing digestion, metabolism, function, requirements, and sources of specific nutrients. 3 lectures. Recommended Prereq: ANSC 123, BIOC 260. S.

ANSC 324. Applied Animal Nutrition. 3 Credits.
The application of nutrition principles in feed management systems for livestock, poultry, and pets. Prereq: ANSC 323.

ANSC 330. Competitive Meat Grading and Evaluation. 2 Credits.
Senior meat judging team. Team members will travel to intercollegiate meat judging contests. May be repeated. Prereq: ANSC 230.

ANSC 331. Competitive Livestock Evaluation. 2 Credits.
Evaluation of breeding and market livestock with an emphasis on preparing students for judging competition. 3 three-hour laboratories plus additional times to be arranged. May be repeated. Prereq: ANSC 231.

ANSC 332. Competitive Dairy Cattle Evaluation. 2 Credits.
Visual appraisal and evaluation of dairy cattle for competition at national dairy evaluation contests. 2 three-hour laboratories plus time to be arranged. Prereq: ANSC 232 and a minimum cumulative 2.0 GPA. May be repeated for credit.

ANSC 335. Competitive Equine Evaluation. 2 Credits.
Evaluation of horse conformation, selection criteria, and judging standards for national equine judging competitions. 2 three-hour laboratories plus time to be arranged. Prereq: ANSC 235. May be repeated for credit.

ANSC 340. Principles of Meat Science. 3 Credits.
Introduction to the anatomical, physiological, developmental, and biochemical aspects conversion of muscle to meat and aspects of fresh and processed meat technology, preservation, microbiology, and current issues. 2 lectures, 1 two-hour laboratory.

ANSC 343. Humane Slaughter and Meat Cutting. 3 Credits.
This course will teach the principles and procedures of meat animal humane slaughter, carcass fabrication, and meat processing. You will be required to help in all processes of slaughter, fabricating, processing, and cleaning.

ANSC 344. Fundamentals of Meat Processing. 2 Credits.
Chemical and physical relationships in meat preservation, sausage production, and other meat product preparation. 1 lecture, 1 three-hour laboratory.

ANSC 350. Graduate Experience Program. 1 Credit.
This course is designed to give undergraduate students the opportunity to explore graduate studies in the Animal Sciences. Undergraduates are paired with a graduate student mentor and participate in data collection, lab work, departmental seminars, journal article presentations, and scientific meetings.

ANSC 357. Animal Genetics. 3 Credits.
Genetic and statistical principles applied to livestock improvement. 2 lectures, 1 two-hour laboratory. Prereq: PLSC 315, STAT 330. S.

ANSC 358. Equine Genetics. 2 Credits.
Genetic principles applied to horses including: genetic improvement programs, genetic defects, color inheritance, inbreeding, domestication and breeds. Prereq: BIOL 315 or BOT 315 or PLSC 315 or ZOO 315. F.

ANSC 360. Equine Nutrition. 3 Credits.
This course focuses on basic equine nutrition fundamentals while integrating concepts in an applied and practical manner. Recommended Prereq: ANSC 223 or ANSC 323.

ANSC 361. Intermediate Horsemanship. 1 Credit.
A continuation of ANSC 261. Further emphasis will be placed on development of the balanced seat and coordinated aids necessary to complete more advanced maneuvers. 1 two-hour laboratory. Lab fee required. Enrollment priority will be given to Equine Studies Major/Minor/Certificate students. Prereq: ANSC 261.

ANSC 362. Colts in Training. 2 Credits.
Principles and application of techniques required to train a young horse to ride. Three two-hour laboratories. Enrollment priority will be given to equine studies major/minor students. Lab fee required. Recommended prereq: ANSC 261, ANSC 361. S.

ANSC 364. Equine Anatomy and Physiology. 3 Credits.
This course focuses on a practical understanding of equine anatomy and physiology as they relate to management, conditioning, and reproduction. Prereq: VETS 135.

ANSC 370. Fundamentals/Animal Disease. 3 Credits.
Basic principles of disease processes and prevention. Comparative review emphasizing infectious and management related diseases in production and companion species. An emphasis will be placed on public health. Prereq: VETS 135 or BIOL 220. Recommended prereq: ANSC 114 and MICR 202 or MICR 350.

ANSC 371. Fundamentals of Animal Disease II. 3 Credits.
Basic principles of disease processes and prevention. Comparative review emphasizing infectious and management related diseases in domestic animals with a focus on canine, feline and equine species. An emphasis will be placed on public health. Prereq: VETS 135.

ANSC 375. Methods of Horsemanship Instruction. 2 Credits.
In this experiential learning course, students will study methods of instruction, lesson plan development, and demonstrate integration of their knowledge through practical teaching situations, both mounted and unmounted. Prereq: ANSC 361. F (even years).

ANSC 378. Animal Health Management. 1 Credit.
This course introduces the student to learning through a case-based approach to animal disease. Case material highlights health problems seen in the Midwest. Case questions encourage students to think about disease prevention, management and eradication. May be repeated for credit. Prereq: VETS 135. Recommended Prereq: ANSC 114.

ANSC 380L. Livestock Sales and Marketing Laboratory. 1 Credit.
Students will learn the importance of livestock marketing by utilizing livestock selection and evaluation, catalog development, livestock photography, sale advertising, and animal management. Furthermore students will build a customer database, prepare sale advertisements and announcements using various forms of communication such as written and electronic. Students will manage numerous social media platforms. At the end of the semester, students will manage and conduct a livestock auction. Prereq: Junior or Senior standing. Co-req: ANSC 380.

ANSC 380. Livestock Sales and Marketing. 2 Credits.
Students will learn the importance of livestock marketing, catalog development, livestock photography, sale advertising, and animal management, and will hold a sale at the end of the semester. Prereq: Junior or Senior standing.

ANSC 410. Therapeutic Horsemanship Teaching Practicum. 1 Credit.
In this practical teaching course, students will team teach for 6 to 12 weeks with a North American Riding for the Handicapped Association (NARHA) certified instructor at a local therapeutic program, assisting with lesson plan and program plan development, mounting and dismounting of riders, as well as instruction and evaluation of riders. Prereq: ANSC 210, ANSC 310.

ANSC 426. Feed Technology. 2 Credits.
This course is a comprehensive introduction to feed production technology; the science of feeds, feeding, feed additives and feed optimization; and management and legal aspects in providing quality livestock, poultry, aquatic and companion animal feeds. Prereq: ANSC 223 or ANSC 324 or ANSC 360.

ANSC 435. Nutrition Laboratory Techniques. 3 Credits.
Theory and basic laboratory techniques associated with nutritional research and current information regarding advanced techniques and developments. 2 lectures, laboratory by arrangement. Prereq: CHEM 260. F (even years) {Also offered for graduate credit - see ANSC 635.}.

ANSC 444. Livestock Muscle Physiology. 3 Credits.
Basic concepts in muscle growth and development of livestock, evaluating the effects of environment, welfare, nutrition and genetics regarding muscle metabolism and physiology, and how this ultimately affects the nature of muscle as food. Prereq: CHEM 260. {Also offered for graduate credit - see ANSC 644.}.

ANSC 457. Genetic Improvement of Livestock. 3 Credits.
Principles and applications of technologies for the genetic improvement of livestock including both quantitative and molecular techniques. Prereq: ANSC 357.

ANSC 458. Evaluation and Use of Breeds of Livestock. 3 Credits.
Evaluation of breeds of cattle, sheep and swine with emphasis of breed comparison research and breed history. Examination of appropriate use of existing breed resources and development of new breeds. Prereq: ANSC 357. {Also offered for graduate credit - see ANSC 658.}.

ANSC 461. Advanced Horsemanship and Equitation. 1 Credit.
Advanced emphasis on horsemanship techniques to develop the finished rider. 1 two-hour laboratory. Lab fee. Prereq: ANSC 361.

ANSC 463L. Physiology of Reproduction Laboratory. 1 Credit.
Anatomy, physiology and demonstration and utilization of techniques in large animal reproductive management. Prereq: ANSC 463.{Also offered for graduate credit - see 663L.}.

ANSC 463. Physiology of Reproduction. 3 Credits.
Comparative anatomy, physiology, and endocrinology of reproduction in mammals. {Also offered for graduate credit - see ANSC 663.}.

ANSC 464. Reproduction Management Procedures. 2 Credits.
Demonstration and utilization of the new technology in large animal reproductive management including embryo and semen collection, pregnancy diagnosis, and estrous control. 1 lecture, 1 three-hour laboratory. Prereq: ANSC 463. F.

ANSC 470. Applied Nutrition. 4 Credits.
Application of nutrition principles in feed management systems for livestock with emphasis on energy and protein (ruminants) and energy and amino acids (non-ruminants). 4 lectures. Prereq: ANSC 323. S.

ANSC 478. Research and Issues in Animal Agriculture. 3 Credits.
Examination of the role of animal agriculture in society, research pertaining to the animal sciences and current issues facing animal agriculture. Prereq: Senior standing with a primary interest in animal agriculture.

ANSC 480. Equine Industry and Production Systems. 3 Credits.
A capstone course that incorporates genetics, nutrition, exercise physiology, reproduction, health care, and industry practices into management of the equine enterprise. 2 lectures, 1 two-hour laboratory. Prereq: ANSC 360, ANSC 364. F.

ANSC 482. Sheep Industry and Production Systems. 3 Credits.
A capstone course that incorporates genetics, nutrition, reproduction, disease control, and marketing into sustainable flock enterprises. 2 lectures, 1 two-hour laboratory. Prereq: ANSC 324, ANSC 357 and ANSC 463.

ANSC 484. Swine Production/Pork Industry Systems. 3 Credits.
Capstone course includes breeding systems, disease control, applied economics, housing, marketing, pork quality, and nutrition in a systems approach. 2 lectures, 1 two-hour laboratory. Prereq: ANSC 324, ANSC 357, ANSC 463.

ANSC 486. Beef Industry and Production Systems. 3 Credits.
Capstone course includes the management, systems, selection, record keeping, merchandising, and production testing of beef. 2 lectures, 1 two-hour laboratory. Prereq: ANSC 324, ANSC 357 and ANSC 463.

ANSC 487. Growing and Finishing Cattle Management. 3 Credits.
Integrated management of cattle fed for slaughter with emphasis on nutrition, health, marketing, and risk management; covers the beef enterprise from weaning to market. Prereq: Junior or Senior standing. {Also offered for graduate credit - see ANSC 687 .}.

ANSC 488. Dairy Industry and Production Systems. 3 Credits.
Capstone course: United States dairy industry including terminology, dairy stock management, economics and finance, facilities, waste management, nutrition, milk quality and animal health. 2 lectures, 1 two-hour laboratory. Prereq: ANSC 324, ANSC 463.

ANSC 635. Nutrition Laboratory Techniques. 3 Credits.
Theory and basic laboratory techniques associated with nutritional research and current information regarding advanced techniques and developments. 2 lectures, laboratory by arrangement. F (even years) {Also offered for undergraduate credit - see ANSC 435.}.

ANSC 644. Livestock Muscle Physiology. 3 Credits.
Basic concepts in muscle growth and development of livestock, evaluating the effects of environment, welfare, nutrition and genetics regarding muscle metabolism and physiology, and how this ultimately affects the nature of muscle as food. {Also offered for undergraduate credit - see ANSC 444.}.

ANSC 657. Genetic Improvement of Livestock. 3 Credits.
Principles and applications of technologies for the genetic improvement of livestock including both quantitative and molecular techniques. {Also offered for undergraduate credit - see ANSC 457.}.

ANSC 658. Evaluation and Use of Breeds of Livestock. 3 Credits.
Evaluation of breeds of cattle, sheep and swine with emphasis of breed comparison research and breed history. Examination of appropriate use of existing breed resources and development of new breeds. {Also offered for undergraduate credit - see ANSC 458.}.

ANSC 663. Physiology of Reproduction. 3 Credits.
Comparative anatomy, physiology, and endocrinology of reproduction in mammals. {Also offered for undergraduate credit - see ANSC 463.}.

ANSC 663L. Physiology of Reproduction Laboratory. 1 Credit.
Anatomy, physiology and demonstration and utilization of techniques in large animal reproductive management. {Also offered for undergraduate credit - see ANSC 443L.}.

ANSC 677. Animal Preventive Medicine. 3 Credits.
Course incorporates factors that contribute to development of animal medical conditions/diseases and how these factors can be manipulated to prevent or control the condition or disease. Emphasis will be placed on undergraduate preventive medicine. {Also offered for undergraduate credit - see ANSC 477.}.

ANSC 687. Growing and Finishing Cattle Management. 3 Credits.
Integrated management of cattle fed for slaughter with emphasis on nutrition, health, marketing, and risk management; covers the beef enterprise from weaning to market. {Also offered for undergraduate credit - see ANSC 487.}.

ANSC 701. Writing and Communicating in the Animal Sciences. 3 Credits.
Studying and practicing scientific writing and communication in the animal science discipline.

ANSC 721. Biology of Lactation. 2 Credits.
Mammary gland development and mechanisms controlling lactation. 2 lectures.

ANSC 725. Advanced Equine Nutrition. 3 Credits.
This course explores concepts in equine nutrition including digestive physiology of horses, nutrient requirements for different classes of horses and feed management. Ration evaluation and balancing, as well as problem solving will be a core component to this course. Prereq: ANSC 776.

ANSC 736. Experimental Nutrition Methods. 1 Credit.
Design, conductance, analysis, and reporting of experiments taken in conjunction with ANSC 773, ANSC 774, ANSC 775, or ANSC 776.

ANSC 740. Data Analyses and Designs of Experiments. 3 Credits.
Experimental design principles, introductory statistical theory, and commonly used data analyses of animal science data are taught and practiced with practical applications using the computer. 3 lectures. Prereq: STAT 725.

ANSC 750. Quantitative Genetics Applications of Matrix Algebra. 1 Credit.
Principles in matrix algebra to describe and solve problems in the agricultural and life sciences, and particularly quantitative genetics. Material includes vocabulary, concepts, and, to a lesser extent, theory of matrix algebra, with application to ecological systems, genotypic transition matrices, selection indices, and the numerator relationship matrix. With matrix algebra, use least squares procedures and canonical transformation to solve problems in biological sciences.

ANSC 751. A Primer to Quantitative Genetics. 1 Credit.
Language and foundational principles of quantitative genetics. Material includes basic model for quantitative genetics (additive and non-additive genetic effects, including Mendelian sampling, and environmental effects), sources of variation, heritability, family resemblance and repeatability, selection response, and family selection. Define expected values and concepts in applied statistics. Prereq: ANSC 750.

ANSC 752. Selection Index Theory and Application. 1 Credit.
Theory and application of selection indices. Material includes design of animal breeding programs, estimating selection response, constructing economic selection indices, and developing multiple-stage selection strategies. Introduces approaches for deriving economic weights, and predicting economic response to selection. Prereq or Co-req: ANSC 751.

ANSC 753. Economic Breeding Programs. 1 Credit.
Principles for developing an economic basis for multiple-trait selection to improve the profitability of production. Material includes review of concepts relevant to the selection index, introduction to the concept of systems analysis, linear programming, and simulation with emphasis on economic values useful for selection index. Critically analyze relevant literature. Prereq or Co-req: ANSC 752.

ANSC 754. Cybersheep: A Genetic Simulation Game. 1 Credit.
Principles of genetic selection and mating strategies applied in livestock breeding programs. Through use of a web-based genetic simulation game (CyberSheep), develop skills in implementing a virtual animal breeding program, assess the outcomes of decision-making in terms of genetic response, inbreeding, and economic returns, and experience stochastic elements inherent to livestock systems.

ANSC 755. Advanced Meat Science. 3 Credits.
An in-depth investigation of the physical and biochemical characteristics of muscle and meat. Students will gain an understanding of advanced meat science topics, and improve their ability to design, conduct, interpret and report meat science research. (even years).

ANSC 756. History and Perspectives in Animal Breeding. 1 Credit.
Historical perspective to the discipline of animal breeding and genetics. Introduction to the contributions of geneticists who have significantly impacted the discipline. Material includes pre-recorded interviews of scientists that have had an international impact in animal breeding and genetics. Critique key papers.

ANSC 758. Molecular Biological Techniques in Animal Sciences. 3 Credits.
The theory and application of molecular biology laboratory techniques to the field of animal sciences.

ANSC 773. Energy Metabolism. 3 Credits.
Methods of measuring energy values and the metabolic processes involved in the production of useful biological energy from organic compounds. 3 lectures. Prereq: BIOC 701. F (odd years).

ANSC 774. Nitrogen Metabolism. 3 Credits.
Detailed overview of nitrogenous compounds including metabolism and function. Considerable emphasis on current research from the literature. 3 lectures. Prereq: BIOC 701. S (even years).

ANSC 776. Digestive Physiology. 3 Credits.
Investigation of digestive and absorptive events occurring within farm animals. Emphasis on enzyme action, nutrient transport, gut motility, gastro-intestinal endocrinology, and current research. 3 lectures. Prereq: BIOC 701. F (odd years).

ANSC 813. Domestic Animal Endocrinology. 3 Credits.
Detailed overview of the function of hormones and their effects on physiological systems. Considerable emphasis will be placed on experimental approaches, approaches to manipulate endocrine status, and current literature.

ANSC 828. Advanced Reproductive Biology. 3 Credits.
Discussion of reproductive physiology research with emphasis on current topics in cellular and molecular biology. 3 lectures. S (odd years).

ANSC 830. Growth Biology. 3 Credits.
Regulation of growth at the cell/tissue, organ systems, and whole animal levels. 3 lectures. S (even years).

ANSC 850. Linear Models in Animal Breeding. 1 Credit.
Principles of linear models used in animal breeding. Models discussed in the context of the random variable that is to be predicted. Material includes animal models, sire/maternal grandsire models, and sire models, models with a single and repeated records, and models with both direct and maternal effects. Prereq: ANSC 751, ANSC 752.

ANSC 851. Genetic Prediction. 1 Credit.
Principles for using best linear unbiased prediction (BLUP) in genetic prediction. Material includes data integrity diagnosis, contemporary grouping strategies, adjusting for known non-genetic effects, the AWK Programming Language, UNIX/Linux scripting, and use of modern computational tools to perform genetic evaluations. Emphasis on real-world datasets designed to develop applied analytical skills in animal breeding. Prereq: ANSC 752, ANSC 850.

ANSC 852. Applied Variance Component Estimation. 1 Credit.
Principles in the estimation of (co)variance components and genetic parameters required to solve mixed models typical in livestock genetics. Focus on applied knowledge of approaches used to estimate the G and R sub-matrices of the mixed model equations. Demonstrate models commonly used in parameter estimation. Introduce scientific literature concerning implementation, and attributes of the solutions, of variance component estimation strategies. Prereq; ANSC 850, ANSC 851.

ANSC 856. Prediction and Control of Inbreeding in Breeding Programs. 1 Credit.
Principles in the prediction and control of inbreeding in livestock breeding program. Material includes definition of inbreeding and identity by descent, impacts of inbreeding on genotype frequencies, trait means and variances, random drift, computation of inbreeding coefficients in pedigreed populations, prediction of rates of inbreeding in closed populations, and control and management of inbreeding in breeding populations. Prereq: ANSC 751.

ANSC 875. Vitamins and Minerals. 3 Credits.
Metabolism of vitamins and minerals and their application in animal nutrition and the feed industry. 3 lectures. Prereq: BIOC 701. F (even years).