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M W P S

MidWest Plan Service
A Foundation of Knowledge

B u i l d i n g

T h e

F u t u r e

T o g e t h e r

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1997



New Publications 1

MWPS Handbooks

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MWPS is...

The MidWest Plan Service is an organization of extension and research agricultural engineers from the 12 states of the north central region, plus representatives of the USDA. Established in 1929, MWPS is one of the oldest regional cooperative efforts of Land Grant Universities in the U.S., publishing its first plans in 1933.

Its long-standing success can be credited to three major factors:

- The dedication of individual committee members who identify new issues, concepts and technologies, then strive to develop basic information that puts them into practice.
- The commitment of individual universities that support the MWPS mission with staff and funding.
- The willingness of specialists and professionals throughout the country to volunteer their time to write and review materials.

NRAES is...

The Northeast Region Agricultural Engineering Service is an interdisciplinary, issue-oriented organization focused on delivering engineering-related educational materials and training opportunities in support of Northeast Cooperative Extension programs. NRAES functions in the Northeastern United States much the same way MWPS does in the Midwest. All activities are guided by extension and research faculty members within the Northeast land grant system.

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Member Universities

University of Illinois
Agricultural Engineering Dept.
1304 West Pennsylvania Ave.
Urbana, IL 61801
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Iowa State University
Ag & Biosystems
Engineering Extension
207 Davidson Hall
Ames, IA 50011-3080
(515)294-6361 FAX: (515)294-9973

Kansas State University
Extension Agricultural Engineering
Seaton Hall, Room 237
Manhattan, KS 66506
(913)532-5813 FAX: (913)532-6944

Michigan State University
Plan Service Secretary
217 Farrall Hall
Agricultural Engineering Dept.
East Lansing, MI 48824-1323
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Extension, Agricultural Engineering
Agricultural Engineering Building
1390 Eckles Ave.
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(612)625-9733

University of Missouri
Agricultural Engineering Plan Service
205 Agricultural Engineering Building
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(573)882-2731 FAX: (573)884-5650

University of Nebraska
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(402)472-1646

North Dakota State University
Extension, Agricultural Engineering
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 Fargo, ND 58105
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Ohio State University
Department of Food, Ag &
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590 Woody Hayes Dr.
Columbus, OH 43210
(614)292-6007 FAX: (614)292-9448

Purdue University
Farm Building Plan Service
1146 Agricultural Engineering
West Lafayette, IN 47907-1173
(317)494-1173 FAX: (317)496-1356

South Dakota State University
MWPS Secretary
Agricultural Engineering
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Brookings, SD 57007
(605)688-5667 FAX: (605)688-4917

University of Wisconsin
MWPS Secretary
Biological Systems Engineering Dept.
460 Henry Mall
Madison, WI 53706
(608)262-3311 FAX: (608)262-1228

New Publications

Greenhouse Barns for Dairy Housing

AED-40 \$4.00

This publication summarizes information about greenhouse barn design for dairy housing. It discusses economic factors that can be used to analyze design layouts and construction alternatives, and it compares the costs of greenhouse barns to the costs of conventional post structures to determine if a greenhouse barn is suitable for a particular situation.

Hoop Structures for Grow-Finish Swine

AED-41 \$4.00

To help producers and designers resolve some of the issues involved in using a hoop structure to finish pigs, this publication summarizes information about hoop structure use and design. It discusses some of the differences in management techniques that hoop structures require, and it presents economic factors that can be used to analyze design layouts and construction alternatives. The publication contains a sample budget comparing the costs of hoop structures to the costs of more traditional confinement housing.

Sprinkling Oil to Reduce Dust, Odor, and Gases in Swine Buildings

AED-42 \$2.00

This publication addresses the problem of dust, odor, and gases in swine buildings. It describes research done to reduce dust and odor, explains the results of that research, and describes a method that the average swine producer can use to reduce dust and odors in swine buildings. The material the publication presents could be useful in helping reduce health risks to those employed in the swine industry and could contribute to a safer future for farm owners and employees.

Swine Nursery Facilities Handbook

MWPS-41 \$12.00

This handbook is one of a series dealing with the various phases of swine production. It provides producers and planners with guidelines and descriptions of systems and components that meet the design goal for housing pigs from weaning to 12 weeks of age. Major topics include housing and management options, planning decisions, building layout and equipment, manure handling, environmental control systems, utilities, and safety. Drawings, tables, and charts are included.

Publications Under Development at MWPS:

MWPS-29, Dry Grain Aeration Systems Design Handbook

MWPS-30, Sprinkler Irrigation Systems for Agriculture

MWPS-43, Swine Breeding and Gestation Handbook

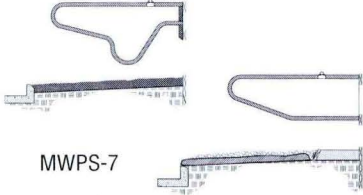
MWPS-44, Integrated Crop Management Handbook

Fast Fact: Fast Facts are from the *Agriculture Fact Book 1996*.

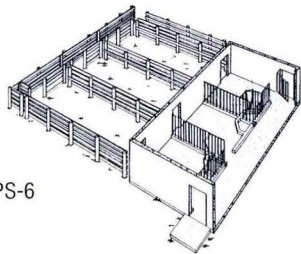
The estimated cost for marketing domestic farm foods is \$401 billion dollars per year.
Fast Facts source; the *Agriculture Fact Book 1996*.

MWPS Handbooks

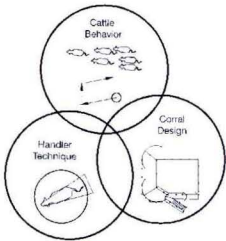
Livestock



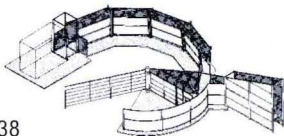
MWPS-7



MWPS-6



CAN-723



OKE-938



MWPS-15

Dairy Freestall Housing and Equipment

MWPS-7 \$20.00

This book presents dairy facility design and equipment planning with an emphasis on freestall housing. Discussion is based on total herd management by production groups; management by age groups; and replacement animal housing. Chapters include: replacement animal housing areas; milking herd facilities; milking centers; special handling and treatment areas; building environment; manure and wastewater management; feeding facilities, and utilities. This edition describes the total dairy facility, including herd makeup, cropland requirements, housing and freestall needs, and basic farmstead planning principles. 124 pages.

ISBN 0-89373-086-6

5th Ed. 1994

Beef Housing and Equipment Handbook

MWPS-6 \$7.00

Current agricultural engineering recommendations are summarized in this complete housing guide. Essential components for an efficient operation such as building design, operation size, and equipment are discussed. Figures, tables, and discussions to help improve, expand, and modernize an operation are included. Topics cover cow-calf, cattle handling, and cattle feeding facilities; feed storage, processing, and handling; water and waterers; manure management; farmstead planning; building construction and materials; ventilation and insulation; fences; gates; and utilities. 136 pages.

ISBN 0-89373-068-8

4th Ed. 1986

Corrals for Handling Beef Cattle

CAN-723 \$10.00

This Alberta Agriculture publication explains the cattle handling equation. The book starts with cattle behavior and handling techniques and then looks at corral design, geometry, and components. It includes more than 60 design drawings and corral plans. These designs cover gates, pens, fences, scales, alleys, chutes and other working areas. Each design includes a cost index based on a minimum working corral. This basic corral is pegged at between \$1,200 and \$1,400 for materials. The book was reviewed by industry experts. 91 pages.

Modern Corral Design

OKE-938 \$5.00

This publication, published by the Oklahoma Cooperative Extension Service, addresses working cattle efficiently and safely with much less labor. Recommendations and design specifications feature plans for three different working facilities, including a simpler, more economical one for small cattle operations. Sections include information about site selection, the main components of the actual working areas, holding and sorting facilities for safe and efficient animal flow and a step-by-step construction sequence. Details are given for including options such as scales, different headgates, loading chutes, a hospital area, a palpation cage, and a calf table in the design. 60 pages.

Horse Housing and Equipment Handbook

MWPS-15 \$7.00

A planning section covers problems regarding codes, regulations, site selection, and housing choice. The housing section details barn styles; open-front buildings; cold enclosed housing; layouts; construction; insulation; vapor barriers; supplemental heat; ventilating systems; and fans. The construction section includes information on tack room equipment; gates; fences; windbreak fences; jumps; loading chutes; and more. 60 pages.

ISBN 0-89373-009-2

1st Ed. 1971

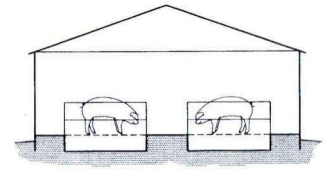
In the United States, retail food prices have risen 39.8 percent over the last ten years.

Fast Fact:

Livestock

Swine Farrowing Handbook: Housing and Equipment MWPS-40 \$7.00

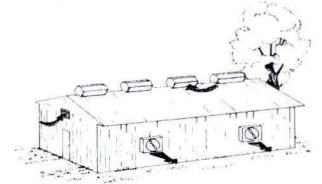
Planning the use of farrowing facilities is the most important and most difficult task of intensive swine production. This handbook covers planning, building design factors, animal environment, manure management, utilities, construction, remodeling, and more. Concepts from nine MWPS farrowing building plans are incorporated and expanded upon. Space use guidelines, layout alternatives, and construction techniques are detailed. 56 pages.
ISBN 0-89373-084-X 1st Ed. 1992



MWPS-40

Swine Housing and Equipment Handbook MWPS-8 \$8.00

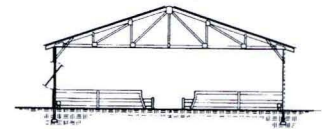
Whether building a new facility or redesigning an old one, this is the complete guide to swine building design, operation, and equipment. A detailed environmental control section covers mechanical and natural ventilation, manure pit ventilation, cooling systems, and insulation. Chapters cover site selection; remodeling; scheduling; handling; grain-feed centers; manure handling; utilities; and building design factors, types, and sizing. 112 pages.
ISBN 0-89373-054-8 4th Ed. 1983



MWPS-8

Sheep Housing and Equipment Handbook MWPS-3 \$10.00

Valuable information is presented for planning an efficient sheep system based on operation size; housing system choice; building needs and location; feeding methods and location; environmental controls; and manure handling. Material is included on building layouts; lambing and nursery layouts; treating and handling facilities; orphan lamb facilities; feeding facilities; equipment plans; manure management; utilities; ventilation, insulation, and material choice. Summary data charts for housing, water, feed, and manure are included. 96 pages.
ISBN 0-89373-090-4 4th Ed. 1994

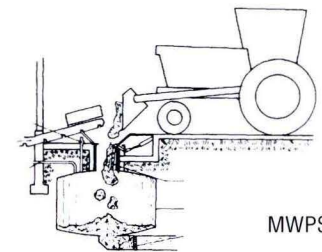


MWPS-3

Waste Management

Livestock Waste Facilities Handbook MWPS-18 \$8.00

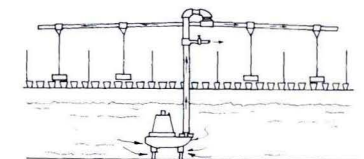
This handbook emphasizes planning and designing livestock waste facilities. It reports design criteria and waste data for manure, bedding, feedlot runoff and milking center wastewater. Chapters cover animal waste characteristics; collection and transport to storage; handling open lot waste; liquid-solid separation; storage; biological treatment; pumps; land application techniques; and waste use. A worksheet helps producers determine manure application rates. Tables include 1992 data. An appendix includes livestock weight and climate data. 112 pages.
ISBN 0-89373-063-7 3rd Ed. 1993



MWPS-18

Research Results in Manure Digestion, Runoff, Refeeding, Odors MWPS-25 \$5.00

This research report expands the technology of animal waste management. Sections include anaerobic processes for stabilization and gas production; runoff control for livestock feedlots; processing manures for feed components; and controlling odors from livestock production facilities. 40 pages.
(NCR Research Publication Number 284) 1st Ed. 1982



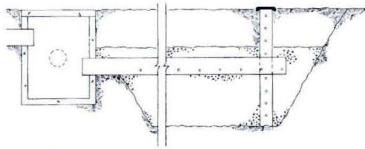
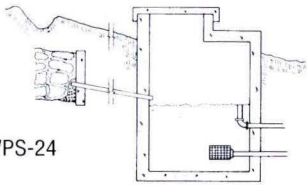
MWPS-25

Fast Fact:

The average American eats 112 pounds of red meat in one year.

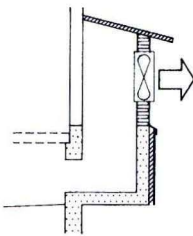
Water Management

MWPS-24

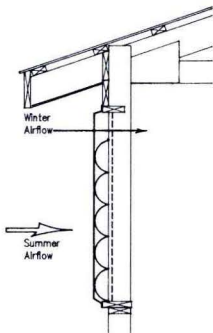


MWPS-14

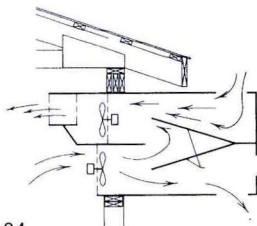
MWPS-32



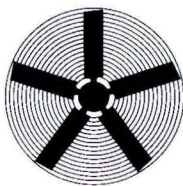
MWPS-33



MWPS-34



IL-95



Onsite Domestic Sewage Disposal Handbook

MWPS-24 \$6.00

Homeowners are given information to plan, design, install, and maintain a private sewage treatment and disposal system. Site selection, septic tanks, pump selection, soil absorption system design, distribution systems, and sewage disposal systems are examined. 40 pages.

ISBN 0-89373-053-X

1st Ed. 1982

Private Water Systems Handbook

MWPS-14 \$7.00

Some people do not have access to municipal water supplies. This handbook addresses how much water is needed, water quality treatment and equipment. Various water sources such as wells, catchments, ponds, and springs are discussed. The information helps the reader make correct planning decisions for new systems and also helps find and correct problems in existing ones. 72 pages.

ISBN-0-89373-045-9

4th Ed. 1979

Ventilation

Mechanical Ventilating Systems for Livestock Housing

MWPS-32 \$6.00

Modern systems for mechanically ventilating livestock buildings are described in this comprehensive book. Assistance with fan and control selection is provided with discussions, illustrations, and examples. This publication explains how to plan, construct, and manage ventilation air inlets. Insulation needs are outlined. Information on handling manure gases and livestock heat and moisture is included. A troubleshooting section lists equipment to help identify problems and to offer solutions to typical ventilation troubles. It also teaches management techniques for these systems. 72 pages.

ISBN 0-89373-075-0

1st Ed. 1990

Natural Ventilating Systems for Livestock Housing

MWPS-33 \$5.00

Applying ventilation basics to naturally ventilated buildings is explained. Systems in current use are illustrated. Helpful suggestions are considered for selecting a system based on building type, site, and orientation, whether it be a cold or modified environment building. Details for planning, constructing, and managing ventilating air inlets and outlets are presented in detail. Insulation needs are outlined for buildings having limited environmental control. Information on handling manure gases and livestock heat and moisture is included. A section on troubleshooting lists equipment to help identify problems and to offer solutions to typical ventilation troubles. It also teaches management techniques for these systems. 32 pages.

ISBN 0-89373-074-2

1st Ed. 1989

Heating, Cooling and Tempering Air for Livestock Housing

MWPS-34 \$6.00

The implications of combining ventilating systems with supplemental heating and cooling systems are discussed. Chapters focus on heating, cooling, tempering, earth tube heat exchangers, insulation, applications, and examples. 48 pages.

ISBN 0-89373-076-9

1st Ed. 1990

Agricultural Ventilation Fans: Performance and Efficiencies

IL-97 \$7.00

This publication provides an unbiased source of performance data for more than 200 commercially available ventilation fans. Fans listed are grouped according to size, so comparisons can easily be made between manufacturers and models. Performance data at multiple speeds allows building operators to get a better handle on their ventilation rates and power usage when fans are running at reduced speeds. An Introductory section gives basics for choosing a fan, including airflow performance, operating costs, and specific applications. 100 pages.

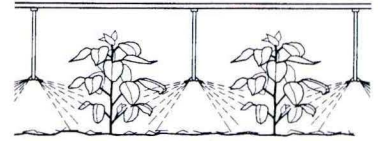
Nearly 20,000 acres of Midwest land have been accepted into the Wetlands Reserve Program.

Fast Fact:

Farm Management

Conservation Tillage Systems and Management: Crop Residue Management with No-Till, Ridge-Till, Mulch-Till MWPS-45 \$15.00

This handbook covers the relationship between tillage systems, residue cover and erosion; long-term issues and concerns such as crop response, costs and returns, soil compaction, water quality; pest and fertilizer management; and system selection and equipment considerations. This book is backed by objective research, and is written for the producer. Authors include soil scientists, entomologists, weed scientists, pathologists, agricultural engineers, and economists. This resource can help producers investigate conservation tillage, aid in making annual decisions, contemplate long-range issues, and evaluate equipment selection. 144 pages.
ISBN 0-089373-088-2 1st Ed. 1992



MWPS-45

Proceedings of the International Conference on Air Pollution from Agricultural Operations MWPS-C3 \$35.00

This 488 page publication, from a conference held in February 1996, contains more than sixty papers about the theoretical and practical aspects of air pollution from agricultural operations. The proceedings cover the following general topics: Regulations and Their Impact on Agricultural Industries/Operations; Wind Erosion: Predictions, Measurements and PM-10; Measurement and Control of Ammonia and Bioaerosol Emissions from Swine Buildings; Emissions from Area and Moving Point Sources; Measurements and Control of Emissions from Enclosed Sources; Odor Sampling and Measurement; Dust and Particulates in Grain and Swine Facilities; Health Risks, Measurement and Control of Air Quality in Livestock Buildings; Odor from Manure Storage; and Control and Reduction of Ammonia and Odor Emissions from Livestock Facilities.



MWPS-C3

Construction

Concrete Manure Storages Handbook MWPS-36 \$20.00

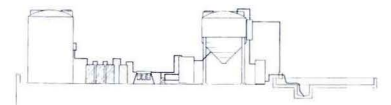
This handbook emphasizes planning and design of rectangular and circular concrete manure storages for depths to 14'. Engineering and planning information, along with documentation to national codes and standards, is presented in an easy-to-follow format. Designs for rectangular tanks include tanks with open tops, solid tops up to 16' wide, and slats up to 12' wide. Circular tanks include designs for above- and below-ground open top tanks for diameters up to 120'. One appendix includes information on concrete characteristics, and equations and assumptions used in designs. A section with design aids includes useful tables, conversions, and 14 illustrated data sheets to record design decisions. A chapter with example problems shows how to use the tables and data sheets. This handbook includes the most up-to-date design information and incorporates design data that is in the popular MWPS publications: Liquid Manure Tanks, Plan 74303; Circular Concrete Manure Tanks, TR-9; and Beams for Open-Top Manure Tanks, TR-10. 80 pages.
ISBN 0-89373-0082-3 1st Ed. 1994



MWPS-36

Designing Facilities for Pesticide and Fertilizer Containment MWPS-37 \$15.00

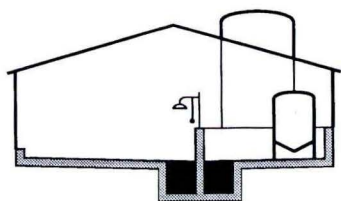
This handbook emphasizes planning and designing pesticide and fertilizer containment facilities and provides engineering and planning information. Chapters discuss regulations; site selection; functional system design; pesticide and fertilizer storage; secondary containment; mixing/loading facilities and equipment; worker safety; concrete; remodeling facilities; emergency planning; and waste disposal. An appendix of regulatory agencies and officials in each state is included. 116 pages.
ISBN 0-89373-083-1 1st Ed. 1991



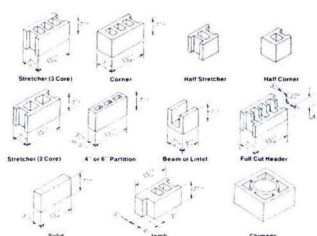
MWPS-37

Fast

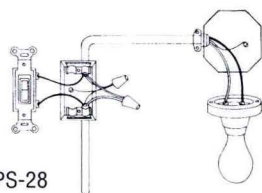
Fact: Fifty-four percent of farmers report full ownership of the land they operate.



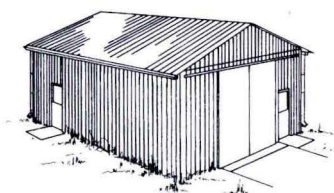
MWPS-9



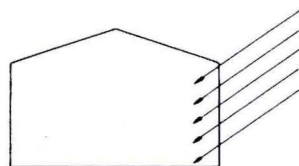
MWPS-35



MWPS-28



MWPS-26



MWPS-23

Construction

Conference Proceedings: Pesticide Containment MWPS-C1 \$15.00

A compilation of papers from the National Symposium on Pesticide and Fertilizer Containment: Design and Management held in Kansas City, MO, February 1992. 164 pages.

Conference Proceedings: Pesticide and Fertilizer Containment Symposium 2 MWPS-C2 \$20.00

A compilation of papers from the Pesticide and Fertilizer Symposium held in St. Louis, MO, February 1994. 248 pages.

Designs for Glued Trusses MWPS-9 \$7.00

This book presents criteria for selection, construction, and erection of glued trusses. Designs for 9,004 plywood-gusset wood trusses are presented. The book features 78 truss selection tables, including trusses with 20' to 60' spans; 3/12, 4/12, and 5/12 slopes; 2', 4', and 8' spacings; 0, 5, and 8 psf ceilings; roof loads from 12 to 100 psf; and lumber grades of 1,100f, 1,400f, and 1,600f. Maximum allowable roof loads are given for each truss design. The trusses were designed with the Purdue Plane Structures Analyzer (PPSA II). 84 pages.

ISBN 0-89373-051-3

Revised 4th Ed. 1989

Farm and Home Concrete Handbook MWPS-35 \$6.00

Discussion and examples detail selecting concrete mixes and ordering ready-mix concrete. This book has comprehensive data on concrete basics: forming; reinforcing; placing; finishing; and curing. Major sections cover preparation; hot and cold weather precautions; slip-resistant surfaces; concrete walls; above- and below-ground horizontal silos; and concrete masonry construction. Appendices include background technical data on cement; other concrete ingredients; and design data for cast-in-place and tilt-up walls. 44 pages.

ISBN 0-89373-079-3

1st Ed. 1989

Farm Buildings Wiring Handbook MWPS-28 \$10.00

This book is based on the 1990 electrical code. Materials and methods for electrical equipment and wiring in farm buildings are outlined. The publication helps determine if existing wiring is adequate, but does not cover wiring from the power supplier to the building's service entrance. Codes, building groups, materials, planning, branch and motor circuits, service entrances, and power to the building are discussed. Other topics are standby power; alarm systems; stray voltage; and lightning protection. Examples of wiring a machine storage building and a swine building are presented. 68 pages.

ISBN 0-89373-085-8

2nd Ed. 1992

Farm Shop Plans Book MWPS-26 \$10.00

Guidelines for planning and building farm shops are featured. Revisions update tables to the 1991 NDS design codes. This book discusses site selection, floor plans, shop size, construction, environment and utilities, equipment, and accident prevention. The book illustrates floor plans, cross sections, and construction details for four shop sizes: 24' x 32'; 32' x 40'; 40' x 48'; and 48' x 56'. 32 pages.

ISBN 0-89373-091-2

Revised 1st Ed. 1994

Solar Livestock Housing Handbook MWPS-23 \$7.00

Descriptions, construction information, and performance data for 10 solar livestock applications in the North Central states are examined. Collecting and using solar energy as heat energy is discussed. Economic and design considerations are presented. Solar radiation data by city and latitude are also included. 88 pages.

ISBN 0-89373-056-4

1st Ed. 1983

United States agricultural, fish, and wood exports create an estimated 960,000 full-time domestic jobs.

Fast Fact:

Home

Shelves, Houses, and Feeders for Birds and Mammals

NCR-338 \$6.00

Studying birds and other wildlife ranks as one of the most popular hobbies in the United States. This bulletin contains information on how to attract birds and small mammals. An amazing number of designs and types of structures are possible, but the basic requirements are few. Using simple diagrams and instructions, the publication explains how to build a variety of creature-friendly structures, including the official bat house from Bat Conservation International and a special section on using recyclable materials. 47 pages.

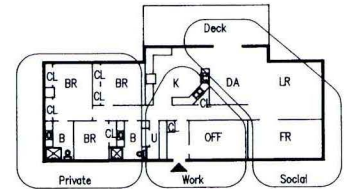


NCR-338

House Planning Handbook

MWPS-16 \$7.00

Recommendations for matching housing needs with lifestyle and family life cycles are considered. The book discusses selecting a location and comparing and evaluating overall floor plans by activity zones and traffic patterns. Detailed dimensions for each area of a house are shown for a business center; kitchen; living, dining, and family rooms; clothes care center; bathrooms; bedrooms; entries; halls; stairs; doors; and basement. Storage needs are analyzed by house area; storage space required; and types of storage. The book includes financing limitations, remodeling, and exterior house styles. A major chapter discusses energy related construction techniques and planning utilities. 81 pages. ISBN 0-89373-073-4 2nd Ed. 1988

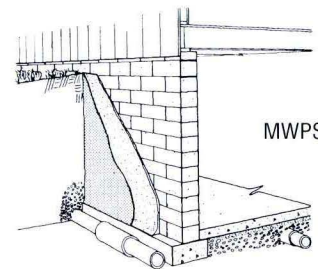


MWPS-16

Home and Yard Improvements Handbook

MWPS-21 \$9.00

This publication explains how to optimize use of available space for storage in all areas of the home. The outdoors, as an extension of the living area, is also covered. Topics for improvements include kitchens; bathrooms; closets; laundry centers; sewing centers; and home offices. Fences, tree wells, decks and patios, patio furniture, recreational facilities, and outdoor cooking are discussed in the section on yard improvements. 100 pages. ISBN 0-89373-034-3 1st Ed. 1978



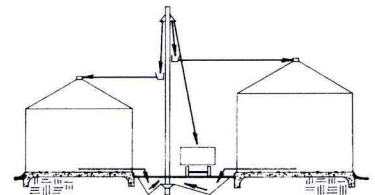
MWPS-21

Grain

Grain Drying, Handling and Storage Handbook

MWPS-13 \$7.00

Recommendations for grain systems are summarized. Locating and developing a grain center is covered. A checklist of issues to consider is included. The producer will find assistance in layout, planning, expanding, and improving grain system operations. Information on drying and storing grain in existing facilities is highlighted. Other chapters cover grain receiving and conveying; storage types and selection; managing grain in storage; and drying systems. 88 pages. ISBN 0-89373-071-8 2nd Ed. 1987

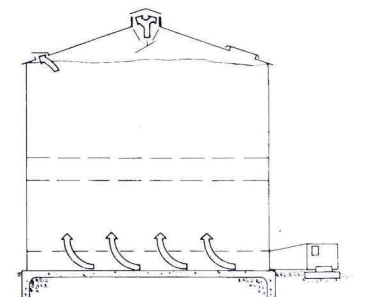


MWPS-13

Low Temperature and Solar Grain Drying Handbook

MWPS-22 \$6.00

This handbook is organized into two major subjects: low temperature grain drying; and principles of solar heating. Procedures and recommendations are given for the North Central region. Data on collecting, storing, and using solar energy is presented. Included are examples of plans for various solar collectors. 86 pages. ISBN 0-89373-048-3 1st Ed. 1980



MWPS-22

Fast Fact:

The USDA Rural Housing and Community Development Service helps finance new or improved housing for more than 65,000 families each year.

MWPS Digests & Technical Resources

Remodeling Corn Cribs for Small Grain Storage

AED-12 \$2.00

Guidelines help determine if a corn crib can and should be converted to handle shelled corn. A variety of specific information on remodeling techniques and materials is covered. 6 pages, 1968.
ISBN 0-89373-018-1

3-Inch 150-Gal Siphon-Flush Tank

AED-17 \$2.00

Materials are listed and complete instructions are given for building an automatic siphon-flush tank for flush-gutter waste handling systems. Trouble shooting and operation theory are covered and suggestions are given for multiple units. 8 pages, 1976.
ISBN 0-89373-022-X

Managing Dry Grain in Storage

AED-20 \$2.00

Maintaining quality of dry grain in storage is considered in detail. Causes of grain spoilage, its prevention, insect control, and personal safety are addressed. 12 pages, 1987.
ISBN 0-89373-049-1

Preservative Treated Wood for Farm and Home

AED-30 \$2.00

What a wood preservative does, how it is applied, and how much is needed for many common applications is reviewed. This digest explains how to economically use preservative treated wood to prolong service life. It provides suggestions for selecting the right chemical and amount of treatment. 6 pages, 1989.
ISBN 0-89373-081-5

Greenhouse Barns for Dairy Housing

AED-40 \$4.00

This publication summarizes information about greenhouse barn design for dairy housing. It discusses economic factors that can be used to analyze design layouts and construction alternatives, and it compares greenhouse barn costs to the costs of conventional post structures to determine if a greenhouse barn is suitable for a particular situation. 16 pages, 1996.

Hoop Structures for Swine Housing

AED-41 \$4.00

To help producers and designers resolve some of the issues involved in using a hoop structure to finish pigs, this publication summarizes information about hoop structure use and design. It discusses some of the differences in management techniques that hoop structures require, and it presents economic factors that can be used to analyze design layouts and construction alternatives. The publication contains a sample budget comparing the costs of hoop structures to the costs of more traditional confinement housing. 16 pages, 1997.

Sprinkling Oil to Remove Dust, Odor, and Gases in Swine Buildings

AED-42 \$2.00

This Publication addresses the problem of dust, odor, and gases in swine buildings. It describes research done to reduce dust and odor, explains the results of that research, and describes a method that the average swine producer can use to reduce and odors in swine buildings. The material the publication presents could be useful in helping reduce health risks to those employed in the swine industry and could contribute to a safer future for farm owners and employees. 6 pages, 1997

Beams for Open-Top Manure Tanks

TR-10 \$1.00

The structural problem of providing lateral support at the top of walls of open rectangular manure tanks built below grade is addressed. A reinforced concrete "sidewalk" around the tank top for adequate support for walls up to 50' long is described. 2 pages, 1985.
ISBN 0-89373-066-1

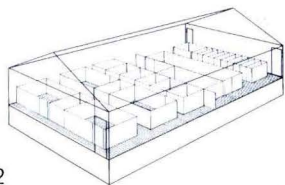
Circular Concrete Manure Tanks

TR-9 \$2.00

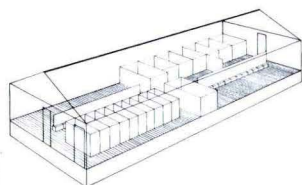
Circular concrete manure tank design criteria, reinforcing for tanks 8'-14' deep and up to 120' in diameter, and floor and footing details are discussed. The designs are for tanks above- or below-ground and agree with Ultimate Strength Design, ACI 318-77. 4 pages, 1983.
ISBN 0-89373-059-9

Nearly 73 million acres of corn are harvested for grain each year.

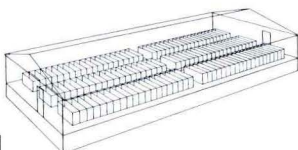
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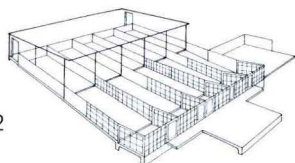
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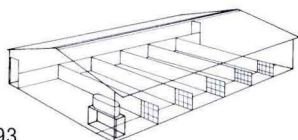
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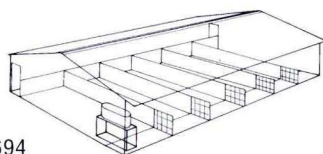
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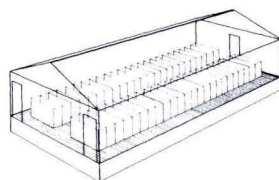
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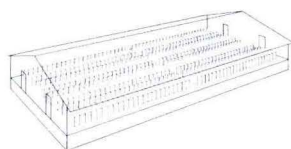
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Swine

Breeding

See MWPS-8, Swine Housing and Equipment Handbook, page 3. See MWPS-40, Swine Farrowing Handbook, for information on farrowing, page 3.

Swine Breeding Building

MWPS-72602 \$4.00

33'x60' stud frame building with stimulus stalls, a sow holding pen, a breeding area, and boar pens. Plan A has gilt pens. Plan B offers gestation stalls. Year-round mechanical ventilation, totally slotted floor, and liquid manure storage are illustrated.

Swine Breeding Building

MWPS-72695 \$4.00

24'x60' stud frame building with 10 stimulus stalls, 8 boar pens, a sow-gilt pool pen, a sow holding pen, and separate breeding areas. Year-round mechanical ventilation, totally slotted floors, and liquid manure storage are illustrated.

Gestation

Swine Gestation Building

MWPS-72601 \$4.00

33'x92' stud frame building houses 120 gestating sows in individual stalls. Two plans are included. Plan A shows totally slotted floor over pit manure storage. Plan B shows 24" wide flush gutters at rear of stalls. Mechanical ventilation in winter, natural ventilation in warm weather.

Swine Gestation Unit, Open Shed with Lot

MWPS-72692 \$3.00

16'x40' open-front shed with 20' outside lot plus 8' manure alley. 60-sow capacity. Layout included for expanding to 9 pens for breeding-gestation.

Swine Gestation Building, Modified Open Front

MWPS-72693 \$5.00

28'x48' insulated pole building. Five 8'x24' pens for 60 sows. One pen for sick sows and equipment. Typically used with a 20-sow farrowing house. Three plans are included. Plan A shows an 8' deep manure storage under 10' slats. Plan B shows a shallow flushed pit under 10' slats. Plan C shows a flushed open gutter. A layout is included to expand to 10 pens for breeding-gestation.

Swine Gestation Building, Two Rows of Stalls, 48 Sows

MWPS-72694 \$4.00

24' x 54' stud frame building houses 48 gestating sows in individual stalls. Two plans are included. Plan A shows a totally slotted floor over pit manure storage. Plan B shows 24" wide flush gutters at rear of stalls. Mechanical ventilation in winter, natural ventilation in warm weather.

Swine Gestation Building, Group Pens, 48 Sows

MWPS-72696 \$4.00

24' x 54' pole frame building houses 48 sows in 4 pens with 2 separate sow treatment pens. A 4' open gutter can be flushed with dump or siphon-flush tanks. Natural ventilation.

Swine Gestation Building, Four Rows of Stalls, 192 Sows

MWPS-72697 \$4.00

42' x 108' stud frame building houses 192 gestating sows in individual stalls. Two plans are included. Plan A shows a totally slotted floor over pit manure storage. Plan B shows 24" wide flush gutters at rear of stalls. Mechanical ventilation in winter, natural ventilation in warm weather.

The average household income for farm operator households is \$40, 329.

*Fast
Fact:*

Swine

Nursery

Raised Deck Swine Nurseries

MWPS-72604 \$4.00

Two 24' x 22' and 24' x 46 stud-frame swine nursery buildings with year-round mechanical ventilation. Two plans are included. Plan A is an early-wean nursery for 160 pigs from 10-30 lb (3-8 weeks). Plan B is a late-wean nursery for 160 pigs from 15-75 lb (5-12 weeks). A single gravity drain gutter is shown along the back of each row of decks.

12-Litter Sow-Pig Nursery

MWPS-72684 \$3.00

16' x 48' open-front shed with 16 outside lot. Heated creep provided for pigs, inside handling alley. Tractor scraping.

20-Litter Sow-Pig Nursery

MWPS-72685 \$4.00

Ten 8' x 10' pens each house 2 sows with litters. Two options are included. Plan A shows 4' slats over deep pits for in-building manure storage. Plan B shows slats over shallow pits flushed with siphon-flush tanks. See AED-17, *Siphon Flush Tank*, for details.

20-Litter Nursery

MWPS-72686 \$4.00

24' x 32' stud frame, totally slotted floor nursery with 2 floor plans. Plan A shows manure storage pit and underfloor ventilation. Plan B shows a siphon-flush pit. See AED-17, *Siphon Flush Tank*, for details.

Finishing

Swine Growing-Finishing Building

MWPS-72603 \$5.00

28' x 80' monoslope, modified open-front building to house about 240 pigs. Three plans are included. Plan A shows a 10' wide by 8' deep manure storage pit under slats. Plan B shows a 10' wide flush gutter under slats. Plan C shows a 5' wide open flush gutter. Natural ventilation.

Swine Finishing Unit

MWPS-72687 \$3.00

16' x 32' open-front, pole frame finishing unit with a 40' outside lot. 100-pig capacity. Tractor scraping.

Swine Finishing House

MWPS-72688 \$4.00

28' x 60' pole frame finishing building with natural ventilation. Two plans are included. Plan A shows a 40" gutter flushed with siphon tank. Plan B shows an 8' scraped gutter. 160-pig capacity. See AED-17, *Siphon Flush Tank*, for details.

Modified Open Front Swine Finishing Building

MWPS-72689 \$4.00

28' x 56' stud frame, modified open-front finishing building with natural ventilation. Two plans are included. Plan A shows an 8' deep storage pit under slats. Plan B shows a 1' deep gutter flushed with tipping bucket. 168-pig capacity.

Swine Finishing House, Off-Center Alley, 320 Pigs

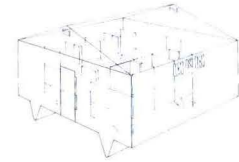
MWPS-72690 \$4.00

Ten 8' x 12' and ten 8' x 16' pens. 4' slats over pit flushed with tipping bucket or open gutter flushed with siphon-flush tank. See AED-17, *Siphon Flush Tank*, for details. Year-round natural ventilation, full insulation recommended.

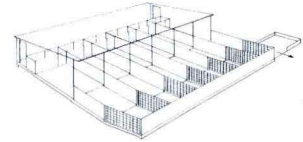
Swine Finishing House, Full-Slotted Floor, 320 Pigs

MWPS-72691 \$3.00

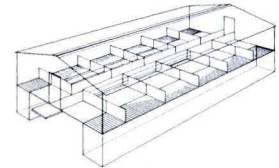
Ten 8' x 12' and ten 8' x 16' pens. Totally slotted floor over 6' deep storage pit. Two 800-cfm continuous pit fans, two 800-cfm intermittent pit fans, and three 3,600 cfm exhaust fans for winter and mild weather. Open doors for summer ventilation.



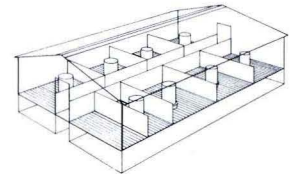
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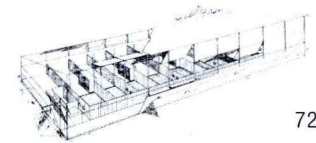
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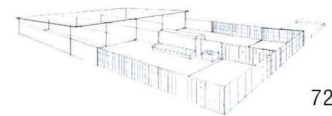
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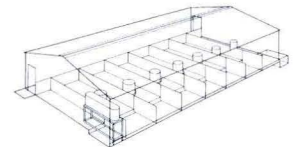
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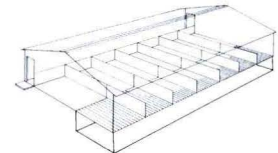
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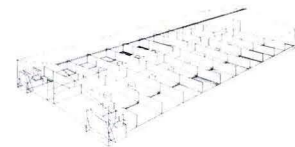
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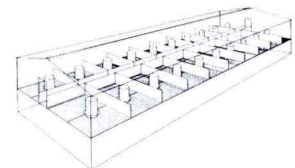
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Fast Fact:

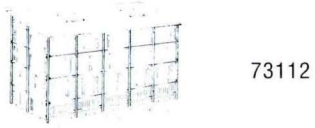
There are 2,144 active product licenses for animal vaccines.



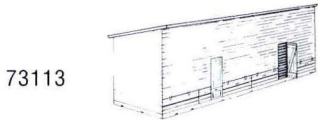
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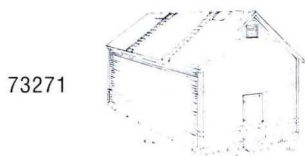
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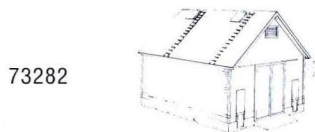
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73283

Grain / Hay Storage

Pole Hay Storage Sheds

The sheds in these plans have 17' interior clearance and clear span pole construction. They can hold small rectangular bales, big round bales, or hay stacks. Open-front construction with alternate wall enclosures is illustrated. Plan MWPS-73113 has interior poles with rafter construction.

24' Wide Hay Barn
24' span.

MWPS-73110 \$4.00

36' Wide Hay Barn
36' span.

MWPS-73111 \$4.00

48' Wide Hay Barn
48' span.

MWPS-73112 \$4.00

32' and 48' Wide Hay Sheds
32' and 48' span.

MWPS-73113 \$4.00

48' Pole Grain Storage

10' or 12' high walls. Pole wall construction, concrete floor with 12' wide bulkheads. 25,000 bu capacity.

MWPS-73220 \$3.00

Ear Corn Crib

Each corn crib plan is accompanied by a complete bill of materials for crib widths of 6, 7, 8, 9, and 10 feet.

Single Pole Corn Crib

Built in 5' increments. Alternate floor construction details show flat concrete or concrete with drag trench.

MWPS-73271 \$3.00

Single Frame Corn Crib

Shed roof. Alternate floors shown include concrete with trench and wood construction.

MWPS-73272 \$3.00

Double Pole Corn Crib

Similar to MWPS-73271 with an 11' wide alley.

MWPS-73280 \$3.00

Double Corn Crib, Alley

A modernized revision of the popular A-frame crib.

MWPS-73281 \$3.00

Double Corn Crib, 11' Alley

Designed for complete mechanical filling and emptying.

MWPS-73282 \$3.00

Double Corn Crib, Overhead Bin

11' alley and 7' 6" deep bins. Before constructing overhead bins in a corn crib, compare costs and handling convenience with other types of storage.

MWPS-73283 \$3.00

To date, thirteen serious livestock diseases have been eradicated from the United States.

*Fast
Fact:*

Grain / Hay Storage

Grain Storage Centers

Grain-Feed Handling Center, Work Tower Across Drive, Equal Sheds

MWPS-73292 \$5.00

The bin arrangement and high temperature dryer position permit a larger wet grain holding area than does MWPS-73293. Good layout for a continuous flow drying system with two vertical legs. The divided work area lets the overhead bins feed two pieces of equipment, one located on each side of the leg.

Grain Feed Handling Center, Work Tower Across Drive, One-Way Shed

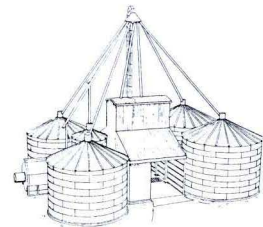
MWPS-73293 \$5.00

The center building includes a central work tower that contains mechanization and overhead hoppers work bins. The building has a single-slope shed roof away from the work tower. With grain dump located 4' from the work tower end of the building, trucks can be hoisted outside the building, eliminating a high inside roof clearance.

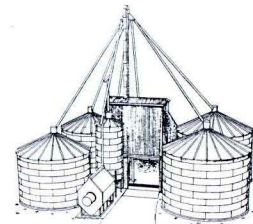
Grain-Feed Handling Center, Work Tower Beside Drive, Offset Gable

MWPS-73294 \$5.00

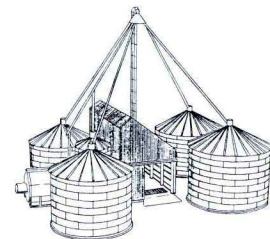
The 20'x36' center building (pole construction) is divided by a 12' drive-through plus an 8' wide processing area. Alternate storage layouts include bin and high capacity drying. The plan has complete working drawings excluding bulk and working bins.



73292



73293



73294

Fertilizer Storage

Portable Fertilizer Storage

MWPS-74401 \$3.00

An 8' x 8' x 16' plywood bin on skids. The bin is rotated 45° and supported above the skids to form a hopper bottom. Capacity is 24 ton.

40' x 48' Bulk Fertilizer Storage, Post Frame

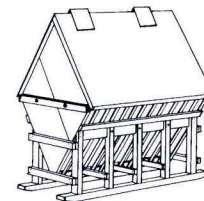
MWPS-74402 \$3.00

Four 12'x36' bins are lined with 2x6s and plywood for bulk fertilizer storage and handling. Steel tie rods brace walls. Sliding access doors. Roof loading hatch. Capacity is 400-600 ton.

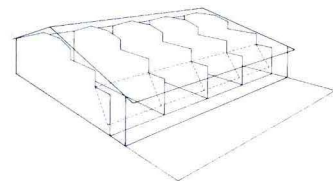
40' x 48' Bulk Fertilizer Storage, Stud Frame

MWPS-74403 \$3.00

Same as MWPS-74402 except walls are stud frame.



74401

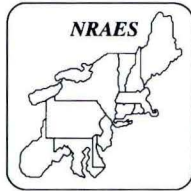


74402, 74403

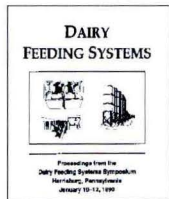
**Fast
Fact:**

More than 8,100 Inspection Operations employees carry out the inspection laws in over 6,200 United States livestock producing plants.

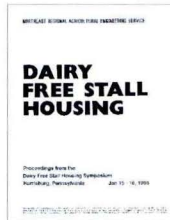
NRAES



Publications



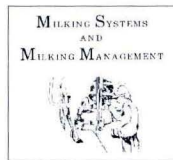
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NRAES-24



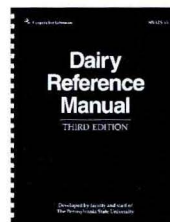
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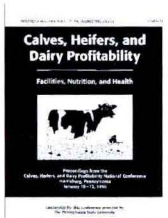
NRAES-26



NRAES-37



NRAES-63



NRAES-74

Livestock

Dairy Feeding Systems

NRAES-38 \$30.00

Dairy Feeding Systems National Symposium papers cover delivery systems, intake, automation. 278 pages. 1990.

Dairy Free Stall Housing

NRAES-24 \$30.00

Proceedings from the Dairy Free Stall Housing National Symposium cover environment, feeding, and health topics. 180 pages. 1986.

Milking Center Design

NRAES-66 \$30.00

This bulletin contains 35 papers presented at the *Milking Center Design National Conference*. Topics cover planning, parlor efficiency and selection, safety, and milking systems. 312 pages. 1993.

Milking Systems and Milking Management

NRAES-26 \$30.00

Papers from the *Milking Systems and Milking Management National Symposium* are presented. Subjects include health, efficiency, design, and installation. 185 pages. 1988.

Planning Dairy Stall Barns

NRAES-37 \$6.00

Construction of a dairy stall barn including site selection, construction details, barn arrangements, ventilation systems, and electrical service is discussed. A 4-page construction plan is included. 22 pages. 1989.

Dairy Reference Manual

NRAES-63 \$40.00

Faculty and staff of The Pennsylvania State University have put together a compendium of information about all facets of dairying—from youngstock to nutrition to housing. It is designed to allow quick access to facts about such topics as balancing a ration, designing a natural ventilation system for a freestall barn, and identifying the causes of and control measures for mastitis. The wire-bound manual contains thirteen chapters that include 240 tables and 88 illustrations. 293 pages.

Calves, Heifers, and Dairy Profitability

NRAES-74 \$30.00

This newly available publication has detailed information from twenty-nine experts from across the country about planning and operating profitable and efficient replacement programs. Authors include specialists in farm management, labor management, housing design, nutrition, animal health, and heifer development. The proceedings focuses on the latest information about raising high-producing replacement heifers at a minimum cost.

Guideline for Planning Dairy Freestall Barns

NRAES-76 \$8.00

This publication covers the many aspects of planning a dairy freestall barn. It discusses the various components of a freestall housing system and explains the design and construction of the barn and stalls. Main topics include construction materials, lighting, wiring, management and maintenance of the stalls, ventilation for insulated and uninsulated barns, manure and liquid waste handling, and regulatory considerations. The guideline contains 37 illustrations along with several freestall housing plans.

Over the last ten years, developed land increased more than 18 percent.

Fast Fact:

Livestock

Animal Behavior and the Design of Livestock and Poultry Systems

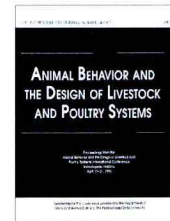
NRAES-84 \$30.00

This publication is the proceedings from the conference held in April 1995. It discusses how considering animal behavior in the design of livestock and poultry systems can improve profitability and efficiency. Included are 30 papers covering topics such as interpreting behavior, environmental enrichment, behavioral needs and motivations, the economic impact of disease and injury, and design assessments. The proceedings includes papers specific to dairying, beef production, swine production, broilers, layers and broiler breeders. 342 pages.

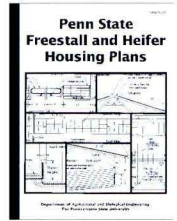
Penn State Freestall and Heifer Housing Plans

NRAES-85 \$11.00

This publication is a collection of 21 plans developed by faculty and staff of the Department of Agricultural and Biological Engineering at The Pennsylvania State University and Penn State Cooperative Extension. Included are 15 freestall housing plans and 6 heifer housing plans. 70 pages.



NRAES-84



NRAES-85

Construction

High-Tensile Wire Fencing

NRAES-11 \$4.00

High-tensile fencing, its advantages, and construction methods for electric and nonelectric fences are explained. High-tensile wire fencing can withstand over 1,000 lbs of livestock pressure or low temperature contraction without losing its elasticity, but is flexible enough to bend, wrap and tie in knots. 24 pages. 1987.

Lumber from Local Woodlots

NRAES-27 \$8.00

Local woodlots can be a source of high-grade lumber for home and farm construction. Information is included on evaluating woodlot resources, wood properties, harvesting, sawing, and seasoning. 42 pages. 1988.

Pole and Post Buildings

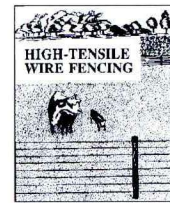
NRAES-1 Call for Price

Ideas help builders with design and construction. The bulletin has easy to follow design information, including sections on suspended floors and bulk grain storages. Utility building plans are included. 312 pages. Revised 1997.

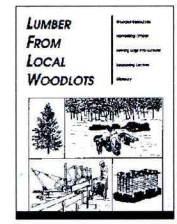
On-Farm Agrichemical Handling Facilities

NRAES-78 \$6.00

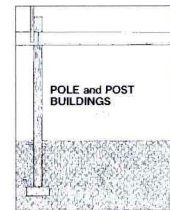
New publication discusses important considerations to make when building or planning a pesticide storage facility. Topics covered include principal parts of the storage facility, storage environmental requirements, safety requirements, and storage alternatives. It looks at the components of a well-designed facility, including detailed descriptions for a storage room; mixing room; safety equipment, records, and locker room; and an area for equipment loading and rinsing. Later sections deal with building ventilation, humidity, and temperature; warning signs; fire safety; personal emergency equipment; security; and building site considerations. 22 pages. 1995.



NRAES-11



NRAES-27



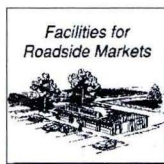
NRAES-1



NRAES-78

Fast Fact:

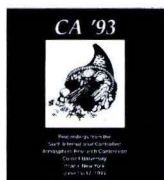
One metric ton of corn equals 39.37 bushels.



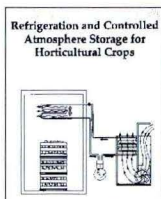
NRAES-52



NRAES-51



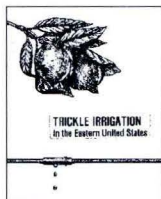
NRAES-71



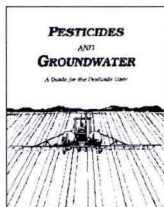
NRAES-22



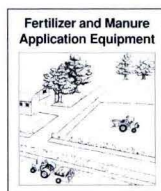
NRAES-47



NRAES-4



NRAES-34



NRAES-57

Post-Harvest

Refrigeration and Controlled Atmosphere Storage for Horticultural Crops

NRAES-22 \$8.00

Procedures for storage facility construction including site selection, insulation, vapor barriers, and ventilation are introduced for refrigerated storage of perishable products. Different systems are explained. 42 pages. 1989.

Proceedings from the Sixth International Controlled Atmosphere Research Conference

NRAES-71 \$95.00

In June 1993, the Sixth International Controlled Atmosphere Research Conference was held at Cornell University, Ithaca, New York. The conference presented the latest research on controlled atmospheres and valuable information for those involved with the production, storage or shipment of vegetables, fruit and flowers. This two volume set includes 96 papers from the 15 sessions that cover all aspects of controlled atmosphere storage, transport, packaging and engineering. 887 pages. 1993.

Facilities for Roadside Markets

NRAES-52 \$7.00

Planning a large farm market is emphasized. Topics discuss display and checkout areas; preparation, office, and parking areas; and refrigerated storages. 32 pages. 1992.

Produce Handling for Direct Marketing

NRAES-51 \$7.00

Recommendations for handling produce are included. Topics include refrigeration, equipment, harvest, transportation, storage, and display. 29 pages. 1992.

Water Management

Private Drinking Water Supplies: Quality, Testing, and Options for Problem Waters

NRAES-47 \$8.00

Information for water treatment professionals and people who supply their own water or are dissatisfied with the public water supplies is presented as a general reference. Current standards for drinking water and activities affecting water quality are discussed. Potential contaminants listed by the EPA are identified. Water testing is discussed. Options are presented for improving water quality and developing new supplies. 60 pages. 1991.

Trickle Irrigation in the Eastern United States

NRAES-4 \$6.00

This bulletin was developed for humid climates and is an excellent planning and installation guide. Information features advantages and potential problems, plant-soil-water relationships, system components, specific crop recommendations, and system planning. 24 pages. 1980.

Pesticides and Groundwater

NRAES-34 \$5.00

Site factors, pesticide properties, applicator processes, groundwater movement, and factors that increase the risk of contamination are presented. Health effects of drinking contaminated groundwater are examined. The importance of safe pesticide handling is stressed and integrated pest management is explained. 17 pages. 1989.

Fertilizer and Manure Application Equipment

NRAES-57 \$6.00

This comprehensive resource guides farmers through the process of selecting, operating and calibrating the right fertilizer and manure application equipment. The publication is divided into two sections: chemical fertilization and manure fertilization. Both sections give detailed information on the operation and calibration of different pieces of machinery. 22 pages. 1994.

There are 191 million acres of national forest land in the United States.

Fast
Fact:

Farm Safety

Farm Accident Rescue

NRAES-10 \$5.00

This comprehensive handbook orients emergency and rescue personnel to a variety of agricultural accidents. Tractor overturns; entanglements in machinery; grain bin and silo entrapments; exposure to toxic gases and chemicals; and chemical fires are covered. 35 pages. 1986.

Fire Control in Livestock Buildings

NRAES-39 \$5.00

Information to ensure that livestock buildings are constructed and equipped to minimize fire danger is presented. Topics include use of fire-retardant materials; building management to limit fire spread; vent spacing; and estimating the cost of early warning and automatic sprinkler systems. 18 pages. 1989.

First on the Scene

NRAES-12 \$7.00

This bulletin presents discussions for farm accident scenarios involving machinery, storage facilities, chemicals, and electrocution. Chapters enable the reader to understand hazards, assess situations, and respond appropriately until emergency personnel arrive. 46 pages. 1989.

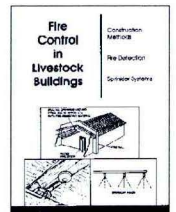
Extinguishing Silo Fires

NRAES-18 \$4.00

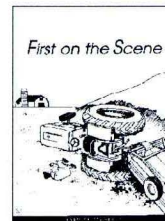
Recognize the hazards and dangerous gases created by different silo fires and the procedures for extinguishing them. Silage management and fire prevention practices are outlined. 14 pages. 1988.



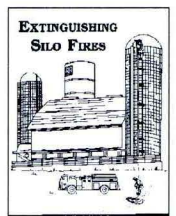
NRAES-10



NRAES-39



NRAES-12



NRAES-18

Waste Management

Dairy Manure Management

NRAES-31 \$30.00

Papers from the *Dairy Manure Management International Symposium* present information concerning manure, environment, utilization, handling and storage. 286 pages. 1989.

On-Farm Composting

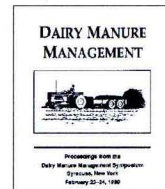
NRAES-54 \$20.00

This book presents a thorough overview of composting on the farm. Compost offers benefits such as improved manure handling, enhanced soil tilth, fertility, and reduced pollution. Chapters explain how to turn problem materials into valuable products to be recycled back to the land. 1992.

Liquid Manure Application Systems: Design, Management, and Environmental Assessment

NRAES-79 \$30.00

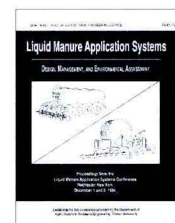
Proceedings from the Liquid Manure Application Systems Conference held in Rochester, New York on December 1-2, 1994. Technical information for applying liquid manure to land is presented. It can be used to evaluate current manure handling options and equipment, improve manure handling practices, develop educational programs and nutrient management plans, and identify experts in this field. 220 pages.



NRAES-31



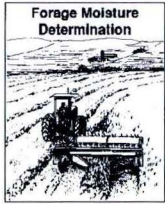
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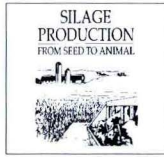
NRAES-79

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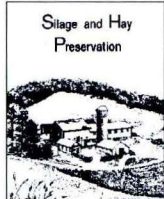
The USDA estimates that there are currently 1,755 farmers markets in the United States.



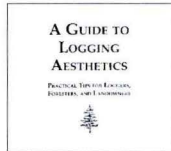
NRAES-59



NRAES-67



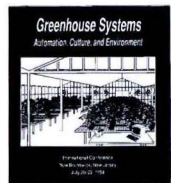
NRAES-5



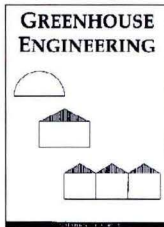
NRAES-60



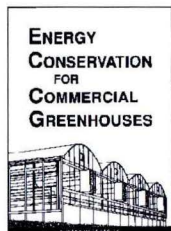
NRAES-64



NRAES-72



NRAES-33



NRAES-3

Ag Production

Forage Moisture Determination

NRAES-59 \$6.00

This handbook describes methods of determining moisture content of stored forage as well as techniques of taking test samples. 28 pages. 1993.

Silage Production from Seed to Animal

NRAES-67 \$30.00

Proceedings from the *Silage Production from Seed to Animal National Conference*, February 1993 includes 30 papers. Topics addressed include: forage in the field, preserving silage, silage additives, choosing a silo, feeding silage and troubleshooting. 302 pages. 1993.

Silage and Hay Preservation

NRAES-5 \$8.00

Information is provided on managing forage preservation to reduce losses and to improve quality. This bulletin describes processes that affect forage quality and sound management practices for greater yields. 53 pages. 1990.

Forestry / Wildlife

A Guide to Logging Aesthetics: practical tips for loggers, foresters, and landowners

NRAES-60 \$7.00

This publication addresses planning and conducting a timber harvest to minimize the effects of cutting and removing trees from a forest. 28 pages. 1993.

Enhancing Wildlife Habitats: a practical guide for forest landowners

NRAES-64 \$25.00

This is a comprehensive guide designed specifically for private, non-industrial forest owners. It outlines strategies for developing a well-focused plan to encourage and manage wildlife on woodlots. Its recommendations apply to any size forest, from one acre to several thousand. 172 pages. 1993.

Greenhouse

Greenhouse Systems: Automation, Culture, and Environment

NRAES-72 \$30.00

Proceedings from the International Conference on Greenhouse Systems includes papers on automation, plant culture, environment and systems. These proceedings organize knowledge of greenhouse systems and initiate the development of mechanisms for evaluation, design, and operation. 306 pages. 1994.

Greenhouse Engineering

NRAES-33 \$30.00

Operation planning, design and construction, materials handling, and remodeling are described. Different needs for different settings are explained. Environment is treated in detail. Other sections deal with remodeling, energy conservation, design data and worksheets, and sources for equipment, supplies, and plans. 212 pages. 1994.

Energy Conservation for Commercial Greenhouses

NRAES-3 \$6.00

Whether you plan to build or renovate a greenhouse operation, this bulletin helps evaluate energy needs and usage to reduce operating costs. Management techniques are described and options to help maximize energy efficiency are explained. 42 pages. 1989.

Smokey the Bear was introduced as the symbol for the forest fire prevention program in 1944.

Fast Fact:

Home Water Treatment

NRAES-48 \$15.00

This handbook describes twenty-three common home water treatment devices and methods, how they work, which contaminants they remove, and how much maintenance they require. *Home Water Treatment* will help homeowners decide if water treatment is necessary and which treatment device or system is appropriate for a particular problem. Useful information for improving the taste, smell, or appearance of water or for treating contaminants that may leach from household plumbing is provided. 120 pages.

Home Buyers' Guide: Financing and Evaluating Prospective Homes

NRAES-50 \$8.00

The home buying process is explored in this handbook covering topics such as financing, location, evaluating floor plans, home inspections, and assessing environmental safety. 73 pages. 1991.

Home Storage of Fruits and Vegetables

NRAES-7 \$6.00

Many simple, economical plans and ideas for adapting areas in the home for cold storage. This book contains detailed information on food characteristics, optimum storage conditions and harvesting methods. 28 pages. 1979.

Composting to Reduce the Waste Stream

NRAES-43 \$8.00

This manual explains compost basics and provides design information and troubleshooting hints. Discussions outline methods for using compost to enrich flower and vegetable gardens and improving the soil around trees and shrubs. 48 pages. 1991.

Burning Wood and Coal

NRAES-23 \$5.00

This publication is a complete guide to using wood and coal for home heating. Current information is presented on each fuel; stove technology developments; heating units; stove installation; operation techniques; and problem solving. 90 pages. 1985.

Home Heating in an Emergency

NRAES-9 \$4.00

Prepare for heating emergencies due to power outages, temporary fuel shortages, or furnace failure. Topics include central heating systems, generators, safe installation and use of backup heating systems. 16 pages. 1980.

Farming Alternatives: A Guide for Evaluating the Feasibility of New Farm-Based Enterprises

NRAES-32 \$8.00

This guidebook considers alternative enterprises by using case study and workbook formats to evaluate personal and family considerations, resources, market potential, production feasibility, cash flow and profitability. Each chapter includes self-tests, checklists, and worksheets. 88 pages. 1989.

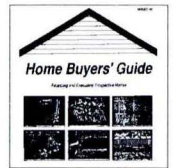
Used Farm Equipment

NRAES-25 \$6.00

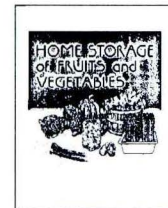
This publication teaches a buyer of used equipment how to inspect items for reliability and safety. Guidelines are offered on estimating economic liabilities of purchasing equipment. Costs of owning and operating new or used machines are compared. 34 pages. 1987.



NRAES-48



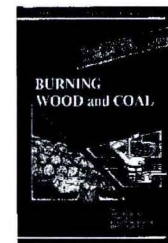
NRAES-50



NRAES-7



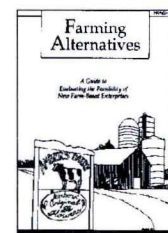
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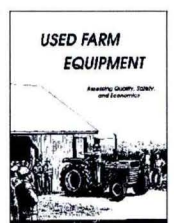
NRAES-23



NRAES-9



NRAES-32



NRAES-25

Fast Fact:

The United States is the world's top exporter of agriculture, fish, and wood products with sales of \$53.3 billion dollars.

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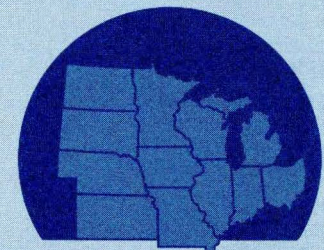
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