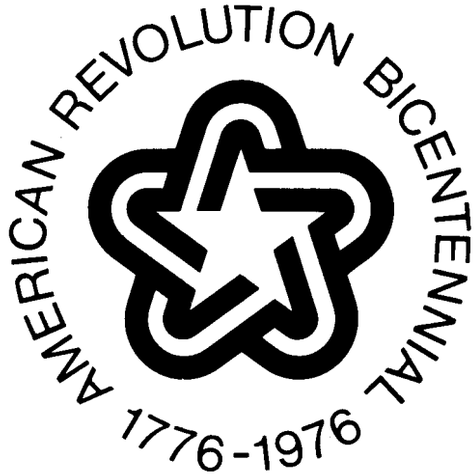
The original documents are located in Box 64, folder "Agriculture Department Bicentennial Leaflets" of the John Marsh Files at the Gerald R. Ford Presidential Library.

UNITED STATES DEPARTMENT OF AGRICULTURE

BICENTENNIAL MATERIAL



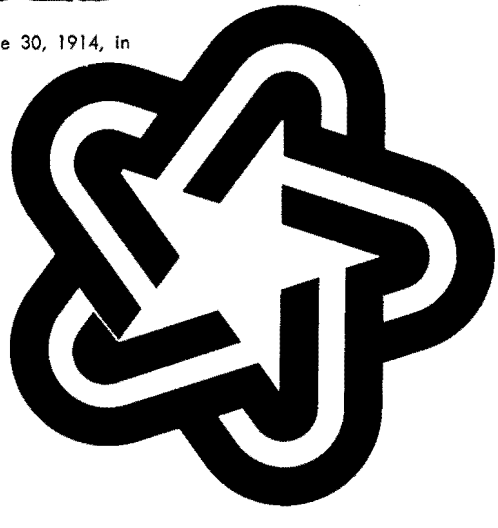
WOODSY OWL SAYS:

U.S. DEPARTMENT OF AGRICULTURE - FOREST SERVICE AND YOUR STATE FORESTER COEP 5-76

Give a hoot! Don't pollute

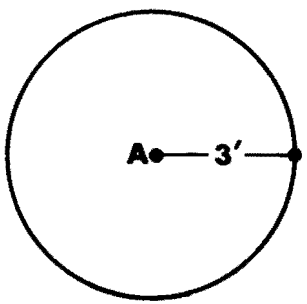
BICENTENNIAL FLOWER BED

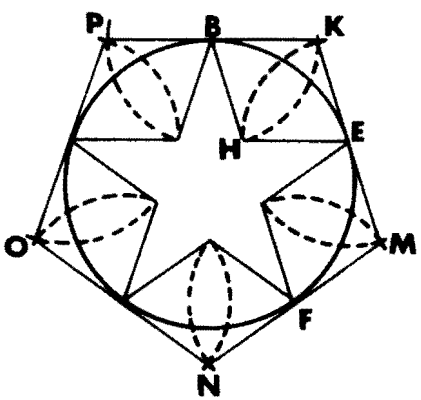
Issued in furtherance of Cooperative Extension work in agriculture and home economics, Acts of May 8 and June 30, 1914, in cooperation with the U. S. Department of Agriculture. William H. Taylor, Acting Director, Alabama Cooperative Extension Service, Auburn University. An Equal Opportunity Employer.



CONSTRUCTING THE FLOWER BED

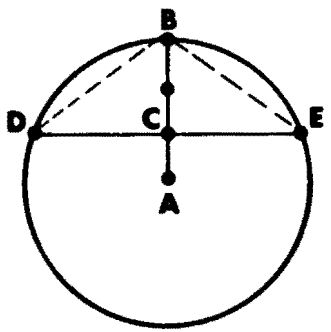
1 Drive a stake into the ground in the center of the flower bed area (A). Tie a piece of string loosely to the stake. Measure off 3 feet of string from the stake and tie a stick at this point. Pulling the string taut, use the stick to draw a complete circle. This circle will be about 6 feet in diameter. The completed flower bed will be about 10 to 12 feet. For a larger or smaller bed, change diameter.

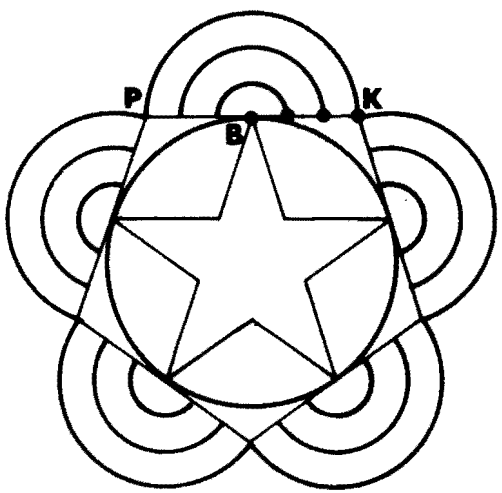




4 Now you must draw a pentagon outside the circle. To draw it accurately, drive stakes into the ground at points B and E. Tie strings to the stakes. Stretch both strings to point H (see illustration) and tie a stick to each string at that point. Now draw an arc with each stick to the point where the arcs cross (point K). Move the stake from point B to point F. Do the same thing to find point M. Continue this process till you have marked points N, O and P. Draw lines between these points.

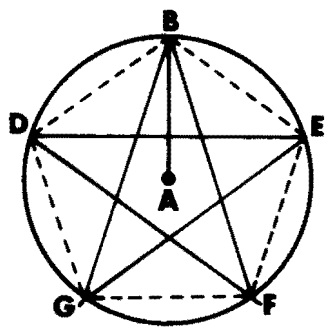
2 Draw a line from the center (A) to the top of circle (B). This will be the top point of the star. Divide this line (A-B) into thirds. At the lower third (C) draw a line (D-E) at right angle to line A-B. To be sure you have located points D and E correctly, stretch a piece of string between points B and E and between points B and D. They should be the same distance.

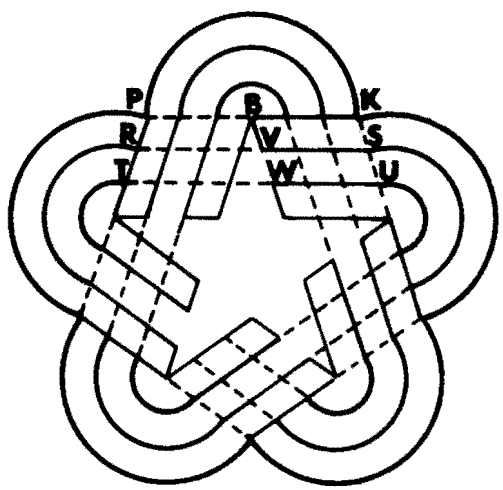




5 You are now ready to draw the arches. Start by dividing the distance from B to K into thirds. Drive a stake into the ground at point B and tie a string around it. Stretch the string to point K and tie a stick at that point. Pulling the string taut, use the stick to draw a half circle to point P. Move the stick and draw a half circle from each of the two points marked along line B-K to line B-P. Make arches this same way on each side of the pentagon.

3 To locate points F and G, use the same length of string you measured from B to E. Hold one end at point E. Stretch the other end to where it will contact the lower part of the circle. This will be point F. Find point G by stretching the string from D to the lower part of the circle. You now have the five points of the star. They should be equidistant. Draw lines to connect the points of the star.





6 It might be helpful now to rub out all the lines **except** the arches, the pentagon and the outside lines of the star.

Use string as a guide to draw the final lines in the flower bed design. Stretch string between corresponding points of the arches (R to S, T to U). However, draw lines **only** from the right side of the star to the arch on the right (V to S, W to U). Do this on the other four sides. Now rub out lines P-B and V-W. Also, rub out the corresponding lines on the other sides.

ESTABLISHING THE FLOWER BED

Bicentennial Flower Beds should be planted with short, stocky plants that are thickly branched and ready to begin blooming. Get them from a reliable source. Recommended planting methods and care of beds will be in vain if diseased plants are used.

Annual flowers recommended for the Bicentennial Flower Bed require full sun. Plant after the last damaging frost in spring. Select a location that will receive at least 6 hours of sun per day. Plants will grow with less sunlight but will not bloom well.

PREPARING AND FERTILIZING SOIL

Many soils are not suitable for growing annuals without some conditioning. Prepare the soil by adding a heavy application of either peat moss (one 6-cubic-foot bale per bed), well-rotted compost, sawdust or other organic material. Mix it thoroughly with the soil. For heavy clay soil, mix an additional 1- to 2-inch layer of sand into the bed.

A soil test is the best guide to fertilization. When no soil test is made, use 2 pounds (approximately 1 quart per bed) of a complete fertilizer to insure sufficient plant food for about 1 month. To prevent damage to young seedlings, mix the fertilizer 4 to 6 inches deep in the soil. Use 1 pound of a complete fertilizer every 3 to 4 weeks as a top dressing.

To free the area of grasses, weeds and disease organisms, fumigate the bed with 1 pound of methyl bromide. This material must be applied under a plastic cover according to manufacturer's directions after organic material and fertilizer have been added to the soil. Wait 4 to 7 days after fumigating before planting. Contact your county Extension office or local garden center for more detailed information on fumigation.

WATERING

Water is essential to all plant life. This is especially true with annual flowers. Once foliage loses enough moisture to become wilted, it is difficult to restore enough to bring back the turgidity of the foliage. The plants may bloom, but foliage is unattractive. The equivalent of 1 inch of rainfall per week is necessary to keep plants vigorous and healthy.

SELECTING PLANTS

Varieties that can be used are listed on the next page. Be careful to use the right color in each area.

PLANT SELECTIONS

RED AREA

SALVIA

St. John's Fire. Average height: 12 inches in full bloom. Blooms mid-May to mid-September.

Red Sentinel. Average height: 16 inches. Blooms from April through September. The brightest red of the salvias.

BEGONIA

New Red Wonder. Average height: 12 inches. Blooms in full sun from April through August. Has large red flowers with green leaves.

Red Tausendschoen. Average height: 6 to 10 inches in full bloom. Tolerates slight shade. Blooms from April through August.

GERANIUM

Carefree Crimson. Average height: 15 inches. Does not require pinching. Blooms from April through October.

Nittany Lion Red. Average height: 15 inches. Has single, scarlet flowers. Blooms from April through October.

WHITE AREA

ALYSSUM

Tiny Tim. Average height: 3 inches. Very compact. Blooms from April through August.

VINCA

Little Bright Eye. Average height: 10 inches. Sparkling white flowers with a bright eye. Blooms continuously from late April through summer in full sun.

PETUNIA

Bridal Bouquet, Glacier, Alaska, La Paloma, White Cascade, White Magic and *Polar Cap.* Bloom from April through August.

DUSTY MILLER

Silver Dust. Average height: 8 inches. No blooms; foliage is grayish white.

BLUE AREA

AGERATUM

Blue Blazer. Average height: 6 to 8 inches. Flowers cover over for continuous bloom from April through August.

Blue Mink. Average height: 12 inches. Uniform in habit of growth. Blooms from April through August.


4H
1ST
NATIONAL
4H Poster Exhibit

about the exhibition

All entries in the exhibit are created by 4-H members ranging in age from 8 to 18. Participants were urged to design their posters based on any one of three theme areas suggested by delegates to the 1974 National 4-H Congress. These three areas are: "We Have a Friend in 4-H" . . . "Get Involved" . . . "4-H — Room to Grow." In many areas poster art contests are held at the local and county level.

The exhibition is non-competitive at the national level. Each state is invited to submit three entries. All state entries are exhibited.

Selected posters from this exhibit have been submitted to an artist for interpretation in designing the National 4-H Poster for 1976-77.

The National 4-H Poster Art Exhibit provides —

a showcase of 4-H members' artistic talents and interpretations of ideas. It gives 4-H members an opportunity to participate in the creation and selection of the design which is used on the national 4-H poster.

Initially shown at National 4-H Congress in Chicago, the posters in this exhibit are to be displayed at the National 4-H Center, Washington, D.C. following this exhibition.

The exhibition is sponsored by —

Coats & Clark Inc.

in cooperation with

Extension Service, USDA

Cooperative Extension Service

National 4-H Service Committee

National 4-H Foundation

National 4-H Supply Service

Poster Art Exhibitors

Alabama
Wade Jenkins, 17
Traci Miller, 10
Mike Williams, 16

Arkansas
Camille Johnson, 16
Felicia Outlaw, 14
Elwood Shannon,

California
Scott Allan Leach, 12
Marie Olson, 17
Sally Naito, 16

Colorado
Linda Schaefer, 14
Jeff Stanton, 17
Donald Williamson, 17

District of Columbia
Chung Eng, 16
Suzanna Lee, 15

Florida
Kathi Kloiber, 16
Gina Mach, 14
Donald Molloy, 8

Georgia
Cheryl Barron, 13
Kathy Hutcherson, 16
Michelle Waters, 15

Idaho
Judy Fredericks, 11
Lynn Thomas, 17
Sherri Malm, 18

Illinois
Donna Kinast, 8
Nancy Vruno, 17
Mary Therese Wroblewski, 17

Iowa
Lisa Hamlett, 16
Pam Long, 17
Sharon Trembly, 15

Kentucky
Kathy Floyd, 12
Tom Floz, 10
Tena L. Sexton, 13

Louisiana
Earl Hodgkins, 13
Nancy Kitchin, 12
Teresa Taylor, 13

Maryland
Francis Feldt, 17
Teresa Milburn, 17
Karen Saufley, 13

Massachusetts
John Enos, 12
Mary Louise Goehring, 7½
Richard Heath, 18

Michigan
Laura Brantley, 15
Lisa Frisell,
Cindy Langdon, 15
Julie Platte, 15

Minnesota
Melinda Hayes, 15
Caroline M. Kalus, 17
Jeff LaRoche, 15

Mississippi
Patricia Matthews, 13
Chris Smith, 16
Mary Jane Smith, 15

Missouri
Jane Bauman, 13
Esther Buenemann, 12
Susan Sarup, 17

Montana
Kay Adler, 13
Cindy Hoffman, 17
Glenniss Indreland, 15

New Hampshire
Joseph Dube, 9
Parker Grant,
Jeanette Ramsbotham, 17

New Jersey
Keith Diem, 14
Sally Morgan, 16
Wendy Newbold, 11

New York
Cindy Keepner, 13
Holly Kelkenburg, 13
Patricia Nugent, 16

North Carolina
Donna Cooper, 16
Donna Hardison, 12
Pam Williams, 16

North Dakota
Vicky Dekrey, 14
Kathy Sebastian, 14
Donna Wilkie, 12½

Oregon
Aubyn Eror, 11
Kirt Feuerborn, 18
Shannon Hadley, 17

Pennsylvania
Denise Beamesderfer, 15
Jeff Hileman, 16
Patti Lewis, 16
Michele Owens, 16
Terri Yenko, 14

South Carolina
Donna Johnson,
Julie Sessions, 18
Margaret Whipple, 11

South Dakota
Alan Bishop, 10
Debbie Kenouer, 12
Joan Wilson, 13

Texas
Kathy Bartholomew, 14
Chriss Cummings, 17
Sheri Gautier, 12

Utah
Todd Haacke, 18
Cassie Hall, 13
Todd Plamer, 14

Vermont
Heide Keck, 10
Beth Morse, 10
Elizabeth Ormsbee, 12

Virginia
Rebecca Dawn Green, 18
Linda Poff, 15
Janet Prillaman, 13

Washington
Linda Bergeson, 10
David Foerstner, 13
Karen Scarlett, 13

West Virginia
Kenny Baker, 10
Beth Davis, 10
Martha Davis, 12
Kathy Reese, 13

Wisconsin
David Hubatch, 14
Karen Hubatch, 10
Penny Lynn Kakes, 13

Wyoming
Brenda Ellingford, 11
Mary Ellen Gee, 14
Libby Lynn, 15

The 2nd National 4-H Poster Art Exhibition will be November 28 - December 3, 1976 at the 55th National 4-H Congress in Chicago.

LET'S PLAN A Birthday Party!

EXTENSION SERVICE • PA-1099
U.S. DEPARTMENT OF AGRICULTURE
BICENTENNIAL BROCHURE

LET'S PLAN A Birthday Party!

The biggest birthday party in America's history will soon be here!

All of us can participate in events marking the 200th birthday of the founding of the United States of America. The official Bicentennial period will be March 1975 to December 1976.

Start plans now. Your community can receive official Bicentennial Community status with the help of the American Revolution Bicentennial Administration, (ARBA) 736 Jackson Place, N. W., Washington, D. C. 20276. Here is how you qualify:

— Contact your mayor or some other town or county official and organize a special bicentennial planning and coordinating committee . . . one representative of all segments of the community.

— Plan a bicentennial program to tie in with the three bicentennial themes: (1) *Heritage '76*, honoring and reflecting upon the past; (2) *Festival USA*, featuring celebrations and hospitality; and (3) *Horizons '76*, making a commitment to improve the quality of life in rural areas.

— Submit the application to the ARBA through your State bicentennial agency. (If in doubt about who heads bicentennial planning for your State, contact the governor's office.)

Every rural community has a rich history of events and situations that can be unfolded to honor and reflect on the past. Here are just a few ideas.

HERITAGE '76

- Run a contest, using local media, to identify and locate the oldest living family whose roots trace to the pioneers.
- Present a plaque, in a public ceremony, to recognize the oldest store or grain mill that has served the community.
- Plan ways to recognize the founding and service of the land grant university, agricultural experiment stations, churches and other institutions in the community.
- Urge 4-H Clubs, Boy Scouts, Girl Scouts and adult groups to conduct pageants depicting the history of the community.
- Trace real estate deeds to find the farm, ranch, or home still in the name of the family first holding the deed. Acknowledge the family.
- Trace the history of farm, church, and other key organizations and associations in the community and publicize how they have aided in the development of the community.
- Select historical farms and museums as projects for observing the bicentennial.
- Get pictures of all chief elected officials of the town, and dedicate a display of them in town hall.
- Tie in the bicentennial celebration with routine events and functions in your community. For example, if you normally have a fair, emphasize the old and the new in this year's exhibits.

GPO : 1974 O—559—845

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 - Price 25 cents

FESTIVAL USA

- Recognize key people and organizations at county and State fairs, using exhibits, bandstand shows and historical ceremonies.
- Display antique tractors and other tools used by community-area farmers and pioneers in industry.
- Organize community events or contests, such as old-fashioned cooking, hand-husking corn, quilting bees, syrup-making, spinning, and plowing matches to feature local talent.
- Conduct agricultural experiment station field days and tours of area farms and ranches to point out the contributions of agriculture to the growth and success of the local community.
- Offer urban people the opportunity to spend a day on a farm during the bicentennial festival period. Help organize these and other events which may call for active cooperation between city and farm people.
- Have pageants of local history between halves of the high school football or basketball games.
- Agricultural histories, city and county histories, and ethnic contributions to the growth and development of the community may be news for the local media and historical gems forever.
- Have a Bicentennial Farm Fair in an urban shopping center. Set up exhibits that show what farming was like 200 years ago—and is like today. Demonstrate home crafts and display animals. Feature kitchen and other home furnishings from 200 years ago and today.

HORIZONS '76

- Establish or improve community parks as a lasting way to improve the quality of life for the future. These parks can include trails for hiking and horseback riding, and a stream for boating and fishing.
- What better way to look to the future than for your community to endorse or develop a long-range plan for Community Development (CD). If you do not have a CD Committee now, contact your mayor or local USDA offices for help in organizing one.
- Encourage home economics extension groups to produce a long-range plan for reinforcing the close-knit family concept as a strength of rural America.
- Some State Extension Services and State Departments of Agriculture have already established "horizon goals" and have moved rapidly to accomplish them. Has your county considered new goals?
- Some communities are reviving streets with flower boxes, planting trees, and remodeling store fronts. Is 1975-76 the time for your community to plan for revitalization? Try it — you might like it!
- Arouse the enthusiasm of young people in high school or youth clubs — let them show the future they want.

How do you take part in '76?

Get involved. It's that simple. Help initiate events and programs which go directly to the people in your community. You are what the bicentennial "birthday party" is all about.

You can help the people in your community rediscover the national spirit of '76 that has been the envy of less fortunate people around the world for 200 years!

The U. S. Department of Agriculture is proud of the part it has played in assuring an adequate supply of high quality food and fiber at reasonable cost since it was created in America's first century.

The State, regional or local offices of the Cooperative Extension Service, Agricultural Research Service, Agricultural Stabilization and Conservation Service, Farmers Home Administration, Forest Service, Soil Conservation Service, and other agencies of the U.S. Department of Agriculture will be participating in the Bicentennial and will help you in any way possible to sense the greatness of the occasion.

Let's get the light of your community uncovered and shining so the whole nation can see it!

Earl L. Butz
Secretary

Issued October 1974

RECOGNIZED BY
AMERICAN REVOLUTION
BICENTENNIAL
COMMISSION

National 4-H Photo Exhibition

Patio

U.S. Department of Agriculture

Washington, D.C.

March 16 - April 9, 1976

about the exhibition

All photographs were taken by 4-H members listed in this program.

The exhibit is made up of about 265 prints on 155 mounts each 16 x 20 inches and includes picture stories as well as individual photographs.

All photographs were printed through the courtesy of Eastman Kodak Company.

The 144 exhibitors represent 44 states and a cross section of creative 4-H photographers 9-19 years of age.

The exhibition is non-competitive at the national level and entries are limited to a maximum of four per state.

Initially shown at National 4-H Congress in Chicago, the photos in this exhibit are to be displayed at the National 4-H Center, Washington, D.C. following this exhibition. Another set of the photographs is being scheduled by 4-H personnel nationwide.

The National 4-H Photo Exhibition provides –

a showcase of 4-H members' photographic accomplishments and a way to improve the public's understanding of 4-H.

The exhibition is sponsored by –

Eastman Kodak Company

in cooperation with

Extension Service, USDA

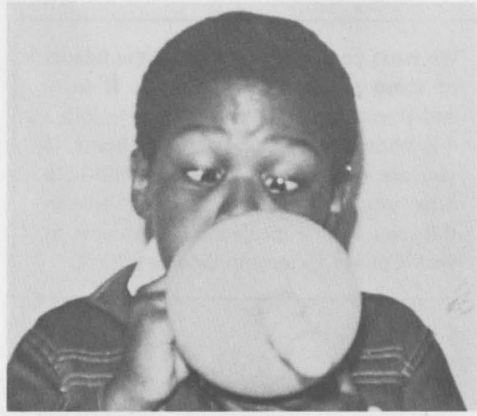
Cooperative Extension Service

National 4-H Service Committee

National 4-H Foundation

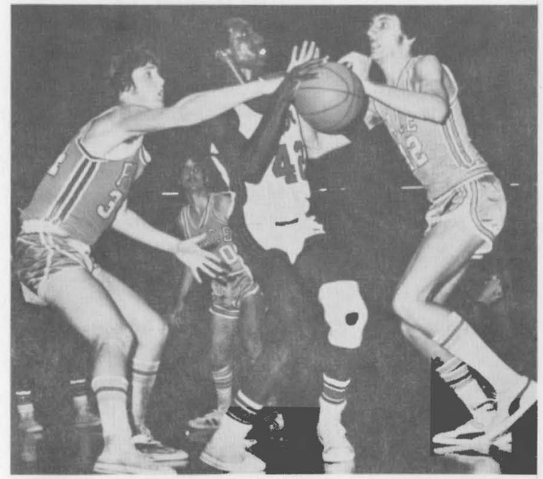
Photo Exhibitors

Alabama	Daryl Custred, 19
Arkansas	Paul Bergman, 17 Jimmy Hendrix, 16 Becky Looper, 16 Tom Martin, 17
Colorado	Cheri Dale, 18
Connecticut	Carolyn Sinclair, 19
District of Columbia	Zina Andrews, 12 Debra A. Jones, 15
Delaware	William T. Campbell, 19 Nels Pederson, 17 Pam Ridley, 16 Denis Shaffer, 16
Florida	Roberta Beckelman, 18 Tim McNeal, 15 Victor Thompson, 12
Georgia	Tim Chason, 16 Jim Gratzek, 11 Mark Hammock, 15 Bob Spratling, 14
Hawaii	Audrey N. Doi, 17 Colin Nakagawa, 16

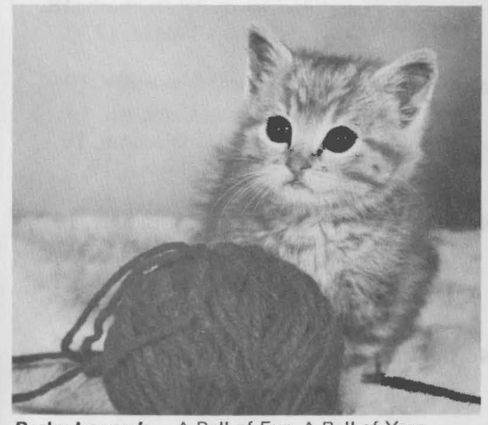


Jim Gratzek's – Eyes on a Balloon

Tim Chasen's – Action on the Court



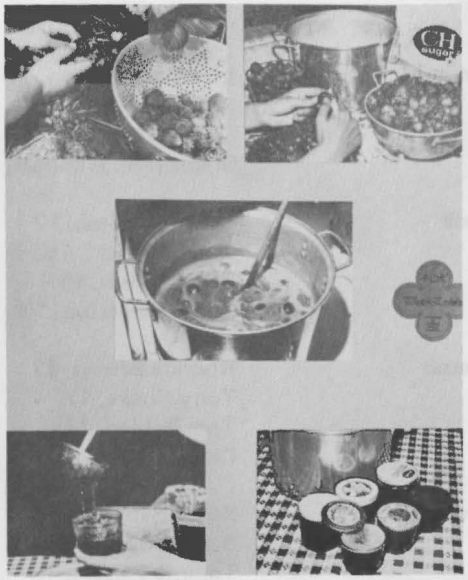
Idaho	Yvonne Cook, 17 Gaydena Jensen, 15 Linda Murray, 19 Chris Pietsch, 17
Illinois	Beth Adams, 14 Ted Hallberg, 13 Jim Hutcheson, 12 John Larkin, 18
Indiana	Lisa O. Albertson, 17 Joni Nussbaum, 17 Dan Ufkes, 18 Stephan M. Wininger, 15
Iowa	Sherry DeMoss, 12 Tim McQuoid, 15 Eric Rawson, 14 Todd Wolverton, 13
Kansas	Rhonda Brown, 12 Tony Cocke, 17 Tom Fabian, 17 Cindy Turner, 17
Kentucky	Kevin Hayes, 14 Dan Grider, 16 Tommy Rogers, 15 John Story, 17
Louisiana	Tommy Merrill, 15 Jolisa Pickett, 12 Melanie Savoy, 12 Glynn Scarborough, 17
Maryland	Barry W. Glotfelty, 16 John Streett, 13 Mary Streett, 14 John Thibeault, 14
Massachusetts	Sandra Field, 15 Miles Prunier, 17 Russell Rheault, 19
Michigan	Jeff Frahm, 15 Nancy Hebb, 16 Paul Kamprath, 14 Andy Todosciuk, 12
Minnesota	Dean Breummer, 15 Guy Eristoff, 12 Linda Rosendahl, 16 Diana Watson, 16
Mississippi	Ann Hallaway, 14 Stuart L. Turner, 13
Missouri	Matthew DeCocq, 16 Joyce Kullman, 12 Tim Luther, 19 Darryl Nicks, 18



Becky Looper's – A Ball of Fur, A Ball of Yarn

Linda Murray's – Dennison Mountain, Alaska

Montana	Ethel Lea Frey, 14
Nebraska	Richard Busse, 17 Jane Egr, 16 Tim Rebman, 16
Nevada	Matt Glaser, 16 Julie Minor, 18 Tom Minor, 14 Tracy Powell, 17
New Hampshire	Melanie Miller, 17
New Jersey	Michael Giglia, 16 David Kleiner, 18 Charles Schroer, 18
New Mexico	Kathy Hudson, 18 Ardythe Ruebush, 18 Elena Valdez, 17
New York	Vicki Alexander, 16 Dawn Campbell, 14 Lori DiGiacomo, 16 Claire Oakley, 17
North Carolina	Daniel H. Bender, 16 Ken George, 17 Hal Hollis, 15 Patricia Todd, 18
North Dakota	Kim Grager, 10 Jane Melander, 18 Shelle Slavick, 18 Betty Stenberg, 17
Ohio	Darroll Converse, 19 Glen Haronff, 17 Tom Naber, 18 Randy Zimmerman, 14
Oklahoma	Rene Crispin, 15 Steve Foster, 18
Oregon	Margaret Holmes, 17 Robbie Huston, 12 Eileen Moore, 16 Cindy Simmons, 17
Pennsylvania	Corky Flick, 16 Darwin Nissley, 17 Trudy Nissley, 16 Timothy Swarr, 15
South Carolina	Omera Davis, 15 Steve McLaughlin, Jr., 17 Mike Moore, 17 John Padgett, 16
South Dakota	Peggy Gauer, 12 Kimberley Henschel, 12 Lynnette McClellan, 13 Nancy Wilson, 16



Ellen Unrein's – Strawberry Jam

Tennessee	Ruth Ann Carlton, 18 Cindy Rasch, 15 Elizabeth Ann Tedrow, 16 Brent Willis, 16
Texas	Debbie Horner, 13 Robert Lastovica, 13 Steve Melasky, 11 Jed Sparling, 14
Virginia	Lee A. Brammer, 18 Doug Dyer, 16
Washington	Carla Beevers, 16 Sean Callahan, 14 Kathy Leid, 15 Peggy McMartin, 16
West Virginia	Ken Bonenberger, 17 Shann Elkins, 10 Mark McClure, 13 Mary Ann Ross, 18
Wisconsin	John Gobis, 17 Gary Nelson, 18 Linda Oestreich, 16 Ellen Unrein, 11
Wyoming	Steve Benshoff, 15 Pat Grieve, 13

We trust you have appreciated the talents of these creative young people. If so – and if you are 9-19 years of age – join a 4-H photography club near your home. If you are older, be a 4-H leader and help other young people achieve recognition in this and similar projects. Learn how at your County Extension Service Office.

a birthday party!

Join Woodsy Owl in a party to celebrate OUR Nation's 200th Birthday

SOME PARTY IDEAS:

- Decorate with flowers and leaves
- Make additional decorations by recycling things around the house, such as moon and stars cut from cardboard and covered with used metal foil or paper chains from used paper
- Paint your own Woodsy Owl posters and signs
- Make a tablecloth by pasting together pictures from old magazines, calendars, and funny papers
- Fashion a Woodsy Owl mask and hat from a large, used grocery sack
- Create paper leis from pieces of used colored paper, string, and a needle

give America a birthday gift

Do something to make your community and country a nicer place to live

SOME GIFT IDEAS:

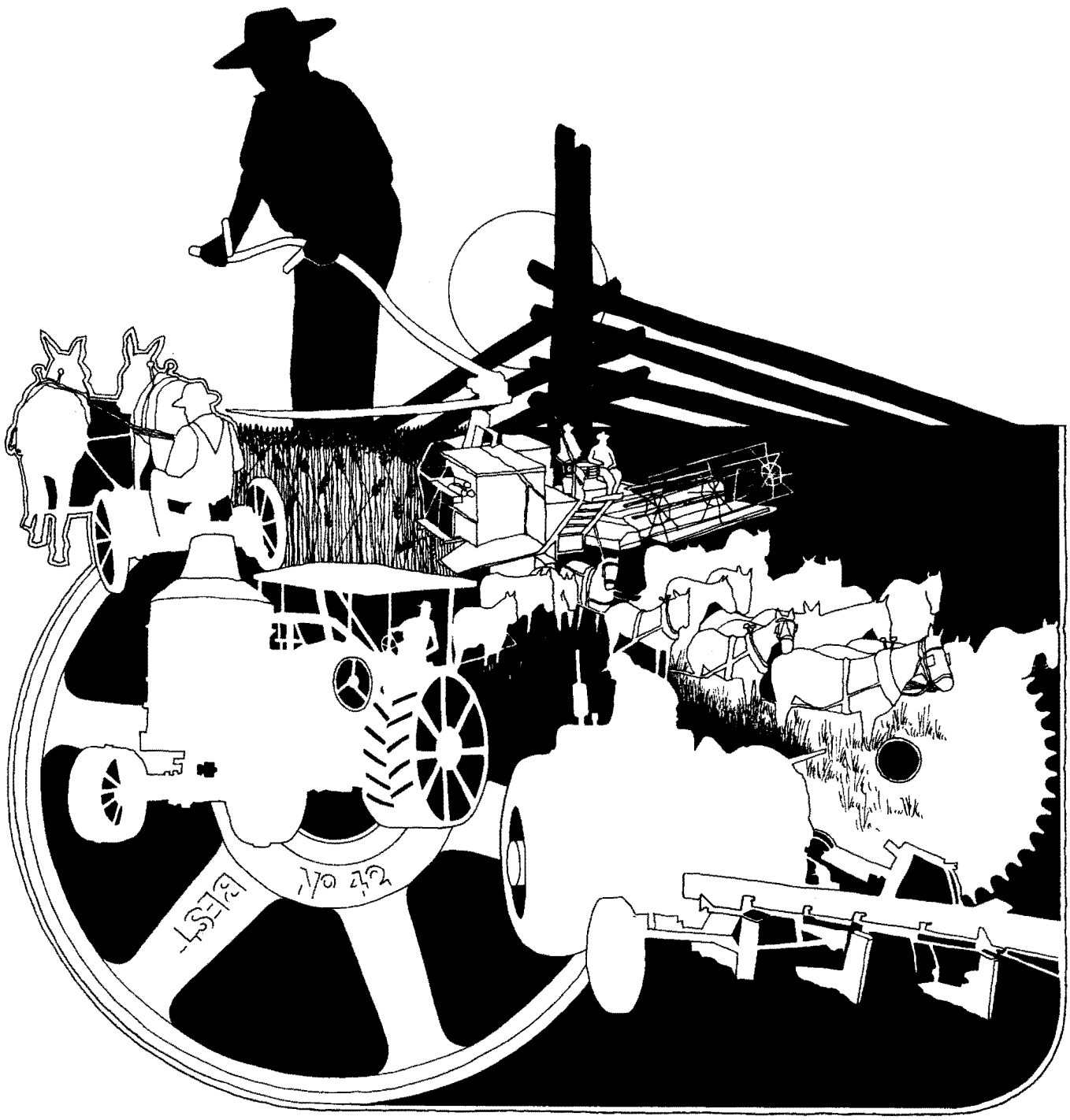
- Plant a tree, shrub, or flowers
- Clean up a vacant lot, trail, or stream
- Clean up an old, unattended cemetery
- Collect used clothes, furniture, and other items and give them to a church or organization that can reuse them
- Make birdhouses, bird feeders, or birdbaths
- Fix up and paint an old building, fence, or picnic table
- Write a newspaper story on things people can do to help Woodsy improve our environment and ask your editor to print it

General Federation of Women's Clubs Juniors
and USDA Forest Service

GPO 890-427

THE FARM INDEX

U. S. Department of Agriculture February 1976



Two Centuries of Clever Contraptions

Contents

Features

Departments

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The Farm Index is published monthly by the Economic Research Service, U.S. Department of Agriculture. February 1976. Vol. XV. No. 2.

Readers are invited to write for the research materials on which we base our articles. Address queries to The Farm Index, Rm. 1664, Economic Research Service, U.S. Department of Agriculture, Wash., D.C. 20250. Please cite article titles when ordering.

Outlook

Sluggish economic recovery abroad could dampen prospects for another record high for agricultural exports. Analysts already figure the total value of 1975/76 exports will nose down somewhat from the $22.7 billion estimated last November. However, dollar value should be near the $21.6-billion chalked up in 1974/75.

Meanwhile lower prices for last fall's bumper crop mean export volumes should be up substantially from last year.

One factor, economists say, is the weak showing of consumer demand for nonessential items in Western Europe, which takes about $7 billion, or one-third, of our agricultural exports. Our products are moving to Europe more in response to poor harvests there than to strong consumer buying. Farm exports to Japan, another big customer, may show little or no value change in 1975/76.

For the rest of the marketing year, the economic health and recovery prospects for many of our foreign markets could have a strong bearing on farm export totals.

Real gross national product fell in virtually all major industrial countries last year. Japan alone eked out a marginally positive growth rate. And despite a brighter outlook for the U.S., Canada, and Japan in 1976, at this time other industrial nations appear to be lagging behind.

However, the expected economic growth should boost import volume and trade between industrial countries this year, although full effects of the economic upswing won't be passed on through the trade sector. Also, growth in OPEC imports from developed nations will probably shrink considerably from the nearly 50-percent surge of 1975.

Inflation appears to be ebbing in most developed countries, and 1976 should usher in generally lower rates. Italy and the United Kingdom, however, still suffer extremely high rates of inflation.

Developing countries—which sell 75 percent of their exports to developed nations—felt the repercussions of recession last year, and the outlook for the poorest of these countries is still gloomy. Non-oil exports to developed nations fell in 1975 while financial constraints curbed needed imports.

Soviet Science Tackles the Weather

What are the Soviets doing to cope with harsh weather? The question was asked by a team of U.S. agriculturalists who visited the U.S.S.R. last fall under the U.S.-U.S.S.R. Agreement on Cooperation in the Field of Agriculture.

The Soviet Union, the team learned, is placing considerable emphasis on the study of agro-meteorology—the impact of weather on agricultural production. This is mainly because the climate of their major agricultural areas is more severe than in the U.S., being generally cooler and drier.

Most Soviet agriculture occurs between 42° and 55° north latitude. This compares roughly with the area from the Central Corn Belt to the northern fringes of the Canadian spring wheat lands on the North American continent.

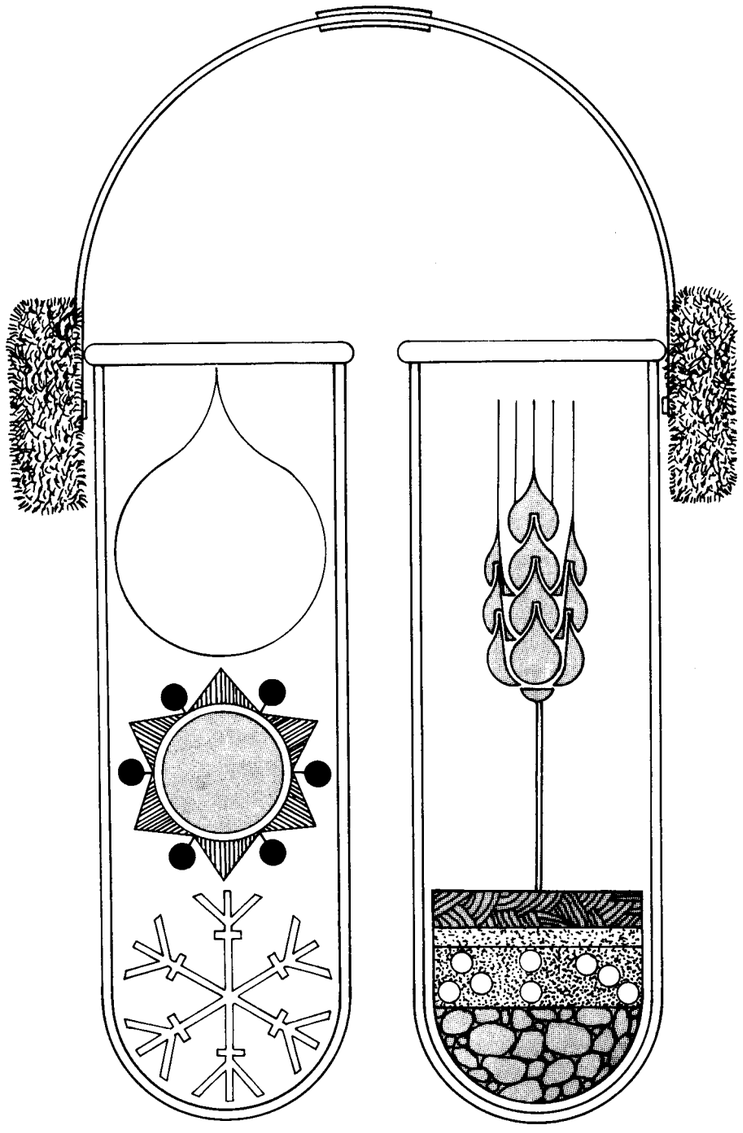
The Soviets have four primary programs in agro-meteorology, each dealing with a different aspect or scale of the weather. These include:

• **Investigation of the atmosphere.** Much like our own National Weather Service, National Oceanic and Atmospheric Association (NOAA), the Hydrometeorological Service of the U.S.S.R. prepares routine forecasts for 1, 3, 5, 10, and 30-day periods. Information on severe weather conditions—such as wind, hail, snow, visibility, and rainfall—is sent to various government agencies, but its dissemination is not as broad as in the U.S. (newspapers, radio, and television).

In addition, the Soviet's Hydromet Service conducts atmospheric research to improve and extend forecast capabilities.

According to the National Weather Service expert who accompanied the U.S. team to the Soviet Union, Russian efforts in this area are similar to ours.

•**Agro-meteorological investigations.** In order to better understand the impact of weather on agricultural production, detailed research is also needed on a smaller scale. For example, how do different plants and animals respond to changes in weather? Soviet efforts are comparable to the work done by



USDA's Agricultural Research Service and land grant colleges.

Examples of research conducted under this program include the relationship between soil moisture and plant height, the impact of temperature and moisture on winterkill, the loss of topsoil by strong winds, the relationship of soil moisture and fertilizer utilization, and time of bloom of fruit trees.

Various moisture conservation experiments have been carried out under the investigations program. One involves the use of "minimum tillage," which has been developed extensively in the New Lands area of Kazakhstan.

This method involves the use of a V-shaped blade to sweep below the soil surface, killing weeds and loosening the soil, but maintaining the stubble cover. This reduces the amount of moisture lost by evaporation, and the stubble helps to catch snow and increase moisture penetration, as well as keep soil erosion to a minimum.

During the fallow year, the V-blade is used 5 times, each time working at a deeper depth. The final sweep is almost 16 inches deep.

Typically, the top 3 feet of New Lands soil will hold up to 8 inches of moisture. In the spring following fallow there is normally 2-3 inches more moisture available than in the remaining years of the rotation. Use of the minimum tillage method has resulted in greater soil moisture than in fields which have been plowed by moldboard plows.

Another means of increasing soil moisture is through the use of natural snow fences. Parallel rows of sunflowers or mustard are planted every 40 feet across the fields, which trap the snow and prevent it from being blown away by wind. Ridging—plowing snow into spaced ridges—is another means of promoting more uniform snow retention. According to Soviet scientists, these methods can result in an extra 3-4 inches of soil moisture each year, adding 4-5 bushels per acre to yields.

In general, this Soviet weather program is very intense and probably more advanced than in the U.S., mainly because the climatic problems faced by the Soviets are so numerous.

•Agro-meteorological services. Probably the least developed of the Soviet agricultural weather programs, these provide daily advisories to farm managers on local weather conditions and how they will affect crops, as well as how the weather may affect the decisions the farm manager must make.

Information in the advisories is related to current crop activities—for example, time of the expected bloom of fruit trees, soil temperature for seeding, suggested fertilizer applications based on soil moisture conditions, danger of frost or pest problems, and so on.

This effort is similar to the Agricultural Weather Service program of the National Weather Service, which sends daily advisories to about 19 States over NOAA "Weather Wires" and makes the information available to local radio and TV stations.

The U.S. program appears to be well ahead of the Soviets' in this area, both in terms of the amount of information provided and the means for getting it out.

• Yield forecasting. Because of their vast agricultural areas and the variety of weather that occurs in a "normal" year, the Soviets have developed a multilevel system for using routine meteorological information to follow potential production throughout the season, including a network of 6,000 soil moisture sampling sites.

Meteorological information is summarized every 10 days, from which yield forecasts are made at the republic and regional levels. The information is also summarized in a report similar to USDA and NOAA's Weekly Weather and Crop Bulletin. It contains material on the latest weather conditions, the state of crops, and an estimated yield figure for each oblast.

[Based on special material from Richard Felch, Agricultural Weather Service, National Weather Service, NOAA.]

U.S.S.R.'s Top Food Producers

The most important food producing areas of the Soviet Union are the republics of the Ukraine and Kazakhstan.

The Ukraine, which has been called the breadbasket of the Soviet Union, produces a wide variety of crops. These include 25 percent of all Soviet grain, 60 percent of the sugarbeets, and nearly 50 percent of the sunflowers, an important oil crop.

There are three general climatic zones in the Ukraine. The southern "prairie" receives 14-16 inches of precipitation annually and is an important grain-producing region.

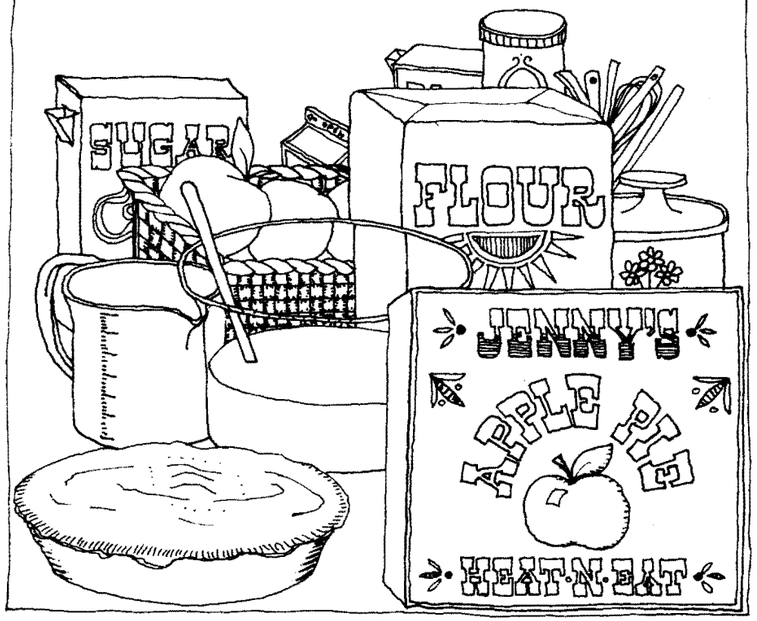
The middle prairie steppe gets 16-20 inches of moisture and produces a mixture of grain, sugarbeets, potatoes, and other crops.

The northern region receives a generous 24 inches or more of rain each year, but cool temperatures restrict production to such crops as flax and potatoes.

Kazakhstan is the U.S.S.R.'s major spring wheat region. Most of the wheat is grown in its "New Lands" area, located in the northern third of the republic.

The New Lands normally have a dry spring, with good precipitation in the summer. Soviet farmers are forced to hold off planting until May 25, so that the young crop won't dry up before the summer rains. Frost is a danger by late August, causing the New Lands to have a very short growing season. If the summer rains don't come, the situation is serious. Witness 1975, when grain production was a third less than planned.

For Convenience Sake



The homemade way may not always be the cheaper way, a survey of convenience foods shows. Out of more than 160 convenience foods studied, about a third cost less than the similar dishes made from scratch.

But wait before you run out and stock the fridge or pantry. Although some convenience foods are somewhat cheaper than home-prepared, others are far more expensive. So if lower food costs are your goal, watch what you're buying.

The study covers July 1974 to June 1975, and is based solely on food ingredient costs. No comparisons or allowances are made for nutritive value or culinary skills, equipment, and time involved in food preparation—factors the consumer might want to consider.

Convenience defined. The study defined convenience foods as "any fully or partially prepared foods in which significant preparation time, culinary skills, or energy inputs have been transferred from the homemaker's kitchen to the food processor and distributor." Therefore, convenience foods included everything from canned and frozen single-ingredient fruits and vegetables, to meat entrees, with built-in chef service.

Prices of some fresh vegetables present a good argument for using the processed kinds. Canned or frozen green peas in particular offer a big saving. A fresh dish of peas would cost you about 27 cents during the survey period, where canned or frozen were about 11 cents.

Processed lima beans and spinach are other big economizers. Frozen limas were the cheapest at 11 cents a serving, with canned 14 cents, and fresh almost 29 cents. Frozen spinach was the best buy at almost 11 cents a serving, followed by canned at 13, and fresh at nearly 25.

Seasonal influences. Asparagus spears, brussels sprouts, and corn are a bit less expensive in the frozen or canned form. However, fresh is a better buy during the growing season.

On the other hand, butter beans are much cheaper to cook from the dried bean (4 cents a serving, according to the survey) than to buy in the can (11 cents a serving). Vegetables with built-in chef service, like broccoli spears in Hollandaise or butter sauce or scalloped, stuffed, or au gratin potatoes are considerably cheaper from scratch, too. However, lest you despair at the thought of peeling all those spuds in an economy move, you can always serve frozen french fries or potato puffs since these actually cost less than their homemade counterparts.

Squeezing is costly. Fruit is another major food group where for some items the fresh form may be more expensive than the processed. Orange juice is the most striking example. Squeezing it yourself costs almost 12 cents a 4-oz. glass, the survey shows, where making it from frozen concentrate ran only slightly more than 4 cents. Canned orange juice averaged about 6½ cents a glass. Lemon juice, too, is cheaper in the ready-squeezed form.

If you're buying tart red pitted cherries, it's almost a tossup between fresh and canned. The cost scale tips both ways for cranberry sauce: Strained sauce is cheaper in the can, but the kind with whole berries costs less to make yourself. Bear in mind, though, that sugar prices during the survey period were unseasonably high, so the homemade strained sauce was at a disadvantage.

Strawberries are the cheapest when bought fresh. However, when not in season, frozen berries in a bulk bag are the best buy. Fresh peaches are also the best bargain, followed by canned. Frozen peaches are considerably more expensive.

Grandma's goodies. Stirring up your own breakfast goodies and desserts may be costing you more than you think. For example, Grandma's baking powder biscuits are still more economical than ready-to-bake kinds or mixes, but not so for steaming hotcakes or waffles. In fact, hotcakes or waffles made from a complete mix cost only about two-thirds as much as the homemade ones.

Watch out for the frozen varieties if you're pinching pennies, though, because they are about 3 times as expensive as the homemade variety.

Frosting and pudding mixes can also save you money. Chocolate pudding made from scratch cost almost 12 cents a serving in the survey period, compared with 10 cents a serving with a mix. The snack-size canned type was the most expensive.

That American favorite—apple pie—is still made most economically in your kitchen. A homemade slice cost about 12½ cents; one from a piecrust mix and canned apple pie filling, nearly 18; frozen, 20½; and ready-baked, 24. The other pies included in the survey, cherry and coconut cream, were also cheaper when prepared at home.

Main-dish pitfalls. If these cost comparisons tantalize you to retire the mixing bowl and measuring cups, hold off: Main-dish convenience foods are often more expensive, sometimes a lot more. For example, a frozen beef dinner that cost 79 cents in 1974-75 would have cost 51 cents if made at home. And a 71-cent frozen turkey dinner would have cost only 29½ cents to make. Sweet-and-sour pork, whether packaged or frozen, carries a premium price too.

There are some bargains to be found though. Chicken chow mein is most expensive when bought frozen, but you come out ahead with the canned version. Also, if you like to extend your meat by adding soy protein, it's cheaper to buy the ground beef mixed with soy at the grocery store. Reason is that grocery stores get a break in price on soy protein because they buy in bulk.

Mixes offer break. Skillet main-dish mixes can sometimes offer a price break too. The ERS survey found that lasagna mix was over 9 cents a serving less than the homemade version, and the tuna noodle casserole mix, 3 cents cheaper. Packaged stroganoff ran only slightly higher than homemade—1½ cents a serving. Chili-macaroni mix, however, got a bit more expensive—2½ cents over the homemade.

Canned spaghetti or a package mix came out cheaper than homemade by over 6 cents, probably because the convenience versions use less expensive cheeses than the parmesan generally added to home concoctions.

If you plan on baking a pizza at home and you're watching the budget, either make one from scratch or else use a mix. At least for a cheese pizza, these are essentially the same price. However, a frozen one cost a hefty 24 cents more per wedge, the ERS study showed.

Seafood bargains. Seafood may also offer some convenience food bargains. A serving of crabcakes averaged 8 cents cheaper than freshly prepared ones. Frozen or canned shrimp was about 11 cents less than fresh. Of course if you live near the coast, your chances of getting reasonably priced fresh seafood may be pretty good.

As with most convenience food items, the plainer seafoods offer more of a price break than the complete dinners or the gourmet dishes. For example, the survey team reported that a frozen haddock dinner was almost 45 cents more expensive than a home-prepared one. Shrimp newburg cost only 69 cents a portion if you made your own, but $1.13 if you bought it frozen.

Dairy comparisons. Most Americans don't prepare their own dairy products these days, other than some cottage cheese and home-churned butter when milk is supplied by the family cow. Still, the consumer can bargain shop at the supermarket.

For instance, American cheese costs essentially the same whether in a loaf or slices, but cheese food in an aerosol can is 3 times as expensive as cheese food in a loaf. Margarine in a tub or a squeeze bottle is higher priced than stick margarine—all of which carry a smaller price tag than butter.

[Based on speech, "Convenience Foods—1975 Cost Update: A Preliminary Report," by Larry G. Traub, National Economic Analysis Division, and Dianne Odland, Agricultural Research Service, at the National Agricultural Outlook Conference, Nov. 20, 1975, Washington, D.C.]

Converting Convenience

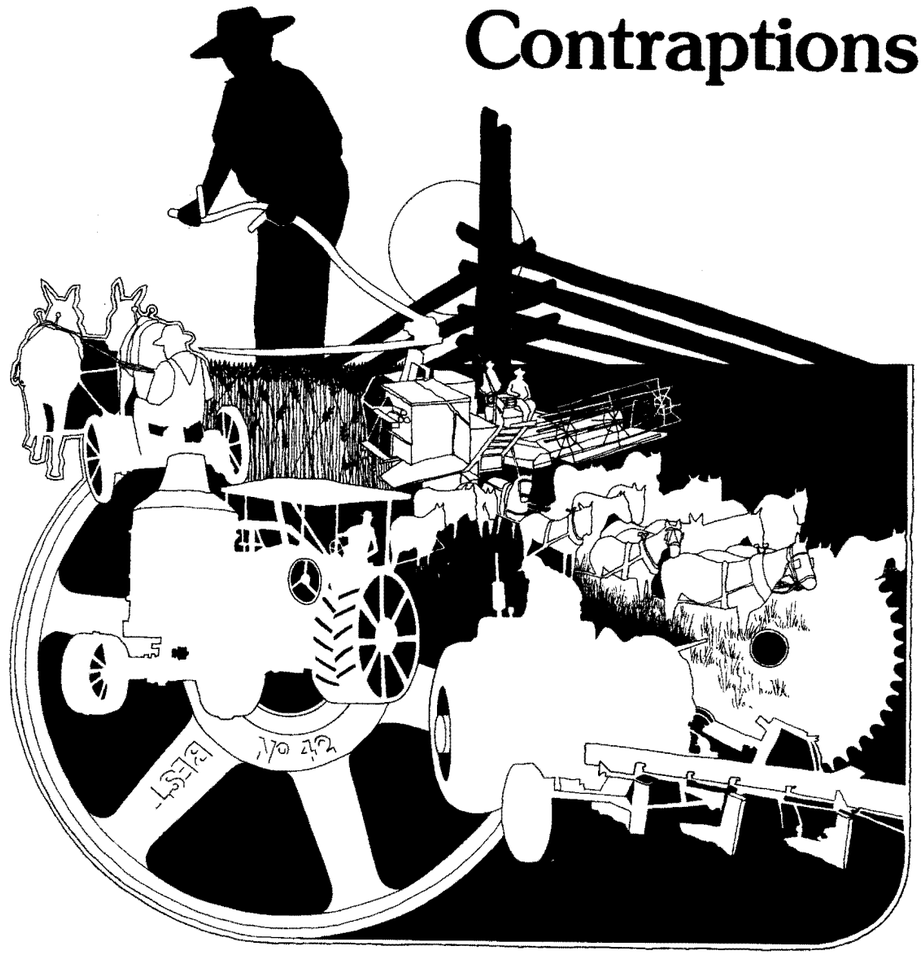
Here's how the ERS study came up with all the cost comparisons. ERS first collected price data from leading retail chain stores in Philadelphia, Milwaukee, Oakland, and New Orleans, then computed cost per ounce and converted it to cost per serving.

Wherever possible, recipes for home-prepared items were adjusted to fit ingredients in corresponding convenience foods. For example, if a convenience food contained butter instead of margarine, butter was used in the home-prepared version. However, no attempt was made to make exact adjustments.

The cost of each ingredient used in the home-prepared foods was based on the original amount of food required to yield the final amount needed. To illustrate, the cost of chicken in a recipe calling for 2 cups of cooked, diced chicken was based on the cost of the raw chicken needed to produce that much meat. Costs for vegetables that had to be trimmed or pared or canned ingredients that had to be drained were also figured on the whole item.

An interesting sidelight of the study: Six of the convenience products dropped in price by at least 1 cent per serving during the 12-month study period, despite rising food production and marketing costs. In order of decreasing savings, they were: shrimp newburg frozen in a pouch, frozen beef dinner, frozen partly prepared fried shrimp, canned chicken meat, frozen peaches, and frozen partially cooked fried shrimp. Outside the seasonal fluctuations in prices of some fruits and vegetables, none of the home-prepared foods decreased in price.

Two Centuries of Clever Contraptions



Swishing their hand-held scythes in steady arcs, Colonial American farmworkers harvested wheat with a technology as old as ancient Egypt.

Today, only two centuries later, a one-man grain combine rumbles through the fields, effortlessly performing the work that would have required dozens of colonial farmers.

This great technological upheaval not only thrust American agriculture from the level of bare self-sufficiency to that of supplying much of the world, it also meant that side effects would greatly affect American society.

Man would become obsolete in many farming operations, and the resulting tide of migration to cities would spawn social problems that still elude solution. The changes occurred so rapidly that no orderly transition from rural to urban society could be instituted. Yet, without these advances, mankind would face an even greater hunger problem.

Story of mechanization. The story of mechanization of American agriculture and its impact on American history may have begun in the same fertile minds that hatched the concepts that led to the American Revolution, guided the course of the

rebellion, and molded the system of American government.

Indeed, Thomas Jefferson and George Washington were perhaps as interested in agriculture as they were in founding a new Nation.

In that age of profound social thought, the seeds of a new agricultural technology were planted and nurtured.

Washington constantly searched for better farm implements for his beautiful Mount Vernon plantation by corresponding with progressive British agriculturalists.

Jefferson, who was an amateur inventor, tinkered with many devices designed to improve farming.

Common concerns. Although Jefferson's designs were rarely practical, the concerns that he and Washington shared in improving agriculture mirrored the concerns of the land where 9 out of 10 workers were engaged in agriculture.

Those Virginia aristocrats may have shared common concerns with typical farmers in 1776, but certainly not lifestyles. The life of the typical farmer was less attractive than that of the Virginia aristocrats. To earn his livelihood, the colonial farmer cleared virgin land with axes and oxen, broke soil with ox-drawn wooden plows, planted seed by hand, and harvested and processed the crop with the crudest, hand-held implements. The aristocrats simply had their hired hands and slaves do that kind of work.

Red Coats and tommyhawks. Although colonial farm life has been much romanticized as being simple and untroubled by such modern problems as crime, poverty and foreign threats, it was far from being utopian. A more severe form of "mugging" came with Indian raids, "foreign threats" roamed the countryside in red British uniforms, and poverty, which in those days meant starvation rather than low income, was the inevitable consequence of a crop failure. In short, farm life was extremely hard, dangerous, and uncertain.

The first great American agricultural invention arrived in 1793 in the Nation's infancy: Eli Whitney's cotton gin.

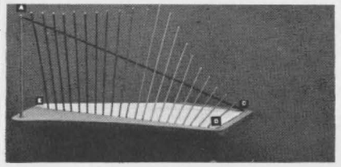
The cotton gin, which separated lint from seed, not only made possible a great new farm staple in the South, but it revitalized the dying institution of slavery and led to the Civil War.

Cotton boom. Cotton production jumped from 10,500 bales in 1793 to 4.5 million bales in 1861. The effect on the American economy was far-reaching. New England was encouraged to develop textile mills, which gave incentive for development of still other new tools and methods.

While cotton production proliferated with the new technology, grain production was held back by many problems that awaited a series of inventions to resolve.

The plow was the object of attention for many inventors. The first patented plow was designed by Charles Newbold. The Newbold plow was solid cast iron, except for handles and beam.

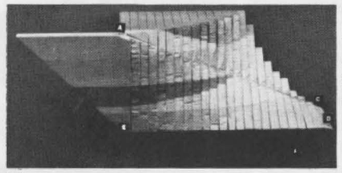
Thomas Jefferson's Plow Design



(1)

Thomas Jefferson's plow design incorporates: (1) the concept of two wedges to raise and turn the furrow. Line A-C is wedge intersection, and parallels A-E to D-C show positions at a given time. (2) The concept is transferred to a block of wood. (3) The block is sawed along traverse lines A-C and D-E to form the moldboard. (4) The finished product as was presented to the American Philosophical Society in 1798.

Jefferson began work on this design in 1788 by applying mathematical principles to produce a more efficient plow that could be uniformly manufactured.



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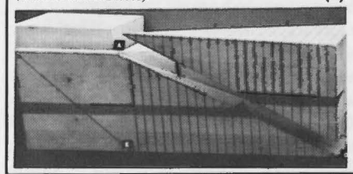

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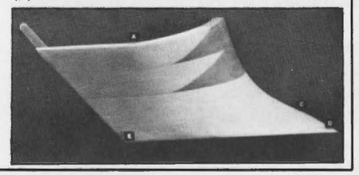


Few farmers were willing to try the new implement, however, because many were convinced that iron poisoned the land and made weeds grow.

The Wood plow. In 1814, Jethro Wood patented another cast iron plow and improved it in 1819. Moldboard, share, and landside were cast in three interchangeable parts, allowing damaged parts to be replaced. The Wood plow was popular.

As farmers pushed westward onto the prairies, another problem confronted the plow. Prairie soil stuck to both wooden and cast iron plows instead of sliding by and turning over.

In 1833, Illinois blacksmith John Lane came up with the idea of fastening strips of saw steel over wooden moldboards. Another Illinois blacksmith, John Deere, used saw steel and smooth wrought iron for shares and moldboards. By 1846, Deere and his partner were turning out 1,000 plows a year.

Horse-drawn reapers. The harvesting problem also received attention. Obed Hussey patented a horse-drawn reaper in 1833. At about the same time, Cyrus H. McCormick completed a design his father had started and patented his reaper in 1834. By 1851, 1,000 McCormick reapers were produced each year to dominate the business.

The corn cultivator preceded the reaper, and it was in limited use by the 1820's, along with the revolving rake. In 1837, the Pitts brothers patented a widely used threshing machine. W.F. Ketchum patented a mower in 1844 and 1847.

By the time of the Civil War, the array of horse-drawn equipment included grain drills, corn shellers, haybaling presses, cultivators of various types, and many other farm implements. Farmers were deluged with magazine advertisements that extolled the real—and imagined—virtues of newfangled machines.

Farmers not inclined. Yet, most farmers were reluctant to invest in the expensive new equipment when labor was so plentiful and cheap, and food prices were relatively low. The equipment was available, but the inclination to try it was not.

Then, in 1861, South Carolina troops opened fire on the Federal installation at Fort Sumter. The huge supply of farm labor suddenly disappeared as thousands of farm hands joined Union and Confederate armies. With a huge demand for food to supply the great armies, food prices shot up.

The thunder of cannon had ushered in the day of horse labor, and marked the end of the day of hand labor. With these new incentives, farmers quickly adopted horse-drawn machines.

Sad homecoming. As the war ended, Union soldiers found that their farm jobs had been displaced by horse-drawn contraptions, and Confederate soldiers returned to the ruins of the one-crop agricultural system. And although thousands of black Americans found themselves free of the bondage of slavery, they were also faced with great economic uncertainty that was eventually "solved" by the sharecropper system.

(Smithsonian Photo)

Breaking Raw Prairie

Something else evolved from the war that was, perhaps, just as significant: the day when a farm laborer could start his own operation by acquiring cheap land and a few hand tools was gone forever.

The dream of owning a farm was restricted by the expense of the machines required to be competitive.

The surplus problem. Even those who were able to buy the machines found themselves in deep trouble. The virtue of the machines—increased production—resulted in surpluses that depressed prices. Farmers, then, became more dependent on bankers and merchants.

In 1850, each farmer had an average of $7 invested in equipment. By 1880 that amount had almost quadrupled. The war had forced farmers to become committed to commercial production and to rely on necessary machines.

As a result of these investments, farmers faced a constant battle between 1870 and 1900 to produce enough to pay for their machinery.

Plagued by surpluses and low prices, farmers were advised to cut production, but no individual farmer could influence the market. Cooperatives helped, and as this first agricultural revolution ran its course, supply and demand came into close balance between the Spanish-American War and World War I.

Machines improve life. Despite the problems, mechanization was still considered beneficial. In 1898, a USDA spokesman wrote: "Mechanical contrivances have largely supplanted human labor in

many respects, or have improved the application of labor and increased the product of agriculture, reduced the cost of production, augmented the farmer's gross income, and made his life an easier one than it was before the machine period."

Before the advent of machines, farming was often a spirit-breaking occupation. With machines, the able farmer could attain prosperity and leisure, and educate his children.

Not all farmers prospered, however. The expense of machinery and other factors forced many farmowners to sell out and become tenants and hired workers.

Tide of migration. Along with this trend, the number of available farm jobs dropped as machines replaced laborers. A tide of farm people began migrating to the cities where jobs were not available. This spawned urban slums and the resulting social problems of crime and poverty.

In the early years of the 20th century, most attention was still focused on developing machines to increase production. The soil was a neglected resource, as the general practice was to abandon land when it was depleted. With vast undeveloped areas, few people worried about soil enrichment. Yields per acre rarely increased from year to year.

Twilight of the horse. Meanwhile, the day of the horse was approaching its twilight as the minds of men turned to steam and petroleum power. Steam engines were used to thresh wheat on large Western farms. By 1913, 10,000 such devices were produced. After that, their use declined rapidly as gasoline tractors came on the market.

The first practical, self-propelled gasoline tractor was built in 1892 by John Froelich of Iowa, who mounted a gasoline engine on a running gear equipped with traction equipment. The Froelich was the forerunner of the John Deere tractors.

In 1905, C.W. Hart and C.H. Parr founded a business devoted exclusively to making tractors, in Iowa City.

Wars help machines. Still, it took something else to convert these contraptions from novelty into general acceptance. Both the adoption of gas-powered equipment and the adoption of the horse as a labor source share a common instigator: the outbreak of war. In both instances, wartime labor shortages forced farmers to turn to labor-saving technology.

In World War I, farm prices climbed and labor shortages developed as in the Civil War. Once again, farmers quickly adopted the best labor-saving, productive equipment that was available. Tractor sales accelerated rapidly.

But in July 1920 farm prices nosedived, and during the 1920's the farm economy looked so uncertain that farmers were reluctant to switch much further toward expensive tractor power. Even so, the number of horses declined and the number of tractors increased.

Gasoline-powered combine. Another major innovation came into wide use in the twenties: the gasoline-powered combine. Horse-drawn combines had been used as early as in 1836, and steam-powered combines were manufactured in the 1880's. By 1912, gasoline had begun to replace steam as a combine power source.

In 1935, a one-man combine was developed, powered by a two-plow tractor. The impact on the farm job market was devastating, since the one-man combine performed the work of a dozen men.

The switch from horsepower to self-propelled machines was accelerated by World War I. But many farmers resisted the change until World War II, when an even greater demand for food and men and rising market prices, caused them to reconsider.

Second agricultural revolution. Just prior to the war, more groundwork for the switch had been laid through New Deal programs that encouraged farmers to replace wornout machines with current models. The rural electrification program had opened a vast new power source. The stage was well set for the "second American agricultural revolution."

The switch to mechanization was only part of that revolution, however. Great advances were made in seed development, soil conservation, irrigation, fertilizers, and pesticides. In effect, the systems approach to farming had arrived, and the results were awesome:

- Wheat production soared from 313 million bushels in 1875 to 668 million bushels in 1925 and 2.2 billion bushels in 1975.
- Since 1950, wheat yields per acre have doubled, corn yields more than doubled, cotton yields almost doubled, and soybean yields increased significantly.

Yet, there is a darker side to this story. What happens to the millions of Americans who are no longer needed on the farm?

Just taking the years between 1950 and 1975, farm employment was reduced by 66 percent, or 5.6 million. It's expected to drop another 10 percent by 1980.

The impact on many rural areas was catastrophic, with small town businesses, schools, and even churches receiving crippling effects as economies suffered and people faced unemployment or migration.

Displaced farmworkers. In the early 1960's, a steady flood of migrants poured into cities, aggravating already severe economic and social problems. Other displaced workers remained in the rural areas, living in deep poverty.

An upbeat note has been sounded in recent years, however, as signs increasingly point to a turnaround of rural economics and a steady decline of migration to the cities.

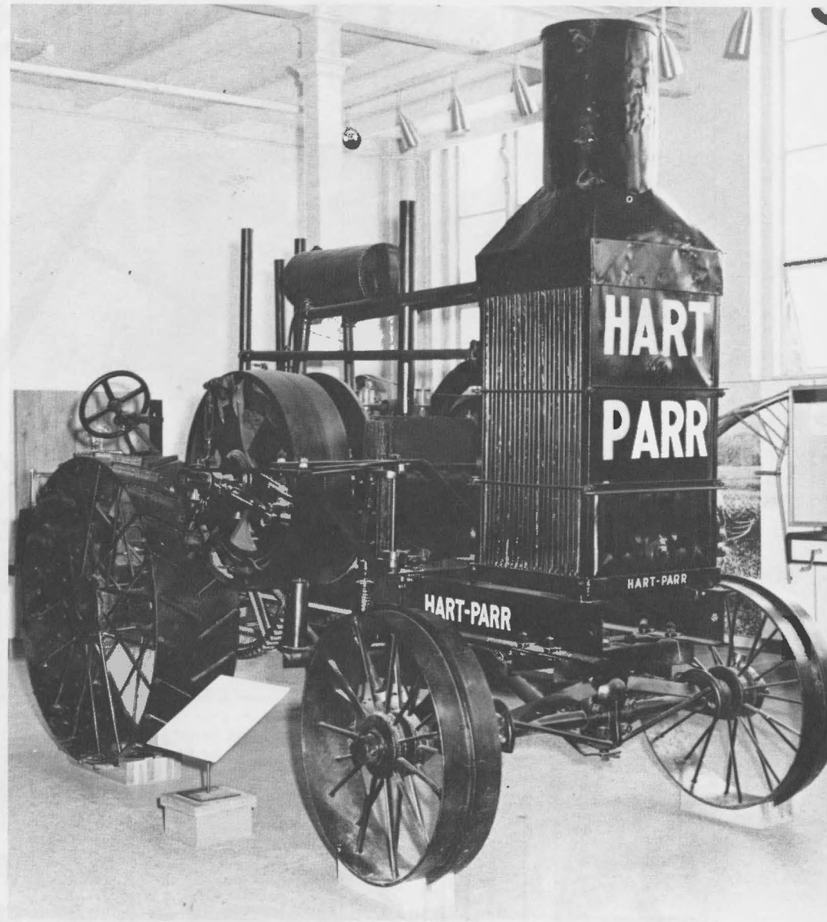
Granted, grave social problems have accompanied farm mechanization. But, consider the alternatives.

Without the highly mechanized American agricultural system, world hunger would be much more severe. And, without the cornerstone of agricultural exports, the balance of trade would tilt dangerously against the U.S., with rising foreign oil costs and the sinking of the value of the dollar causing inflation to reach even higher levels.

[Based on the manuscript, "The Mechanization of American Agriculture," by Wayne D. Rasmussen, National Economic Analysis Division.]

This 1851 farm scene, painted by Currier, depicts the grueling labor shared by man and oxen in guiding a plow along a straight furrow. As evidenced by the child, farming was a family chore.

(Smithsonian Photo)



(Smithsonian Photo)

The age of mechanized farming dawned at the turn of the century with such contraptions as this Hart-Parr gasoline traction engine.

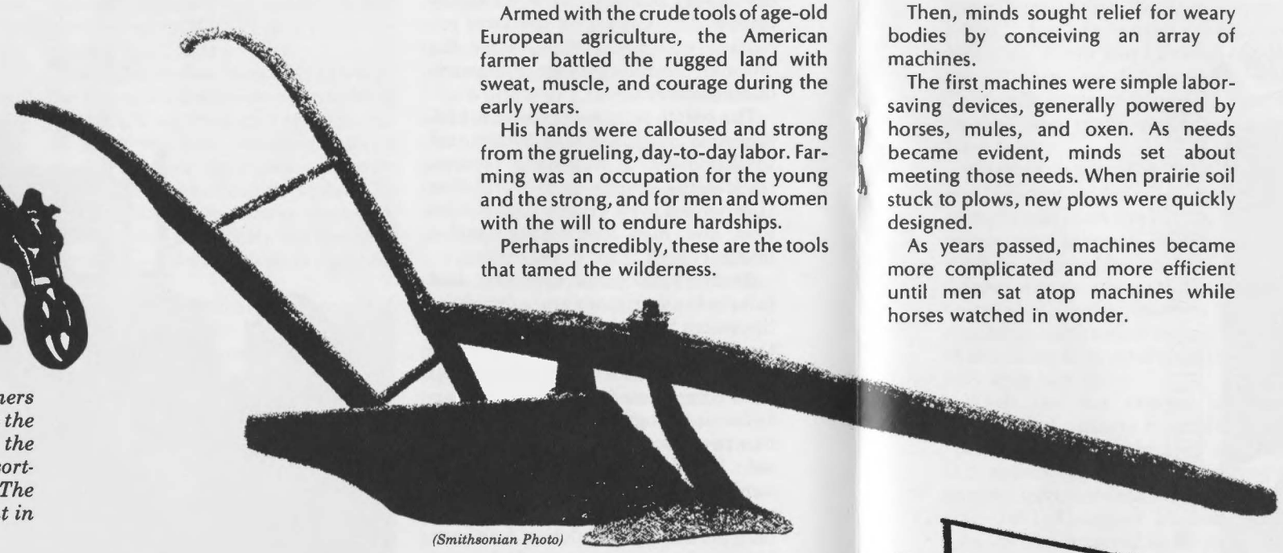
FROM MUSCLE TO MACHINERY

(Smithsonian Photo)

Armed with the crude tools of age-old European agriculture, the American farmer battled the rugged land with sweat, muscle, and courage during the early years.

His hands were calloused and strong from the grueling, day-to-day labor. Farming was an occupation for the young and the strong, and for men and women with the will to endure hardships.

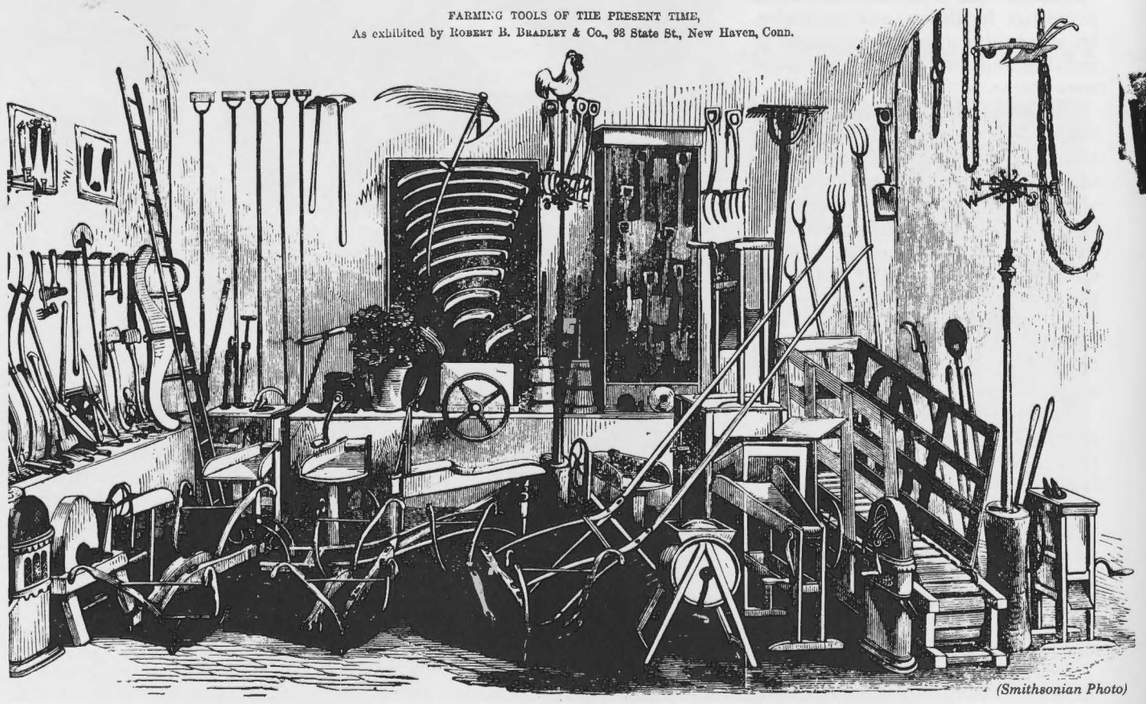
Perhaps incredibly, these are the tools that tamed the wilderness.



(Smithsonian Photo)

In the early 19th century, farmers fought the land with such tools as the horse-drawn cultivator (above), the Cary plow (right), and a wide assortment of hand tools (below). The hardships of farm life are evident in the nature of the tools.

FARMING TOOLS OF THE PRESENT TIME,
As exhibited by ROBERT B. BRADLEY & Co., 98 State St., New Haven, Conn.

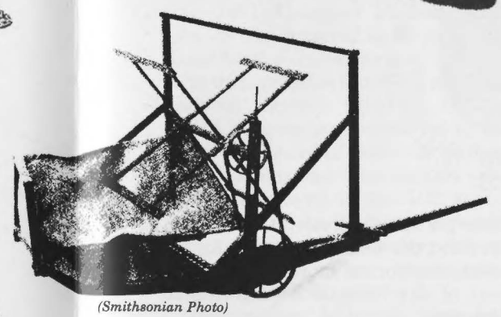


(Smithsonian Photo)

Then, minds sought relief for weary bodies by conceiving an array of machines.

The first machines were simple labor-saving devices, generally powered by horses, mules, and oxen. As needs became evident, minds set about meeting those needs. When prairie soil stuck to plows, new plows were quickly designed.

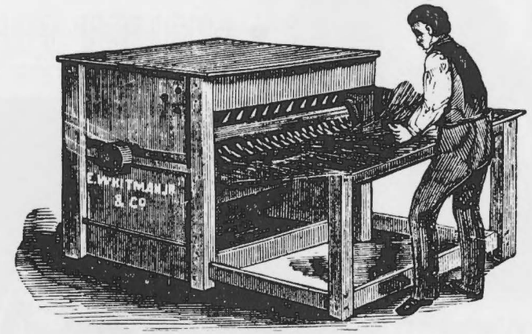
As years passed, machines became more complicated and more efficient until men sat atop machines while horses watched in wonder.



(Smithsonian Photo)

E. WHITMAN & CO'S

Premium Iron Cylinder Thresher.



☞ The teeth are set in spiral form or in straight lines, as may be desired by the purchaser. There is no diffence in price.

E. WHITMAN & CO. manufacture and sell the only THRESHING DRUM in the world which will neither wear out nor break by use. After using one of these Drums one hundred years, it will be as good as new, and its superiority over others that are so likely to break by use, can readily be seen. It has also other advantages. Its speed is more regular, and consequently will break less grain than any other. It is also more convenient and runs with more ease, and is more pleasant to the feeder, as there is no dust blown from it to his face. These machines are known and in use in every State of the Union, and those "Old Foggies" who have been waiting for twenty years for one of these Drums to explode, will soon have to "give in" that their theory has exploded, and acknowledge our Drum to be the best in the world, as thousands who have used them in the last twenty years have testified.

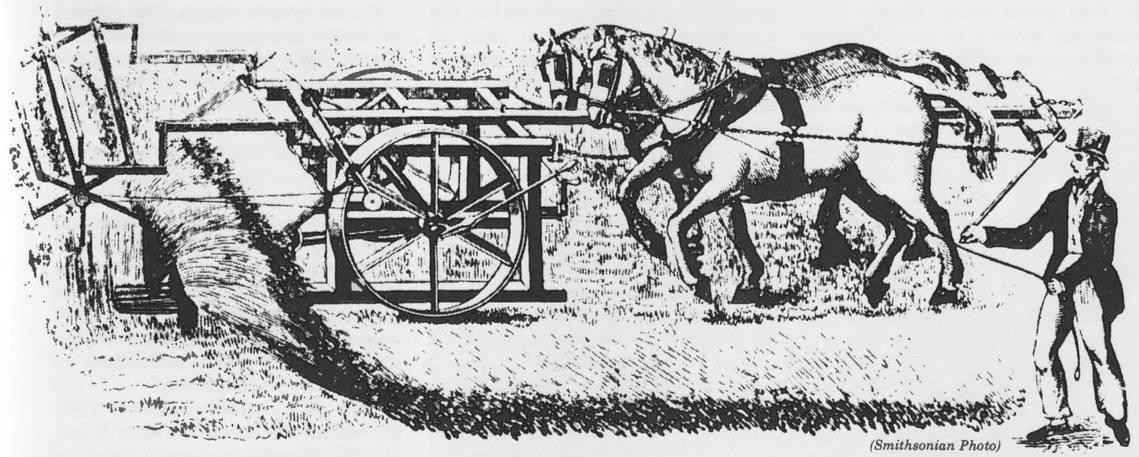
Prices—20 inch Drum, $50—24 inch Drum, $60—Straw Carrier to either, $15.

We have also the common THRESHER, as good as can be had in the market, at $35 to $40.

my1 E. WHITMAN & CO., 63 EXCHANGE PLACE, BALTIMORE.

(Smithsonian Photo)

Labor-saving machines soon evolved to provide relief and expand the harvest. The advertisement (above) appeared in The American Farm Advertiser, July 1859. The 1831 McCormick reaper (left) was the progenitor of that company's line. Less successful was Bell's reaper, an 1826 device putting the "cart before the horse."



(Smithsonian Photo)

Farm Labor's Niche in History

When early man dropped the first seed in the ground and produced food, a demand for agricultural labor was born.

The American Indians were among the first farmworkers. Nearly 3,000 years ago, Indians in the Southwest formed settlements to cultivate maize, squash, and beans.

On the Atlantic seaboard, the Indians cleared land to plant a variety of crops. Recognizing the value of fertilization, they buried fish along with the seeds.

When the Spanish settled the New World, they forced nearly 5 million Indians into virtual slavery under the "encomienda" system. The Spaniards, believing that the natives should be "converted, civilized, and exploited," distributed the Indians and their land among themselves and held them in trust. The trustee, or "encomiendaro," was charged by the Spanish King with converting and taking care of the Indian. In return, he was empowered to exploit Indian labor, sharing the profits with the King.

Convict labor. Convicts were another source of agricultural labor in the American colonies. As early as 1620, England was sending criminal elements to the colonies. The prisoners, most of whom arrived with 7-year terms, were used to harvest rice, tobacco, and indigo. Probably as many as 50,000 convicts were shipped to the colonies prior to the Revolutionary War.

One of the most common methods of transporting labor to colonial America was the indentured servant system. Under this practice, English citizens who wanted to come to America but lacked the necessary funds, would agree to temporary servitude, usually 3-7 years, in exchange for their transportation, room and board, and a small sum at the end of their period of service. This system provided the needed financing for the transportation of more than 60 percent of the colonial immigrants to America.

Cotton breeds slavery. The success of tobacco as a cash crop first whetted the colonists' appetite for Negro slave labor. The invention of the cotton gin in 1793 turned it into an insatiable demand. The slave population of the colonies grew from slightly over 20,000 in 1700 to nearly 4 million at the outbreak of the Civil War in 1861.

In 1869 the first transcontinental railroad was completed, and thousands of Chinese coolies who had been working on the railroad found their way into agriculture. This influx helped California farmers switch from wheat to more labor-intensive fruit and vegetable crops.

The Exclusion Act of 1882 prevented the use of Chinese labor, and California growers turned to Japanese farmworkers to harvest their crops. Before long the Japanese constituted a major percentage of the agricultural labor force in selected crops. Anti-Japanese sentiment following World War I phased out the use of Japanese farmworkers, and California growers turned to Mexico as their last ready supply of cheap farm labor.

Mexican labor. The Immigration and Nationality Act of 1917 permitted Mexicans to enter the U.S. to work as agricultural laborers. Before this act, workers from Mexico had simply filtered across any part of the long, unguarded border between the two countries, performing simple harvest chores, and then returning the same way they had come.

When the Act expired in 1942, agricultural workers from Mexico, or "braceros," were admitted into the U.S. as temporary farmworkers under various governmental authorities.

In 1951, Congress passed Public Law 78, which served as the statutory basis for the contracting of braceros until its expiration in 1964. Unlike the previous bracero program run by USDA, this one was controlled by the U.S. Department of Labor. More than 4 million Mexican farmworkers were legally employed in the U.S. under this program. In its later years, the bracero program was severely criticized by those trying to organize agricultural labor.

Unionization. Although there had been attempts to unionize agricultural labor since the turn of the century, efforts prior to World War II were largely unsuccessful because of the ready supply of foreign labor—Chinese, Japanese, Korean, Mexican. Even without alternate labor sources, the unionization of farmworkers would have been difficult. For example, agricultural laborers are widely dispersed on different farms, and tend to move from one job to the next with the ripening of crops, thus making themselves a very diffused target for unionization.

In 1947 the American Federation of Labor chartered the National Agricultural Workers Union. One of the Union's first projects was to organize grape pickers in the Di Giorgio vineyards in California. The attempt failed because of a Federal injunction against picketing and the importation of strikebreakers by the grower.

First success. Not until the California grape pickers strike by Cesar Chavez and the United Farm Workers (UFW) in 1965, were unions particularly successful in organizing agricultural workers. The UFW succeeded in part because of the high visibility of their campaign, which resulted in a nationwide boycott of grapes. Another bonus was the popularity of Cesar Chavez.

In April 1966 the first grower signed with the UFW, and by the following April over 30 growers had followed suit. Although significant, the unionization of grape pickers accounted for only 1 or 2 percent of the total agricultural labor force in California. Since the sixties, the UFW has faced opposition from growers, and has had to compete for members with the International Brotherhood of Teamsters.

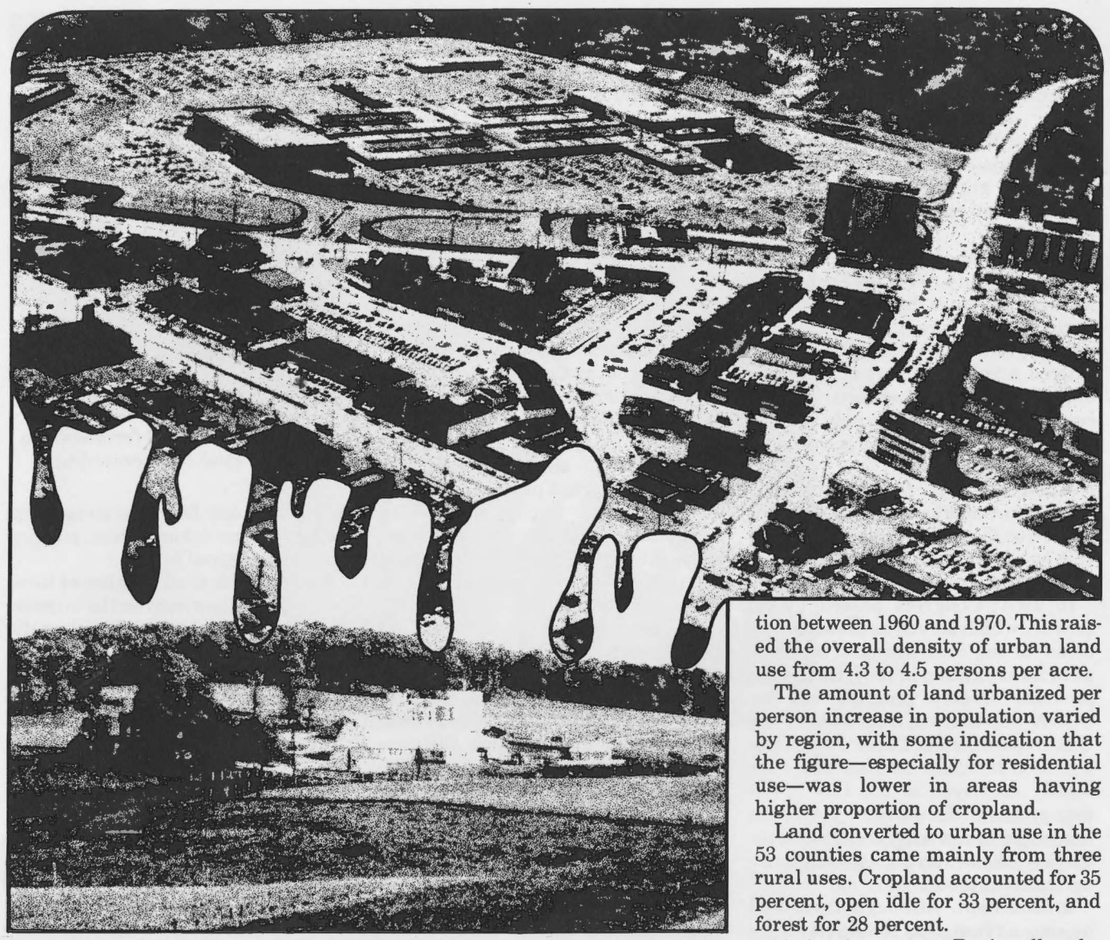
What lies ahead? The future of U.S. agricultural labor seems to point to less migratory and seasonal farmworkers and to more full-time employees. In the last 30 years the number of farms has declined over 50 percent, while farm size has almost doubled. Larger farms mean more opportunity for mechanization, and less need for seasonal labor.

Even so, the total number of hired farmworkers has been on the increase in recent years. About 2.7 million did farm wage work in 1972-74, some 20,000 more than in the previous 3 years. The 1975 figure was even higher—2.8 million.

[Based on the manuscript, "Agricultural Labor in the United States: A Brief History," by Tom Fulton, National Economic Analysis Division.]

Children of seasonal farmworkers often help with the harvesting.

Migratory workers have long been a source of U.S. agricultural labor.



Urban Encroachment
Not as Bad as it Looks

The human eye can't deny it: A ride down the highway tells you that housing developments, shopping malls, and other trappings of urban living are gnawing away at our cropland base.

Seen from an airplane, the picture is less alarming: Urbanization's toll on agricultural land has not been as heavy or extensive as many people have feared.

On examining aerial photos of 53 urban fringe counties in 1960 and 1970, ERS found that cropland, pasture, and forest remained the chief uses of the land. This despite the fact that land area claimed by urban uses increased from 13 percent to 16 percent in the 10-year period.

Drop in the bucket. For all 53 counties—and they absorbed one-fifth of total U.S. population growth in the 1960's—the amount of land converted to urban uses was only .173 acres (less than two-tenths of an acre) for each person added to the population between 1960 and 1970. This raised the overall density of urban land use from 4.3 to 4.5 persons per acre.

The amount of land urbanized per person increase in population varied by region, with some indication that the figure—especially for residential use—was lower in areas having higher proportion of cropland.

Land converted to urban use in the 53 counties came mainly from three rural uses. Cropland accounted for 35 percent, open idle for 33 percent, and forest for 28 percent.

Varied by region. Regionally, the proportion of urban development at the expense of the different rural uses varied greatly. Generally, the proportion of new urban development on different non-urban uses appeared to show some positive relation to the proportion of land originally in various rural uses.

However, where cropland was the most important previous use, the amount of land urbanized per person tended to be lower. Thus, in the two California counties where 70 percent of new urban development was on cropland, the land urbanized per person increase was .097 acres. In the three Florida counties, where only 6 percent of new urban development was on cropland, .481 acres of land were urbanized per person increase.

Gone: ½ million acres. Overall in the 53 counties, cropland shrank by over one-half million acres. Losses were heavy in several areas with a high proportion of prime agricultural land.

The 11 Corn Belt counties, for example, lost 67,000 acres of cropland. Two California counties—Santa Clara and Santa Cruz—lost 40,000 acres. Six counties in the better agricultural areas of Minnesota, Wisconsin, and Michigan lost 92,000 acres.

On the other hand, almost 325 thousand acres of the cropland drain occurred in areas where cropland had been declining for reasons other than urbanization; e.g. in the Northeast, Appalachia, Eastern Piedmont, and the central Texas prairie area. Some of this was the direct result of urbanization, but much land would have shifted to pasture or forest in any case because it had become uneconomic to continue cropping it.

Idle shifts to urban. A lot of land was idled during the study period. But, at the same time, much idle land went to urban uses. Generally, the open idle land was in a state of transition between agricultural use and a new urban use. Some land was probably idled permanently, or at least for long periods, in the urbanization process.

However, the results of the study did not show much net increase in idle land where there were large acreages of prime agricultural land. An exception was in the Great Lakes counties—in Minnesota, Wisconsin, and Michigan—where a net 52,000 acres were idled, of which about 80 percent was cropland.

ERS researchers drew several conclusions from their study of the aerial photos—

Rural land loss. Land uses did not change dramatically in the 53 counties over the 9-year period. Total net decline in rural land (cropland, pasture and range, open idle, and forest) was 7 percent.

- Not all the cropland loss was directly attributable to increase in urban land. Only about a third of the land shifting from cropland went to urban uses.
- Even in urban areas shifts among rural uses were an important aspect of land use change. Some new cropland was developed even in areas with rapidly growing populations.
- Open idle land use had the most dynamic changes of any of the uses. Though some cropland and pasture were idled, half as much new cropland and pasture was developed from idle land as was abandoned to idle status.

Room for research. The results of this study bring up two additional questions on agricultural land use changes in urbanizing areas:

- How much agricultural land is idled because it is uneconomic to farm for reasons unrelated to urbanization, and how much would have real economic potential were it not for urban encroachment?
- Who owns the idle land—farmers or land speculators—and what are their plans and motivations that will affect future availability for agricultural use?

Future ERS research will address these questions.

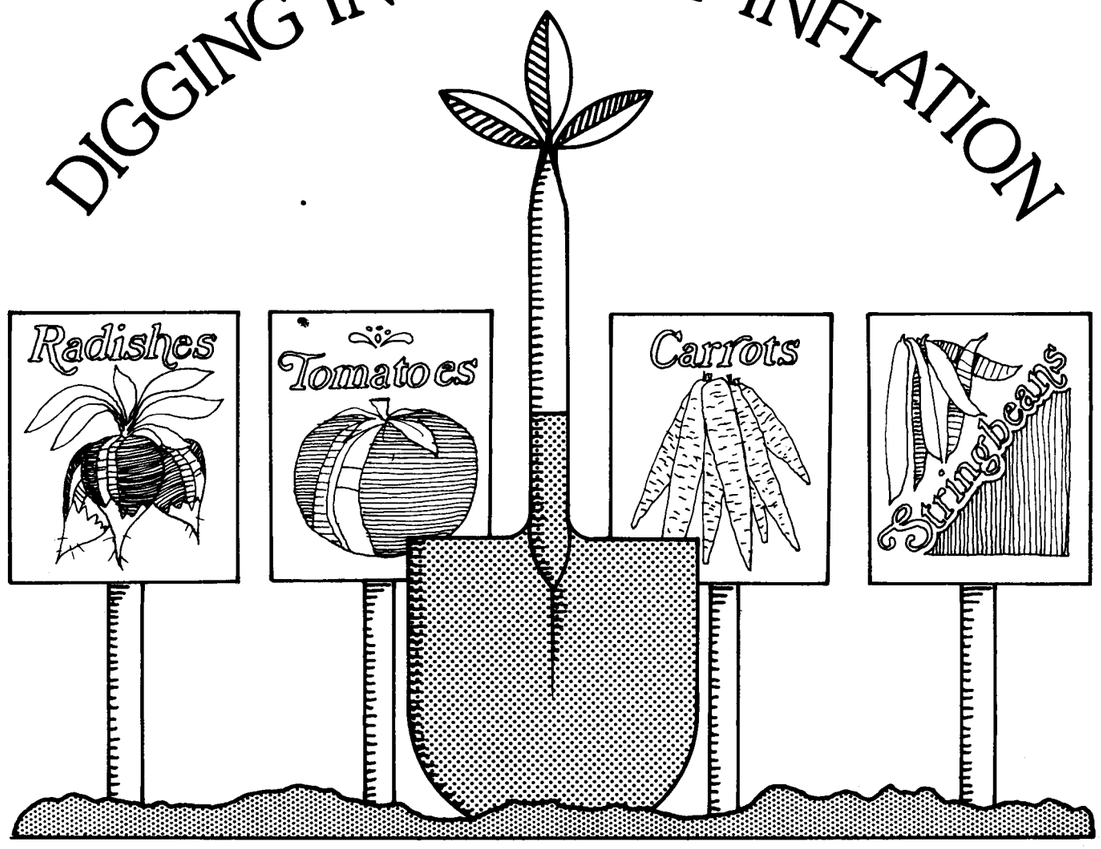
[Based on manuscript "Dynamics of Land Use in Fast Growth Areas," by Kathryn A. Zeimetz, Elizabeth Dillon, Ernest E. Hardy, and Robert C. Otte, Natural Resource Economics Division.]

THE 1961-70 SCOREBOARD: CHANGES IN URBAN LAND USE BY REGIONS FOR 53 COUNTIES

Item	NE[1]	Mid-Atlantic[2]	Piedmont[3]	Appalachian fringe[4]	Florida Gulf[5]	Jackson Co. Miss.[6]	Corn Belt[7]	Great Lakes[8]	So. Cen. Prairie[9]	Texas Prairie[10]	Colorado[11]	California[12]	53 county total
						1,000 acres							
Urban land[13]													
1961	450.5	195.8	234.8	152.0	72.4	20.4	525.2	228.1	345.7	406.7	80.3	90.2	2802.1
1970	550.2	255.6	338.9	185.8	136.4	34.2	605.3	281.9	432.5	500.2	115.0	125.9	3561.8
Net change 1961-1970	+99.7	+59.8	+104.1	+33.8	+64.0	+13.8	+80.1	+53.8	+86.8	+93.5	+34.7	+35.7	+759.7
Gross additions to urban land 1961-1970	99.9	60.0	104.9	34.2	64.0	13.8	80.8	56.1	86.8	94.6	39.0	35.7	769.7[15]
						Percent							
Converted from:[14]													
Cropland	25.5	39.3	19.2	34.1	6.2	9.7	49.2	62.0	14.8	48.8	55.8	70.1	34.6
Pasture and range	1.0	.5		2.2	10.0		.6	2.7	4.6	8.7	3.6	7.2	3.5
Farmsteads	.4	1.2					.3	.3		.9	1.8		.4
Open idle	23.3	32.4	23.3	47.1	61.1	24.2	37.3	20.2	40.7	30.1	37.5	19.2	32.8
Forest	49.8	26.6	57.2	15.9	16.2	66.1	12.4	14.8	39.9	11.3		3.5	28.0
Water bodies more than 40 acres					1.1		.3						.1
Miscellaneous			.3	.7	5.4					.2	1.2		.6

[1]Plymouth, Mass.; Burlington, N.J.; Monmouth, N.J.; Morris, N.J.; Sussex, N.J.; Bucks, Pa.; Chester, Pa. [2]Harford, Md.; Howard, Md.; Montgomery, Md.; Prince Georges, Md.; Henrico, Va. [3]Cumberland, N.C.; Mecklenberg, N.C.; Wake, N.C.; Cobb, Ga.; Dekalb, Ga. [4]Portage, Oh.; Monroe, Ind.; Fayette, Ky.; Madison, Ala. [5]Lee, Fla.; Pasco, Fla.; Sarasota, Fla. [6]Jackson, Miss. [7]Dupage, Ill.; Lake, Ill.; Will, Ill.; Porter, Ind.; Boone, Mo.; Clay, Mo.; Jefferson, Mo.; St. Charles, Mo.; St. Louis, Mo.; Sarpy, Neb.; Johnson, Kan. [8]Macomb, Mich.; Washtenaw, Mich.; Waukesha, Wis.; Anoka, Minn.; Dakota, Minn.; Washington, Minn. [9]Cleveland, Okla.; Harris, Tex.; Travis, Tex. [10]Collin, Tex.; Dallas, Tex.; Denton, Tex.; Tarrant, Tex. [11]Adams, Col.; Arapahoe, Col. [12]Santa Clara, Calif.; Santa Cruz, Calif. [13]Includes residential, urban idle, transportation, recreation, and commercial-industrial-institutional uses. [14]Percents may not total 100. [15]Includes 10,000 acres which changed to open idle.

DIGGING IN AGAINST INFLATION



As the ugly head of inflation rises up to bite family food budgets in supermarkets, many Americans are retreating to the homefront and digging into their backyards.

With a few dollars of garden tools, fertilizer, and seeds, they hope to raise and preserve enough vegetables to ease food costs.

Yet, as blisters, callouses and backaches grow, the question may logically rise: Is all of this really worth it? A USDA report that examined economics of home gardening, canning, and freezing answers with a resounding "maybe." Here are a few key findings:

- Home gardens may produce a tidy savings, if the gardener doesn't charge for his time and labor.
- Freezing in a home freezer is the most convenient form of preservation, but dollar savings are severely reduced by fuel and investment costs. For freezing costs, add 12 to 24 cents per pound of food. If the item is still cheaper than store prices, freeze it if you like.
- Canning is easily the most economical method of preservation, especially with amortization of lid and jar costs. Yet, work and know-how are required.

Obviously, much more is involved in home food production than buying a few seeds and reaping a harvest. The gardener must make several critical decisions based on costs, inconvenience, and returns.

Bountiful harvest. Also, the ERS forecast of food prices may lessen the economic incentive for gardening. America is enjoying its most bountiful harvest ever, with record corn, wheat, rice, and soybean crops, and plentiful supplies of many fruits and vegetables. The result: Retail food prices in first half 1976 are expected to rise 4-5 percent at an annual rate. This compares with 8½ percent for all of 1975.

Nevertheless, savings can be substantial for the thoughtful and persistent gardener.

In examining the economics of gardening and preserving foods, the best place to start is at ground level: the economics of home gardening. Several studies have examined the costs and returns of home gardening, including one by Cornell University researchers.

Costs per bushel. The 1975 Cornell study found that a bushel of green peas purchased from a roadside stand cost $6 a bushel. At a pick-your-own farm, the price dropped to $3 a bushel. And a bushel grown in a home garden cost only $1.17 plus a share of the fixed costs for the total gardening operation.

This encouraging finding echoes a 1973 student project at the University of Maine—a theoretical comparison of costs versus supermarket value of a 1,409-pound vegetable yield in a 4,800-square foot plot. At supermarkets, the crop would have cost $521. Total costs in growing the crop amounted to only $92, leaving a tidy $430 profit. If the gardener's time is worth something, subtract another $189 for labor costs, and the result is still a substantial profit of $240.

A tidy "profit." In another study, a Wisconsin extension agent gained a $152 "profit" from his 30 x 30-foot plot on public lands after subtracting $27 for expenses.

Other studies tend to bear out the bright picture of substantial returns for the small gardening investment, especially when labor costs aren't considered. Yet, this encouragement must be tempered with a few words of warning:

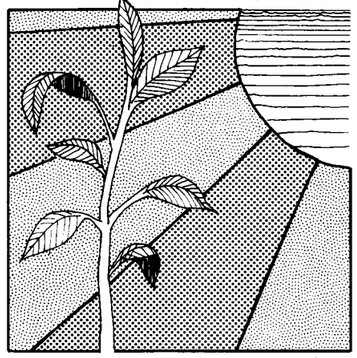
- Home gardening, like farming, offers no assurance of a bumper harvest, despite the gardener's skill and work. Crop failures can wipe out the investment.
- Gardening requires a continuous commitment of time and labor over the entire growing season. Seeds and plants require tender loving care.
- If the gardener succeeds in growing a bountiful crop, he may face a second difficult problem: what to do with all those vegetables?

Making a choice. The answer may lie in choosing between freezing and canning the excess.

Many people may choose the convenience of freezing, especially after considering the mess and work of canning. Yet, they should be aware of the economic drawbacks of this convenience.

Freezing entails much more than simply going out and buying a freezer, plugging it in, and filling it with food.

Another Cornell University study found that home frozen food costs as much as 19 cents a pound more than if you bought it at the supermarket—even when using an energy-efficient freezer at full capacity in an area



where electricity rates are relatively low. High electric rates, poorly operating freezers, or inefficient use can drive costs up as high as 53 cents a pound.

Fixed costs. In addition, fixed costs for a freezer are steep in the short run. In calculating the costs, finance charges, taxes, delivery, and installation should be divided by the 20-year life expectancy. USDA also estimates a 2-percent annual repair cost.

Using these criteria, total overhead for a $300 15-cubic foot freezer is about $17 annually. With repairs, interest, and electricity, annual operating costs would range from $80 to $247, depending on cost of electricity.

If the gardener is still determined to freeze, then he should carefully select the freezer. Convenience of a frost-free freezer adds about $24 a year to electricity costs.

Turnover rate. Size of freezer is another factor. Cost per pound of food ranges from 7 to 13 cents for a 12-cubic foot freezer, and 5 to 9 cents for an 18-cubic foot freezer, depending on the turnover rate. The greater the turnover, the lower the cost per pound.

Food must also be packaged before being frozen. Packaging costs vary greatly, depending on the container and whether it can be reused. A plastic bag with twist tie adds only 1.2 to 2 cents a pound, while a plastic freezer wrap can add 10 cents a pound. Reusable containers cost 19 to 38 cents per pound initially.

In preparing food for freezing, water costs a half cent per pound.

Savings increased. All told, cost per pound of food for a 15-cubic foot freezer is 22.4 cents, or about the same as retail prices for the least expensive frozen fruits and vegetables. However, costs do not increase appreciably with turnovers, thus the savings of freezing may rise considerably with, say, a 6-month turnover.

Although savings may result if homegrown vegetables are frozen, such savings may be questionable when store-bought food is stored.

Cornell researchers report that storage costs may add up to 20 cents a pound to the food price during a year's time. Thus, that pound of vegetables bought at a 10-cent discount may turn into a 10-cent loss over a year.

If the gardener is discouraged from freezing, he may turn to canning. Canning is probably the most economic and practical way of preserving food at home.

Canning costs vary. Costs of canning vary with the nature of the product, equipment, and the means of acquiring the product to be canned. In most instances, however, savings may be significant.

In determining total canning costs, the home gardener must consider costs of produce, equipment, energy, and water.

Cost of produce varies. If bought at a store, it may be a major expense, while homegrown or roadside stand vegetables are, of course, much cheaper.

In equipment, the most expensive item is the pressure canner, costing from $40 to $70 for common models. Smaller models cost $20 to $35. This

cost may be amortized over the 15-20 year life expectancy, with a 2-percent annual repair cost.

Assorted equipment. Other equipment may include a large water bath canner for fruits, tomatoes, pickles, and preserves, which cost about $6; a jar lifter for $2 to $3; and a funnel and canning book.

New canning jar units cost $2.29 to $3.49 a dozen. The jar unit costs can be amortized over a 10-year period. Lids cost 1½ to 5 cents, and rings are 1 cent, amortized over 10 years.

Energy costs vary with heating requirements and local fuel costs.

Water, for washing produce, and steam, for blanching, costs about a half cent per pound of food canned.

One study combined these costs and found that the estimated cost for canning 280 quarts was $25.40, or 9 cents per quart, not including the cost of food and labor.

Peaches and beans. A Cornell University study examined costs of canning peaches, tomatoes, and green beans.

A quart of homegrown peaches, canned with jars already on hand with new purchased lids, cost 20.5 cents. If produce is purchased, the total cost increased to 66.8 cents. If jars are purchased at 28.3 cents each, the cost is 44 cents or 90.5 cents, depending on whether the peaches are bought or homegrown.

Cost of a quart of tomatoes ranged from 4.3 cents to 50.9 cents.

A quart of green beans cost from 4 cents to 63 cents.

The study also examined energy costs for canning, and found that at 2.8 cents per kilowatt hour, the energy component in a quart of peaches and a quart of tomatoes was about 1 cent each, while the cost for a quart of green beans was about a half cent.

Canning vs. retail cost. How do canning costs compare with retail prices at stores? Cornell University researchers compared their findings in peaches, tomatoes, and green beans to store prices in Ithaca, N.Y., in April 1975. They found that:

Canned peaches ranged from 20.5 to 90.5 cents per quart, while store prices ranged from 94 cents to $1.10.

Tomatoes could be canned for 4.3 to 50.9 cents per quart, while retail stores sold them for 64 to 90 cents.

Green beans could be canned for 4 to 63 cents a quart, compared with store prices of 62 to 78 cents.

While these figures may indeed be enticing, the home canner should be forwarned about other considerations before happily embarking on a canning spree:

- Adequate storage space is needed where jars are protected.
- Misguided creativity in canning can lead to waste, or even family sickness due to spoilage.
- Some foods are available year round at reasonable costs.
- Commercially frozen orange juice is a far better source of vitamin C than home canned tomatoes or juices.
- It is economical to can and freeze only the amount that can be used within a reasonable period of time.

An extensive study by Michigan State University researchers points to still another major consideration: Gardening and canning must be continued over several years to produce a real savings. The reason: The initial capital investment of gardening and canning equipment must be amortized.

Capital costs. The study shows that gardening and canning costs, without allowance for capital investment in items ranging from pressure cookers to wheelbarrows, total only 37 cents a quart for green beans, assuming 180 quarts of all commodities are canned per season. Yet, capital investments can turn this initial savings into a big loss during the first year.

During the first year, without amortization, gardening costs are 33 cents per quart, and canning costs are 51 cents per quart. Amortized over 20 years, gardening capital costs are only 2 cents, while canning capital costs are 3 cents per quart.

Persistency pays. Thus, the faint-hearted home food producer should beware: That quart of green beans could cost $1.54 if he gives up the project after 1 year. Yet, the persistent home gardener who continues the operation over 20 years may "pay" only 43 cents per quart after capital costs are amortized.

The Michigan State researchers added still another warning: Labor costs for canning and gardening aren't considered in the study, so the home producer may still ask—Is it worth it?

There's a way to determine the answer. Here's what the researchers advise.

Carefully keep track of the hours spent in gardening and canning, and campare store prices with home production costs after a year. Then, subtract the costs from the savings and divide the savings by the number of manhours. The result will be the per hour "pay" for labor.

No economic windfall. Regardless of whether freezing or canning is used to store garden produce, it's unlikely the home producer can realistically declare that the efforts produced an economic windfall. Yet, if he views it as a hobby, the successful gardener can enjoy the tasty "fruits" of his labor and still relish some savings.

[Based on the speech, "Canning and Freezing: What is the Payoff?" presented by Evelyn H. Johnson, USDA Extension Service, at the 1976 National Agricultural Outlook Conference in Washington on November 20, 1975, and the ERS Winter Food Preview.]

Clothing Expenditures Double in a Decade

American consumers have more than doubled their spending for clothing in the past decade, according to an ERS study.

Clothing expenditures increased by 111 percent from 1964 to 1973, as the percentage of personal disposable income going for clothing edged up from 6.5 to 6.6 percent.

The study also found a significant shift in consumption and production of fibers. Cotton, wool, rayon, and acetate fibers lost ground to noncellulosic fibers, such as polyesters.

Back in 1974, consumers put out less than $19 billion for women's and children's clothing and $10 billion for men and boys' clothing. By 1973, spending had jumped to almost $39 billion for women's and children's clothing, and $21 billion for men's and boys' clothing.

Comparing U.S. fiber consumption between 1964 and 1974, the study found that noncellulosic use rose from 8.1 pounds per capita in 1964 to 31 pounds in 1974; cotton dropped from 22 to 16 pounds, wool from 2.6 to .7 pounds, and rayon and acetate from 8 to 5 pounds.

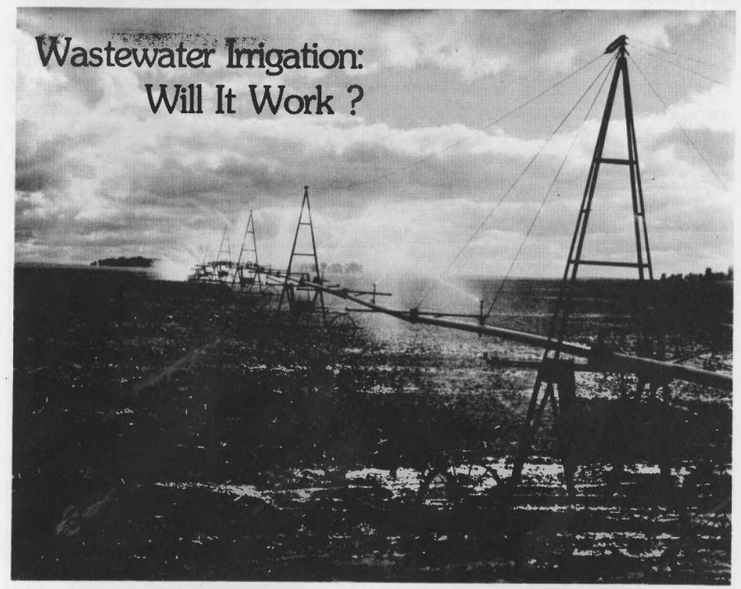
Production trends were similar, as cotton production fell from 7 billion pounds to 5½ billion pounds, wool production from 119 to 67 million pounds, and rayon and acetate from 1.4 to 1.1 billion pounds. Manmade noncellulosic production, meanwhile, leaped from 1.4 to 6 billion pounds.

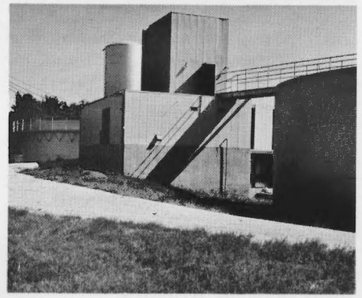
In percentage of the total fiber market, cotton and wool had 70 percent in 1964, but only 41 percent in 1974.

Department stores remained the most popular clothing outlet. In 1963, close to 40 percent of women's and girls' clothing was sold there, along with a third of men's and boys' clothing. In 1973, department stores covered over 44 percent of the market for women's and girls' clothing, and about 39 percent for men's and boys' clothing.

[Based on the paper, "An Overview of the Marketing System for Textile Fibers and Products," by R.S. Corken, National Economic Analysis Division, presented in New Orleans, La., on September 24, 1975.]

Wastewater Irrigation: Will It Work?





Treatment of wastewater from municipalities by application to land is drawing increased attention, according to an ERS study. The establishment of such systems requires the acquisition and management of land for treatment purposes.

In Germany, a wastewater cooperative has been successfully used to manage such a land treatment system. So, ERS researchers decided to test the applicability of such a cooperative to U.S. use by developing a strictly hypothetical model for testing.

The researcher based his study on the concept of a wastewater cooperative applied in the Detroit Metropolitan area. A 72,000-acre site near Detroit was the locale of the theoretical cooperative.

Using the model, a comparison of production estimates with and without wastewater irrigation showed that corn production would have increased 36 to 70 percent with wastewater irrigation, with lesser increases for soybeans, drybeans, wheat, and alfalfa hay.

If costs and benefits of the system were divided between the city and farmers under a prearranged agreement, the city would likely pay the bulk of the costs.

Preliminary results indicated that with conservative yield and price effects, about 75 percent of the $9.3 million annual total costs of the system would have had to be paid by the municipality if farmers were to have realized an economic gain and, thus, found incentive to join such a cooperative.

[Based on the manuscript: "Land Treatment of Municipal Wastewater: A Cooperative Approach to Management," by Lee A. Christensen, Natural Resource Economics Division.]

Recent Publications

1976 U.S. Agricultural Outlook. Economic Research Service. Congressional Committee Print.

In 434 pages, this committee print compiles all the papers given at the National Agricultural Outlook Conference held by USDA in November. Many of the papers include the graphs used in the original presentations. The print was prepared for the Committee on Agriculture and Forestry, U.S. Senate.

Supplement for 1973 and 1974 to Wool Statistics and Related Data, 1930-79. Shirley M. Frye, Commodity Economics Division. Sup. to Statis. Bul. 455.

This annual supplement brings up to date the long-time statistical series presented in *Wool Statistics and Related Data, 1930-69,* published in June 1970. Coverage includes primarily production, consumption, international trade, and prices of wool, mohair, and similar hair fibers of the U.S. Selected data on cotton and manmade fibers are given along with certain data on wool for several other countries and world totals.

Farm Population Estimates for 1974. Vera J. Banks, Economic Development Division. AER-319.

Farm population continued its long-term downtrend during 1970-74, but at a slower pace than in the 1960's, according to this study. The average annual decline was only 1.2 percent, compared with the sixties' rate of 4.8 percent. The South continued to be the heaviest loser of farm population among the regions.

Taxes Levied on Farm Personal Property, 1960-72. Ann Gordon Sibold, Economic Development Division. AER-321.

Farm personal property taxes in the U.S. went up over 48 percent during 1960-72, this study concludes. Arkansas had the highest 12-year rate of increase at over 153 percent, followed by California at 150 percent. However, the study notes a trend in which more and more States are exempting all or part of farm personal property from taxation.

Single copies of the publications listed here are available free from The Farm Index, Economic Research Service, Rm. 1664-So., U.S. Department of Agriculture, Washington, D.C. 20250. However, publications indicated by (*) may be obtained only by writing to the experiment station or university. For addresses, see July and December issues of The Farm Index.

Costs of Producing Selected Crops in the United States, 1974: A Summary. Economic Research Service. ERS-620.

The result of a directive of The Agriculture and Consumer Protection Act of 1973, this study summarizes the results of a survey taken by ERS and the Statistical Reporting Service. Cost data are given for major crops—cotton, corn, grain sorghum, barley, winter wheat, durum wheat, other spring wheat, soybeans, peanuts, flaxseed, and milk—on both a national and regional basis. Data was collected from 40 production subregions chosen to represent the major U.S. crop production regions. Cost factors are broken down into major inputs, such as overhead, management, labor, etc.

Predicting Employment in Four Regions of the Western United States. Lloyd D. Bender, Economic Development Division. Tech. Bul. 1529.

This study tests a model designed to predict the local service employment associated with employment in basic industries within local communities of four regions of the western U.S. The model is based on the hypothesis that the ratio of the jobs in each sector are a function of an industry, its size, and distance from a major trade center.

Decentralized Tomato Processing: Plant Design, Costs, and Economic Feasibility. E. V. Jessee, W. G. Schultz, and J. L. Bomben. AER-313.

According to the study, decentralized tomato processing merits consideration as an alternative to the conventional centralized operation. If the tomato cleaning and juicing steps were done at satellite locations in the areas where tomatoes are grown and the final processing done at existing canneries, significant savings would result says the study.

The American Farmer

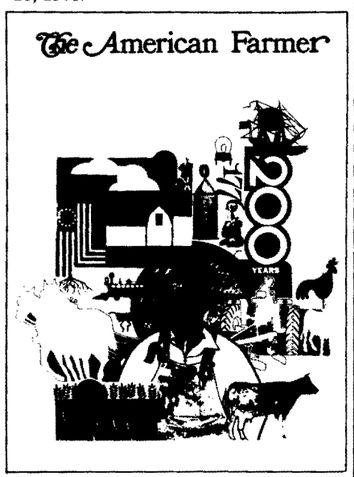
"This booklet sketches in bare outline one of the great stories of all time . . . the drama of American agricultural history, and something of the complexity of the forces that have shaped it . . ."—Foreword to *The American Farmer.*

Due off press in the next several months, *The American Farmer* is a collection of the 11 Bicentennial articles carried in The Farm Index since January 1975.

In more than 100 pages, including photos, charts, and other illustrations—many in two colors—you'll read of the developments that laid the foundations for the world's most productive agricultural plant.

A sampling of the articles: "The American Farmer—The First 200 Years"; "This Land of Ours"; "The Farmer and His Farm"; "Research and Development for Farms"; "The Farm Family: New Viewpoints"; "From Farm to Consumer"; Farming for World Markets"; "The Farmer and the Environment"; and "Farming in the Third Century."

To reserve a single copy, write The Farm Index at the address given above. Free distribution will be limited to orders placed by March 15, 1976.



Economic Trends

Item	Unit or Base Period	1967	Year	1974 Dec.	Oct.	1975 Nov.	Dec.
Prices:							
Prices received by farmers	1967=100	-	184	178	193	185	187
Crops	1967=100	-	214	214	199	188	188
Livestock and products	1967=100	-	164	153	190	184	187
Prices paid, interest, taxes and wage rates	1967=100	-	169	179	188	188	189
Family living items	1967=100	-	161	173	180	182	182
Production items	1967=100	-	172	184	192	192	192
Ratio[1]	1967=100	-	109	99	103	98	99
Wholesale prices, all commodities	1967=100	-	160.1	171.5	178.9	178.2	-
Industrial commodities	1967=100	-	153.8	166.1	174.7	175.4	-
Farm products	1967=100	-	187.7	183.7	197.3	191.7	-
Processed foods and feeds	1967=100	-	170.9	188.2	186.2	182.6	-
Consumer price index, all items	1967=100	-	147.7	155.4	164.6	165.6	-
Food	1967=100	-	161.7	169.7	179.0	179.8	-
Farm Food Market Basket:[2]							
Retail cost	1967=100	-	161.9	167.8	177.2	177.8	-
Farm value	1967=100	-	177.6	178.2	197.1	188.0	-
Farm-retail spread	1967=100	-	152.0	161.2	164.6	171.4	-
Farmers' share of retail cost	Percent	-	43	41	43	41	-
Farm Income:[3]							
Volume of farm marketings	1967=100	-	111	116	173	158	-
Cash receipts from farm marketings	Mil. dollars	42,817	93,521	7,975	11,563	10,500	-
Crops	Mil. dollars	18,434	52,097	4,850	6,894	6,500	-
Livestock and products	Mil. dollars	24,383	41,424	3,125	4,669	4,000	-
Realized gross income[4]	Bil. dollars	49.9	101.1	101.9	-	-	102.4
Farm production expenses[4]	Bil. dollars	38.3	73.4	74.0	-	-	78.0
Realized net income[4]	Bil. dollars	11.6	27.7	27.9	-	-	24.4
Agricultural Trade:							
Agricultural exports	Mil. dollars	-	21,994	2,120	2,082	2,176	-
Agricultural imports	Mil. dollars	-	10,247	966	829	805	-
Land Values:							
Average value per acre	Dollars	[6]168	[7]339	-	-	-	[8]354
Total value of farm real estate	Bil. dollars	[6]181.9	[7]335	-	-	-	[8]370
Gross National Product:[4]	Bil. dollars	793.9	1,397.4	1,430.9	-	-	-
Consumption	Bil. dollars	492.1	876.7	895.8	-	-	-
Investment	Bil. dollars	116.6	209.4	209.4	-	-	-
Government expenditures	Bil. dollars	180.1	309.2	323.8	-	-	-
Net exports	Bil. dollars	5.2	2.1	1.9	-	-	-
Income and Spending:[5]							
Personal income, annual rate	Bil. dollars	629.3	1,150.5	1,191.0	1,279.2	1,290.1	-
Total retail sales, monthly rate	Mil. dollars	26,151	44,815	45,109	49,955	50,705	-
Retail sales of food group, monthly rate	Mil. dollars	5,759	9,980	10,330	11,324	11,322	-
Employment and Wages:[5]							
Total civilian employment	Millions	74.4	[9]85.9	[9]85.2	85.4	85.3	-
Agricultural	Millions	3.8	[9]3.5	[9]3.3	3.4	3.3	-
Rate of unemployment	Percent	3.8	5.6	7.2	8.6	8.3	-
Workweek in manufacturing	Hours	40.6	40.0	39.4	39.9	39.8	-
Hourly earnings in manufacturing, unadjusted	Dollars	2.83	4.41	4.66	4.90	4.93	-
Industrial Production:[5]	1967=100	-	125	117	117	117	-
Manufacturers' Shipments and Inventories:[5]							
Total shipments, monthly rate	Mil. dollars	46,449	81,723	79,737	87,704	-	-
Total inventories, book value end of month	Mil. dollars	84,655	150,404	150,404	146,510	-	-
Total new orders, monthly rate	Mil. dollars	46,763	83,297	76,704	86,422	-	-

[1]Ratio of index of prices received by farmers to index of prices paid, interest, taxes, and farm wage rates. [2]Average annual quantities of farm food products purchased by urban wage earner and clerical worker households (including those of single workers living alone) in 1959-61—estimated monthly. [3]Annual and quarterly data are on 50-State basis. [4]Annual rates seasonally adjusted fourth quarter. [5]Seasonally adjusted. [6]As of March 1, 1967. [7] As of November 1, 1974. [8] As of March 1, 1975. [9]Beginning January 1972 data not strictly comparable with prior data because of adjustment to 1970 Census data.

Sources: U.S. Dept. of Agriculture (Farm Income Situation, Marketing and Transportation Situation, Agricultural Prices, Foreign Agricultural Trade and Farm Real Estate Market Developments); U.S. Dept. of Commerce (Current Industrial Reports, Business News Reports, Monthly Retail Trade Report and Survey of Current Business); and U.S. Dept. of Labor (The Labor Force and Wholesale and Consumer Price Index).

'USDA'

Volume 35
Number 5
March 3, 1976

Serving the Bicentennial for Lunch

This year is an important one for all Americans, but it has special significance for school lunch workers across the Nation—1976 marks both 200 years of American independence and 30 years of the National School Lunch Program.

To celebrate these two anniversaries, USDA, the child nutrition directors in state departments of education, and ASFSA—The American School Food Service Association—are sponsoring a Child Nutrition Bicentennial Project.

Last year several representatives of these three groups set up a child nutrition bicentennial committee to develop plans for this project.

"We have roughly 10 or 12 committee members," says *Herb Rorex*, committee chairman and assistant to Food and Nutrition Service Administrator *Edward Hekman*. "They include FNS representatives, a representative from the state school lunch directors and the ASFSA president and president-elect, as well as two or three staff members from their headquarters, including the editor of their magazine."

The bicentennial project is more than an anniversary celebration, it is an opportunity to combine bicentennial-theme activities with the primary goal of the National School Lunch Program, according to *Gene Dickey*, manager of the school nutrition programs branch of the child nutrition division.

"The national charter of the school lunch program has several thrusts," Dickey points out, "but basically it is a program that places responsibility on USDA, as administering agency, to maintain and monitor the nutritional well-being of all the nation's children." The end of 1975 saw 25.4 million children in the School Lunch Program.

With a responsibility of this magnitude, the bicentennial provides a springboard to reach those people who are not presently involved or familiar with the National School Lunch Program.

"There are a number of objectives," Dickey comments. "One is to create a national awareness of what our program is about and what its objectives are; to let people and administrators who do not have a program know what is available. Another objective is to increase participation in those schools that already have the program through an increased awareness or increased emphasis on nutrition education."

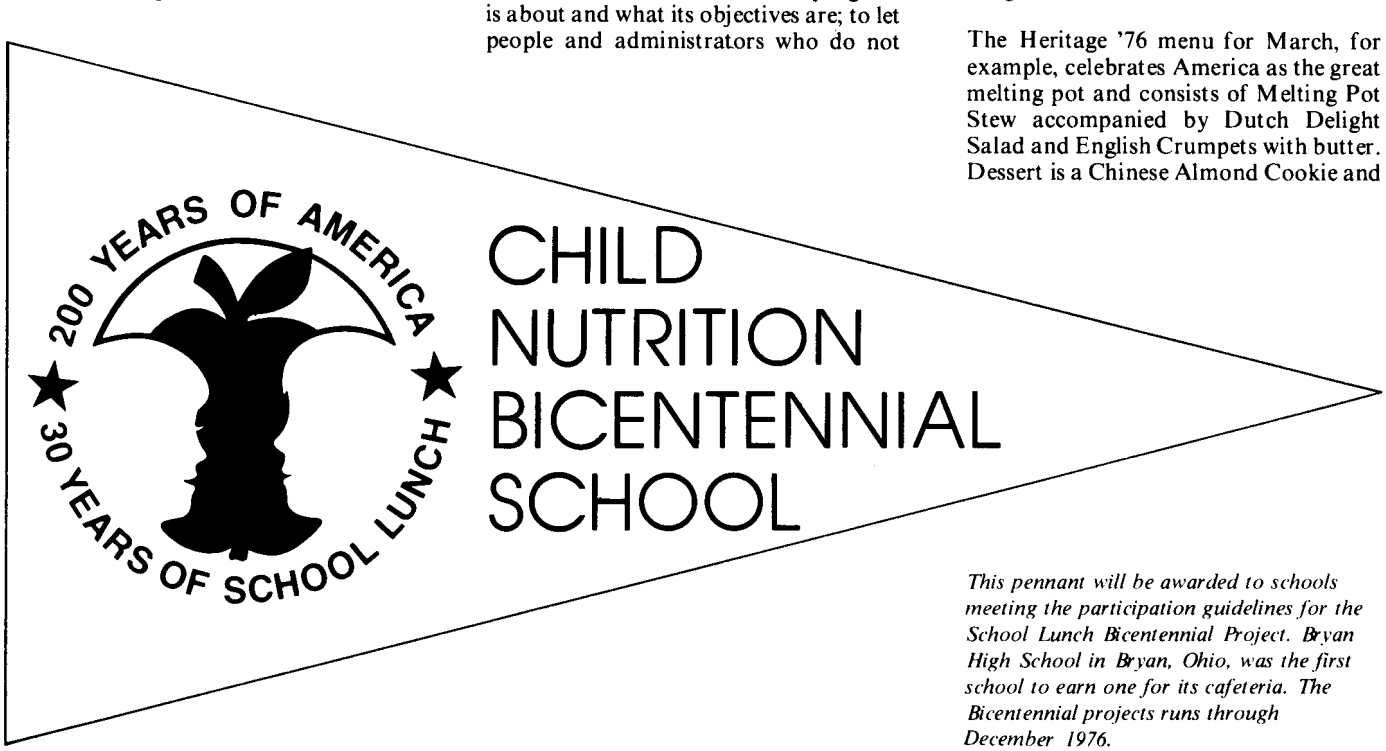
The committee began plans for the bicentennial project over a year ago, and decided to promote all three bicentennial themes: Heritage '76, Festival U.S.A., and Horizon '76.

"Under the Heritage '76 theme we have developed a series of 15 menus that trace our country's history from the colonial period, on up two centuries," says Donna Roberts, editor of ASFSA's *School Foodservice Journal.*

"The menus are not actually menus of the period," the editor explains. "A menu of the period would not meet Type A requirements, so we had to keep in mind those requirements, food costs and food availability, children's preferences and that sort of thing when designing these menus."

Rather than suggesting authentic menus of the period, she continued, "We tried to give some flavor of the period through the food and through the names that we assigned to various menu items."

The Heritage '76 menu for March, for example, celebrates America as the great melting pot and consists of Melting Pot Stew accompanied by Dutch Delight Salad and English Crumpets with butter. Dessert is a Chinese Almond Cookie and



This pennant will be awarded to schools meeting the participation guidelines for the School Lunch Bicentennial Project. Bryan High School in Bryan, Ohio, was the first school to earn one for its cafeteria. The Bicentennial projects runs through December 1976.

Settler's Milk will be served with the meal. Young diners will celebrate the Louisiana Purchase in April with Cajun Creation served on Louisiana Rice. Pirate's Treasure Spinach, River Boat Salad, and French Bread with butter will be served as side dishes. A Lewis and Clark Cookie and Mississippi Milk will round out the meal.

Many schools will be celebrating the Festival U.S.A. theme during National School Lunch Week in October. Part of this theme is "Invite America to Lunch." For this aspect of the project, sponsors are encouraging school lunch managers to invite senior citizens, parents, community leaders, and other members of the community to lunch. All schools participating in Festival U.S.A. will be encouraged to serve the "universal menu," a special menu developed by ASFSA, on Wednesday of National School Lunch Week. This year's menu is called the "All American Lunch" and features a cheeseburger.

The third bicentennial theme, Horizon '76, includes projects designed to improve the quality of life in the country's third century through and understanding of the importance of good eating habits.

"We are hoping that the bicentennial festivities through the Child Nutrition Bicentennial Project will teach children more about good nutrition and encourage them to eat lunch at school," says editor Roberts.

To encourage schools' involvement in the bicentennial project, USDA will award a pennant to each qualifying school. To receive the award a school must do two of the following things: serve one of the Heritage menus during the bicentennial period; serve the "universal menu" during School Lunch Week, and participate in "Invite America to Lunch"; or increase participation in school food service programs. Under the third requirement, a school will have to increase lunch or breakfast participation by an average of 5 percent or more for any one month between September 1975 and October 31, 1976. Any school with 100 percent participation automatically qualifies, as will any school with 90 percent or more participation for 2 months.

Project sponsors are encouraging individual schools to develop bicentennial programs of their own, particularly in instances where it is possible to tie in a local historical event.

"The people in the field have a lot of imagination," says Gene Dickey. "And they are more than willing to go ahead and do all sorts of things. We are suggesting to them that they try to tie in with local bicentennial activities—that they contact their local bicentennial groups and work with their state commissions to develop their own menus and their own activities."

While the School Lunch Bicentennial Project is not a contest, it will produce a lot of winners—the students who will get a lesson in good nutrition every time they eat in the cafeteria. And when it's good to eat, the lesson is a lot easier to swallow. □

NEWS

Population Trends

As we crystal-ball gaze and look ahead to what 1976 may hold, you might want to feed a few population trends into your projections. At last fall's Outlook Conference, Helen F. McHugh, Dean of the College of Home Economics at the University of Delaware, summarized them for conference participants.

In short, she said, it can be said that the working population must support increasing percentages of young and old; that a greater number of women than men will be found in most population segments; that as many people have had more than 12 years of education as have had less; that one out of ten families is headed by a woman and about one out of seven are nonnuclear in character. The numbers of people living in nonmetropolitan areas are increasing; and, while the population is highly mobile, moves are occurring at a decreasing rate. The South leads other regions in the rate at which new households are being formed.

As For Income Prospects

McHugh also shared some observations on income prospects with participants at the Outlook Conference.

Signs are that 1976 and beyond will see increased earnings levels on the average, she said. Important to this prediction is the fact that some 66 million income recipients (not all employed) receive automatic adjustments in income with increases in the cost of living. The pervasiveness of such adjustments has implications for future income levels that are not clear, she added. Such an approach to income changes (costs of production when interpreted from another vantage point) is an added force in the cost-price spiral. Current prices, at least in some instances, neither reflect the representative costs of production nor the worth of the goods to the potential consumer. Furthermore, many items included in the so-called cost-of-living index can hardly be considered essential to one's survival. The arguments for adjusting salaries and wages according to changes in some partially-related apparatus are no more logical than a faculty member or executive asking for a salary adjustment because he wants to send his children to a private school. Yet, this approach already is deeply engrained in our economy.

The point . . . is that income changes cannot be totally separated from the price structure.

With that last point in mind, it's logical that . . . .

When We Get a Raise, They Get an Increase

USDA recently announced another increase in fees for meat and poultry laboratory services.

USDA's Animal and Plant Health Inspection Service said the new rate—$19.92 per hour—for all laboratory work reflects last fall's government pay raises and increased laboratory costs during the past year. The old rate was $19.20.

This laboratory rate is used in billing for services provided to states and other government agencies, and to operators of meat and poultry establishments, importers and exporters who request laboratory services for voluntary inspection.

Pass it on.

The Bilberry Factor

With some help from the tiny bilberry, sales of U.S. cultivated blueberries to Western Europe have climbed significantly over the past 3 years. Combined U.S.-Canadian blueberry exports to European markets totaled some 14 million pounds between August 1974 and mid-May 1975. The American and Canadian berries are helping to fill the gap left by bilberries, a smaller, darker, and more tangy variety that grows wild in Poland. Bilberry harvests have declined steadily in recent years as growing numbers of Polish workers abandon the relatively low-paying, part-time harvesting jobs in favor of full-time farm or factory work.

"MOD" Air Transport for Livestock

A modular container designed for transporting livestock in "jumbo jet" air freighters is being tested by USDA scientists and engineers.

Some air carriers are purchasing jumbo jets optionally equipped with extra air conditioning capacity and noncorrosive cabin areas. They anticipate transporting large numbers of livestock to overseas markets, according to *Hunt Ashby*, an agricultural marketing specialist with the Agricultural Research Service at Beltsville, Md.

The 20 x 10 x 10 foot aluminum container has a number of special features, including tubular side bars and three decks with diamond mesh (expanded metal) floors. The pen mesh flooring allows maximum ventilation, a critical factor for livestock during transit. The solid floors now used tend to block air circulation and trap hot air. This creates a hazard for the animals.

The open mesh floor remains dry and clean, giving livestock surer footing during loading and unloading. Animals may be injured if they fall on solid floors that are slippery with animal wastes.

During transit, a floor pan collects the animal wastes, which can then be flushed and/or vacuumed for disposal in airport sewage systems.

The modular container system allows livestock shipments to be mixed with other types of containerized cargo, reports Ashby.

Results of tests with the experimental module will be useful in determining the ultimate dimensions and design of future containers for air transport of livestock. The tests were conducted by an ARS multidisciplinary team made up of Ashby, agricultural engineer *William Bailey*, and agricultural economist *William Kindya* at the Beltsville Agricultural Research Center.

Kepone from Mirex

USDA has launched an intensive review of the pesticide residues resulting from the cooperative federal-state Imported Fire Ant Control Program.

The review was initiated after preliminary results of USDA-supported research indicated that very small amounts of the chemical kepone are slowly formed from mirex under conditions of direct sunlight and moisture. Mirex has been used widely in the imported fire ant control program in the southern states.

Scientists have recently recovered small amounts of kepone and other compounds in addition to mirex from an experimental plot where mirex was applied at unusually high concentrations in 1962 and from a site where an airplane carrying mirex bait crashed in 1969.

USDA officials said that laboratory studies support the finding that some kepone can result from the exposure of mirex to ultra-violet light. These results indicated a potential means by which both mirex and kepone eventually disappear from the environment.

Since 1972, the fire ant control program has been extensively monitored. These studies have not shown any evidence of kepone in the environment resulting from aerial application of mirex to control the fire ant.

This is because of the very low amount of mirex used per acre, which results in residue levels so low that they cannot be detected by established laboratory procedures.

Clothing Outlays

Americans spent an estimated $369 a person on clothing and shoes in 1975, according to consumer specialists with USDA's Agricultural Research Service. While that's $19 more than in 1974, higher prices rather than increased buying accounted for about three-fifths of the increase. This year, apparel prices are expected to continue climbing, but persistent pressures on consumer income will probably prevent any sizable advance in average clothing expenditures.

Loan Rate Lowered

Farmers Home Administration will now make housing loans to families of low and moderate income for single family homes at an interest rate of 8-¾ percent. The previous rate of 9 percent had been in effect since September 1975.

The new rate will apply to FmHA loans to eligible families for purchase or improvement of individual homes. FmHA's rate is consistent with the current interest rate on housing loans insured by the Department of Housing and Urban Development and Veterans Administration.

The interest rate of 9 percent will continue to be applied to FmHA loans for the development of rental and cooperative housing.

Housing loans are administered by FmHA in rural areas including rural towns of not more than 10,000 population, and in certain designated towns and cities with populations between 10,000 and 20,000.

More Pay, Fewer Workers

Statistical Reporting Service reports that farm wages, cash and non-cash combined, last October averaged out to $2.63 an hour—up 8 percent from a year earlier. Workers paid by the hour in cash wages only earned $2.65. Meantime, the total farm work force edged down 1 percent from October 1974 to an estimated 4.5 million workers.

A Taste for Fungi

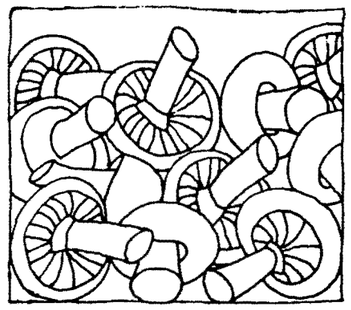
Ever since the Statistical Reporting Service started keeping tabs on U.S. mushroom production nearly ten years ago, it's been up all the way.

In the latest survey, the Crop Reporting Board turned up 299 million pounds of mushrooms for the 1974/75 crop year. That's 7 percent more than the previous year's record outturn of 279.6 million pounds.

Pennsylvania, top mushroom producer, grew 178.6 million pounds in 1974/75—60 percent of the U.S. total and 9 percent above its 1973/74 output.

Value of the latest U.S. crop is pegged at over $147 million. Growers averaged about 49 cents a pound, compared to about 44 cents a year ago.

Fresh market sales for 1974/75 surpassed those of a year earlier by 23 percent. At 126 million pounds, they accounted for 42 percent of the U.S. crop.



PEOPLE

John Foltz Moves to FAS

John Foltz was recently named Assistant Administrator of the Foreign Agricultural Service. He will be responsible for the agency's foreign market development programs.

Foltz served as USDA's Deputy Under Secretary of Legislative Affairs since 1973. In 1974, he was vice chairman of the U.S. delegation to a U.N. conference on rural development which was held in Bulgaria. Last summer, he represented the Secretary of Agriculture in opening an FAS-sponsored food festival in Osaka, Japan.

New Attache to Guatemala

Francis H. Jack III was recently appointed agricultural attache on the staff of the U.S. embassy in Guatemala City, Guatemala. He succeeds *John McDonald*, who has been reassigned

COMMENTS

Development or Deviousness?

The December 24 issue carries an article, "USDA Needs New Executives," which may be true, but it seems to me not for the reasons noted.

The article makes the point that 50 percent of USDA's supergrade managers can retire within the next five years. My reaction is—what else is new? One should expect this to be a healthy situation. After all, these supergraders, like the rest of us, can retire at age 55, which means that 50 percent of them are 50 years of age or older. That's good. I don't think an individual can advance through the ranks much more quickly, assuming the career system is working.

I suspect USDA is not making the point that we need executive development programs because upper grade incumbents are getting old and an insufficient reservoir of talent exists, but rather to justify alleged circumvention of the career system by selecting younger career employees for executive and managerial development.

J.G.
Vienna, W. Va.

USDA's Office of Personnel notes that the fact that 50 percent of USDA supergrades will be eligible for retirement in five years can hardly be considered a healthy situation, when, as the *USDA* article pointed out, 46 percent of the GS-15's and 33 percent of the GS-14's will themselves be eligible for retirement in the next five years.

Continuity in the effective and efficient delivery of services and programs to the people USDA serves is important. And OP hopes current executive development efforts will serve as a pipeline to assure a continuing supply of managerial and executive talent.

Personnel also points out the arduous assessment process and competitive selection, within the merit system, of executive development program participants will serve to strengthen the career system, rather than weaken it.

There's Plenty In Alaska

In reading "Almost All Cropland Now In Use" in *USDA* (October 8, 1975) I was surprised and disappointed to learn that it is still a policy of Economic Research Service to ignore the potential crop and grazing lands of Alaska.

It probably would be of interest to you to know that the Alaska Rural Development Council report to which the Soil Conservation Service and other USDA agencies were major contributors shows that Alaska has about 17.5 million acres of tillable land plus about 10 million acres suitable for conventional livestock grazing plus approximately 100 million acres suitable for reindeer and muskox grazing.

Since your article, and presumably the ERS report, listed potential acres, it seems that these acreage figures should have been included.

C.E.L.
Institute of Agricultural & Land Resources Management
University of Alaska

PERSON TO PERSON

Traveling the waters of Chincoteague Bay by sailboat is a favorite past time for *Victor H. Berry*. Traveling is also a necessary part of his job. As assistant deputy administrator of Animal and Plant Health Inspection Service, he travels about 25 percent of the working year.

Dr. Berry plays an important role in administering USDA's Meat and Poultry Inspection Program, which provides for the inspection and truthful labeling of all meat and poultry products from plants selling across State lines.

"I feel the most important function of my job is to assess meaningful changes needed in the program and to help bring them about," Dr. Berry said. "And I do this mainly through continual personal contact with those directly carrying out the program."

Dr. Berry added he can't truthfully say he enjoys so much travel—without his sailboat—but he knows the job cannot be done well without it.

"I get a great deal of satisfaction from working with the Federal program," he said. "Because I know that a wholesome meat and poultry supply is important to society. It gives me a sense of worth to know that I am contributing something toward satisfying that need."

Since earning his doctorate in veterinary medicine at Tuskegee Institute in 1951, he has attended five universities, the USDA Graduate School, and the Federal Executive Institute in Charlottesville, Va.

"It seems I have spent almost as much time in school since receiving my doctorate as I did earning it," Dr. Berry said.

His interest in a veterinary career was apparent early, but he admits that he was side-tracked from his original plans.

"I was always interested in the care of animals. I worked after school with the local veterinarian in my hometown, Valley Center, Kans., and also practiced animal medicine for a few years after graduating from Tuskegee. But I had all intentions of going back to school for a career in pathology."

His career with the Department of Agriculture began, after he left the Air Force in 1955 and began working as a federal veterinary medical officer in the Milwaukee, Wis., area.

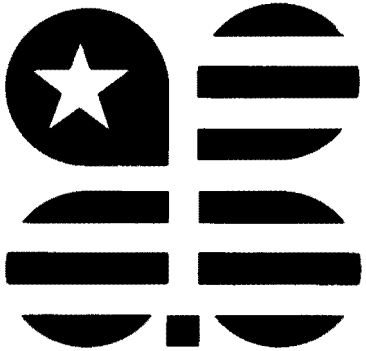
With his experience, administrative expertise, and determination, Dr. Berry advanced rapidly from an in-plant veterinary medical officer in 1955 to Chief of the Planning Branch in Washington, D.C., in 1967. He has been Assistant Deputy Administrator of Field Operations since 1972.

Victor Berry

USDA is published biweekly by the U.S. Department of Agriculture, Office of Communication, Washington, D.C. 20250, for distribution to employees only by direction of the Secretary of Agriculture. Retirees who request it may continue to receive **USDA.**

USDA Vol. 35, No. 5, March 3, 1976
Bonnie Kreitler, Editor.
Roxana Barnes, Editorial Assistant.

U. S. GOVERNMENT PRINTING OFFICE : 1976 O - 201-578



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Homemakers _____ 4-H Families _____ Other _____

_____ _____

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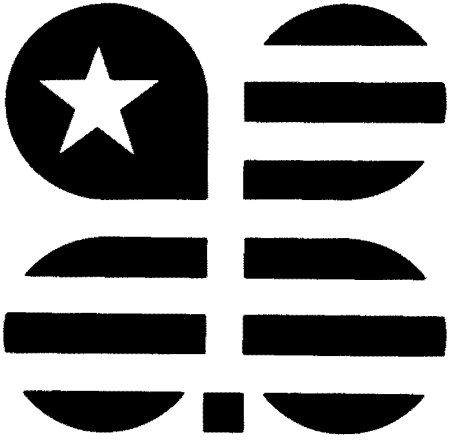

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Your Role as a Citizen in Our World

Focus on international interdependence, the role of the United States in world affairs and gain new understanding of the many cultures of our world.

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WHAT COST:

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_____ 4-H Teens
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_____ 4-H Families
_____ Other Adult Group
_____ High School Class
_____ Homemakers
_____ Youth Organization
_____ Other

is interested in attending Citizenship '76 during the week(s) of _____

_____

(Please give choice of three dates)

Wants more details on special interest programs on _____

_____

(Please specify dates and type of training desired)

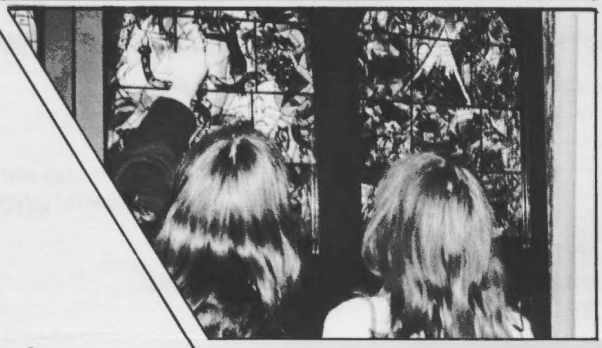
_____

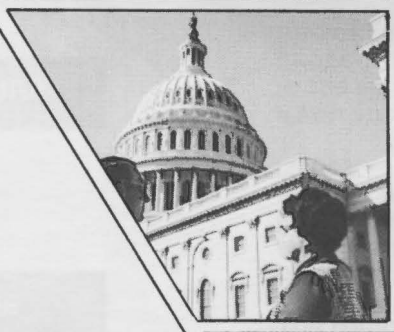
Name *Address*

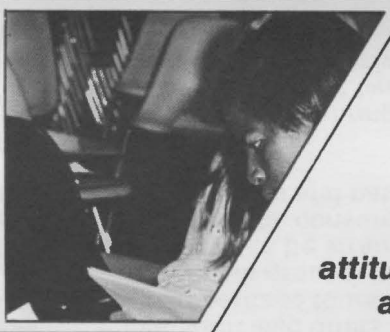
_____ _____

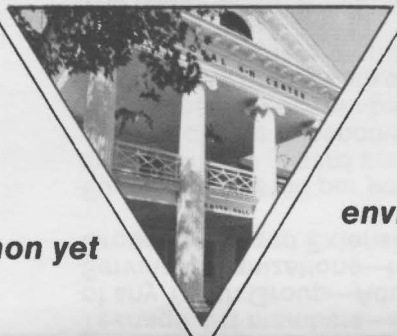
Title *Phone Number*

"My Country 'Tis of Me"









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BECKY HICKS, *Arkansas*

"Most important to me was learning to put Citizenship in action in our community . . . especially with emphasis on voting."
SANDY BURNS, *Wyoming*

"Sharing ideas with other leaders about 4-H was the most interesting part of the seminar. It's nice to know we have many things in common yet our programs are quite different."
MRS. VIRGIN RUECK, *Illinois*

"It's a once in a lifetime chance for a trip you'll never forget."
MARY RICHARDS, *Illinois*

"This has changed my attitude toward government and my responsibility as a citizen."
MRS. MARVIN GARREN, *North Carolina*

"The best week I've ever spent started me thinking a lot about different things. I've started an environmental project on recycling and our club plans a roadside litter clean-up contest."
HAROLD BERSANI, *Maine*

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FAMILIES

★ ★ ★ ★ Visit Your 4-H Center in the Nation's Capital ★ ★ ★ ★

EXPLORE YOUR NATION'S HERITAGE AS A FAMILY GROUP

4-H families traditionally value their heritage and seek ways to interpret that heritage into positive action. This heritage program offers families an opportunity to spend time together in Washington, D.C. on a long holiday weekend or any other three day period when space is available at the National 4-H Center. Longer stays also can be arranged.

During your visit you will experience history through visits to see documents, monuments and places that play a vital role in our nation's cultural, social, political and economic development. You'll also have time to explore contemporary issues and look to the future.

YOUR FAMILY WILL . . . .

Have a night view of Washington
Visit the
Top of the Washington Monument
The John F. Kennedy Center for the Performing Arts
Lincoln and Jefferson Memorials
U.S. Capitol and Supreme Court Buildings
Arlington Cemetery
Smithsonian Institution, including the National Zoo
Take a boat trip to Mt. Vernon when time permits.

A 4-H plus . . .

The USDA/4-H Tree on the Mall
4-H in stained glass at the National Cathedral
4-H sculpture in Danforth Court
Seaman A. Knapp (Founder of Extension) Arch
4-H recognition in the Smithsonian Bicentennial Exhibit

COSTS ARE REASONABLE—

$60 to make the 4-H Center your home away from home for three nights for the total family. A sleeping room with two double bunk beds and space for sleeping bags if you wish to bring them—use of recreation facilities, television rooms and program guidance. Other accommodations available on request at additional cost.

$16.30 for meals per person over 10 years of age (three breakfasts, three box lunches, two dinners)
$12.50 for meals per child 10 years of age and under
$5.50 for boat trip tickets to Mt. Vernon; $3.50 for children under 12
Plus field trip transportation costs varying according to number of persons in program and ranging from $12 to $20 per person.

YOU CAN CUT COSTS BY: arranging with other families to travel to the National 4-H Center by bus which you can then use for field trips. Maps and field trip interpreters are provided to you at no extra cost. You can also save by using public transportation. Use of personal cars for field trips is not recommended.

Exact transportation costs, based on your needs, provided 15 days prior to arrival. All prices are subject to change but will be confirmed one month in advance of visit.

RESERVATION FORM

(Send at least 30 days in advance of date requested)
TO: Families Heritage Program, National 4-H Foundation,
7100 Connecticut Avenue, Washington, D.C. 20015 • Phone: 301/656-9000

OUR FAMILY IS INTERESTED IN COMING TO A HERITAGE PROGRAM

From _____ (day and date) to _____ (day and date)

Alternate dates _____

No. of adults _____ No. and ages of children _____

_____ We will be coming with a group in a chartered bus. Total No. in group _____

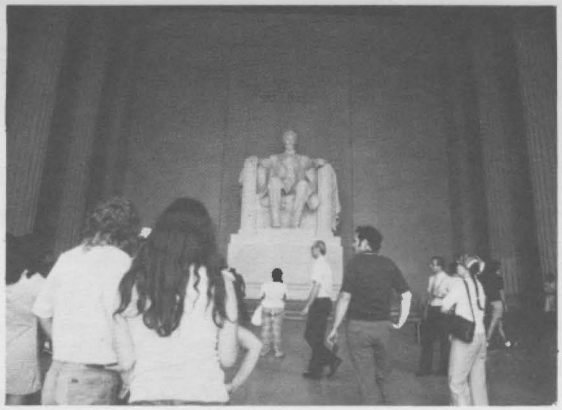
_____ We will need local field trip transportation.

Name _____ Address _____

Telephone Number _____ _____ Zip _____

Signature, Extension Representative _____

The National 4-H Foundation offers a variety of citizenship and leadership training programs, weekend heritage study or other short term experiences on specific topics for teenagers, families, volunteer leaders and adult groups. Special training can be arranged to zero in on humanities, international affairs, consumer education or specific aspects of government agencies and national or international issues.



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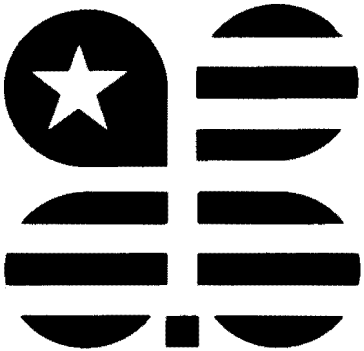

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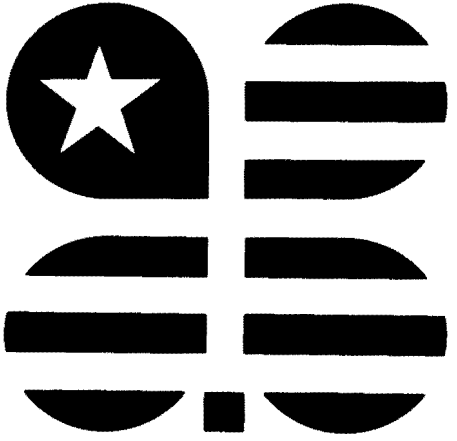

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_____ 4-H Families
_____ Other Adult Group
_____ High School Class
_____ Homemakers
_____ Youth Organization
_____ Other

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(Please give choice of three dates)

Wants more details on special interest programs on _____

_____

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_____ _____

Name *Address*

_____ _____

Title *Phone Number*

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"Most important to me was learning to put Citizenship in action in our community . . . especially with emphasis on voting."
SANDY BURNS, *Wyoming*

"Sharing ideas with other leaders about 4-H was the most interesting part of the seminar. It's nice to know we have many things in common yet our programs are quite different."
MRS. VIRGIN RUECK, *Illinois*

"It's a once in a lifetime chance for a trip you'll never forget."
MARY RICHARDS, *Illinois*

"This has changed my attitude toward government and my responsibility as a citizen."
MRS. MARVIN GARREN, *North Carolina*

"The best week I've ever spent started me thinking a lot about different things. I've started an environmental project on recycling and our club plans a roadside litter clean-up contest."
HAROLD BERSANI, *Maine*

Citizenship '76 . . .

. . . is conducted by the National 4-H Foundation in behalf of the Cooperative Extension Service of the State Land Grant Universities and the U.S. Department of Agriculture. You can obtain detailed information about various programs—domestic and international—from your county Extension office of the state 4-H office at your land grant university.

The National 4-H Foundation is a private non-profit educational institution, incorporated to complement and support the youth work of the Cooperative Extension Service through training, research and development programs funded primarily from private sources.

Bicentennial 4-H Symbol courtesy Al Brothers, Agricultural Extension Service, North Carolina State University

FAMILIES

★ ★ ★ ★ Visit Your 4-H Center in the Nation's Capital ★ ★ ★ ★

EXPLORE YOUR NATION'S HERITAGE AS A FAMILY GROUP

4-H families traditionally value their heritage and seek ways to interpret that heritage into positive action. This heritage program offers families an opportunity to spend time together in Washington, D.C. on a long holiday weekend or any other three day period when space is available at the National 4-H Center. Longer stays also can be arranged.

During your visit you will experience history through visits to see documents, monuments and places that play a vital role in our nation's cultural, social, political and economic development. You'll also have time to explore contemporary issues and look to the future.

YOUR FAMILY WILL . . . .

Have a night view of Washington
Visit the
Top of the Washington Monument
The John F. Kennedy Center for the Performing Arts
Lincoln and Jefferson Memorials
U.S. Capitol and Supreme Court Buildings
Arlington Cemetery
Smithsonian Institution, including the National Zoo
Take a boat trip to Mt. Vernon when time permits.

A 4-H plus . . .

The USDA/4-H Tree on the Mall
4-H in stained glass at the National Cathedral
4-H sculpture in Danforth Court
Seaman A. Knapp (Founder of Extension) Arch
4-H recognition in the Smithsonian Bicentennial Exhibit

COSTS ARE REASONABLE—

$60 to make the 4-H Center your home away from home for three nights for the total family. A sleeping room with two double bunk beds and space for sleeping bags if you wish to bring them—use of recreation facilities, television rooms and program guidance. Other accommodations available on request at additional cost.

$16.30 for meals per person over 10 years of age (three breakfasts, three box lunches, two dinners)
$12.50 for meals per child 10 years of age and under
$5.50 for boat trip tickets to Mt. Vernon; $3.50 for children under 12
Plus field trip transportation costs varying according to number of persons in program and ranging from $12 to $20 per person.

YOU CAN CUT COSTS BY: arranging with other families to travel to the National 4-H Center by bus which you can then use for field trips. Maps and field trip interpreters are provided to you at no extra cost. You can also save by using public transportation. Use of personal cars for field trips is not recommended.

Exact transportation costs, based on your needs, provided 15 days prior to arrival. All prices are subject to change but will be confirmed one month in advance of visit.

RESERVATION FORM

(Send at least 30 days in advance of date requested)

TO: Families Heritage Program, National 4-H Foundation,
7100 Connecticut Avenue, Washington, D.C. 20015 • Phone: 301/656-9000

OUR FAMILY IS INTERESTED IN COMING TO A HERITAGE PROGRAM

From _____ (day and date) to _____ (day and date)

Alternate dates _____

No. of adults _____ No. and ages of children _____

____We will be coming with a group in a chartered bus. Total No. in group _____

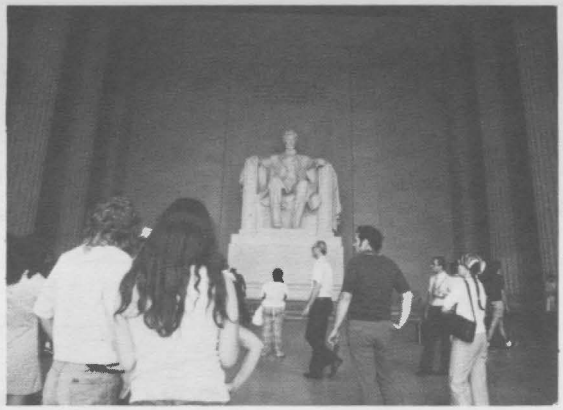
____We will need local field trip transportation.

Name _____ Address _____

Telephone Number _____ _____ Zip _____

Signature, Extension Representative _____

The National 4-H Foundation offers a variety of citizenship and leadership training programs, weekend heritage study or other short term experiences on specific topics for teenagers, families, volunteer leaders and adult groups. Special training can be arranged to zero in on humanities, international affairs, consumer education or specific aspects of government agencies and national or international issues.



BICENTENNIAL BONUS

If you are personally responsible for bringing a group of 25 or more to the National 4-H Center for at least five days' study during the period from August 1 to June 1 you receive tuition, board and room free of charge.

FAMILIES '76

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GROWING BONSAI

U.S. DEPARTMENT OF AGRICULTURE • Home and Garden Bulletin No. 206

CONTENTS

Washington, D.C. Issued August 1973

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402 - Price 40 cents
Stock No. 0100-02772

GROWING BONSAI

Prepared by HENRY M. CATHEY, PLANT GENETICS AND GERMPLASM INSTITUTE, NORTHEASTERN REGION, AGRICULTURAL RESEARCH SERVICE

Bonsai are miniature trees grown in pots. The aim of bonsai culture is to develop a tiny tree that has all the elements of a large tree growing in a natural setting. This look is achieved, principally, by branch and root pruning and shaping, but other factors are also important. The texture of the trunk, its look of age, the moss and underplantings in the container—all contribute to the illusion of a minature tree as it is seen in nature.

A presentable bonsai can be created in a few seasons. Cultivating these miniature potted trees is both an intriguing hobby, and a means of adapting a wide range of plants to specialized and decorative uses. Bonsai require daily watering during their growing season, and, because the plants are rooted in shallow pots, careful pruning.

Bonsai are kept outdoors most of the year, but—from time to time—these miniaturized versions of nature are brought indoors for display. Only certain tropical trees, shrubs, and vines can be continuously kept indoors full time as bonsai.

Bonsai, as an art form, stems from ancient oriental culture. It originated in China and was developed by the Japanese. In the 13th century, the Japanese collected and potted wild trees that had been dwarfed by nature. These naturally formed miniatures were the first bonsai.

When demand for the small trees outgrew the supply, Japanese gardeners began to train bonsai from native trees. They shaped the trees to give them the illusion of age and naturalness. Over the years, the Japanese devised standards of shape and form which gradually became the classic bonsai styles.

American bonsai are much freer in concept and style than Japanese bonsai. American bonsai growers have recognized that the horticultural and aesthetic rules are important, but are specifically aimed at Japanese culture. Because of this, Americans have taken oriental styles and applied them to plants never grown by the Japanese. Therefore, the rigid procedures and names used by the Japanese are not used in this bulletin.

PRINCIPLES OF BONSAI

Not all plants are equally effective as bonsai. To produce a realistic illusion of a mature tree, look for plants with the following characteristics—

- Small leaves or needles.
- Short internodes, or distances between leaves.
- Attractive bark or roots.
- Branching characteristics for good twig forms.

All parts of the ideal bonsai—trunk, branches, twigs, leaves, flowers, fruits, buds, roots—should be in perfect scale with the size of the tree. Plants used for bonsai should have small leaves, or leaves that become small under bonsai culture. Plants with overly large leaves, such as the avocado, will look out of proportion if chosen for bonsai. Sycamores also develop leaves that are too large. Certain species of both maple and oak trees usually respond well to bonsai culture and develop leaves that are in proportion.

Among the plants with small leaves and needles are: spruce, pine, zelkova, pomegranate, and certain oaks and maples.

Plants chosen for bonsai should have attractive bark, and the trunk must give the illusion of maturity. The trunk should have girth, but must remain in proportion to the entire tree. The trunk should taper gradually toward the top of the tree. Sometimes one or two of the main branches must be shortened to emphasize the vertical line of the trunk and give the trunk a balanced appearance.

To give the appearance of age, the upper one-third of the root structure of a mature bonsai is often exposed. This is especially effective if the roots have good girth and form. Twisted and tangled roots should be straightened before potting or repotting a tree to achieve an aged appearance.

Bonsai from nursery stock, and trees collected from the wild, should have a root system that will—when exposed—add to the appearance of the finished bonsai.

Plants have a "best profile" just as people do. Decide on the front of the tree at the very beginning, because planting and shaping are done with the front of the tree in mind. However, you may change your ideas about the plant's ultimate shape as you clip and prune.

The front of a bonsai should offer a good view of the main trunk which must be clearly visible from the base to the first branch, typically about one-third the way up. Everywhere on the tree, but mostly from the front, the branches should look balanced and appear to be floating in space; they should not appear lopsided or top heavy. The branches should not be opposite one another with their lines cutting horizontally across the trunk. The branches give the bonsai dimension and establish the tree's basic form.

A bonsai should have a harmonious arrangement of branches without unsightly gaps. Flaws can be spotted by looking down on a bonsai. Upper branches should not overshadow lower branches.

Before deciding on the shape of your bonsai, study the tree carefully, and take into account the natural form of the species. Observe the way mature trees of the same kind grow in their natural setting to achieve an impression of age and reality.

Decide on the final shape and size of your bonsai before starting. Make a rough sketch of what you wish to create and use it as a guide.

CHOOSING A STYLE

Bonsai can be classified into five basic styles: **formal upright, informal upright, slanting, cascade,** and **semicascade.** These classifications are based on the overall shape of the tree, and how much the trunk slants away from an imaginary vertical axis. (See figs. 4 and 6.)

The numerous Japanese bonsai styles are principally variations of these five basic styles. The styles given in this bulletin apply to trees with single trunks. The single trunk style is a basic design that is simplest to shape because the one trunk determines the overall composition.

The formal upright style has classic proportions and is the basis for all bonsai. It is the easiest for a beginner to develop because it requires the least experimentation, avoids the problem of selective pruning, and should almost immediately become a displayable bonsai.

PN–2707

FIGURE 1.—Note the off-center placement of this mugho pine in its rectangular container. This tree was trained in the formal upright style.

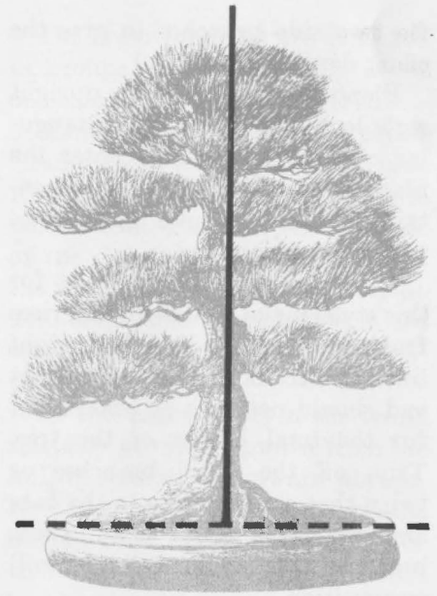


FIGURE 2.—The formal upright style is considered the easiest for the novice bonsai grower. This style features a straight trunk, and a bottom branch that is lower and extends further from the trunk than its opposite.

In this style, the form is conical or sometimes rounded and the tree has an erect leader and horizontal branches. One of the branches is lower and extends a little farther from the trunk than the others. (See fig. 1.)

Also, the two lowest branches are trained to come forward on the front side of the tree, one slightly higher than the other. The third branch of this style extends out in back of the tree at a level between

the two side branches to give the plant depth. (See fig. 2.)

Plants in the formal upright style look best in oval or rectangular containers. Do not center the plant when placing it in the container. Plant it about a third of the distance from one end.

In choosing a nursery plant for this style, make sure the trunk rises from the ground in a fairly straight line. The trunk should be straight and should not fork or branch out for the total height of the tree. Trim off the small branches or twigs that are too close to the base and near the main stem. These branches detract from the overall composition.

The informal upright style has much the same branch arrangement as the formal upright style, but the top—instead of being erect as in the formal upright style—bends slightly to the front. This bend makes the tree's branches appear to be in motion and enhances the look of informality. (See figs. 3 and 4.)

Many nursery trees are naturally

PN–2708

FIGURE 3.—Flowering plum bonsai, trained in the informal upright style, is set on a rock; this setting enhances the illusion of a tree growing in the wild.

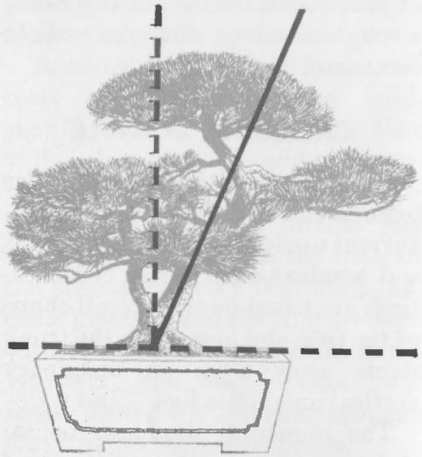


FIGURE 4.—The trunk in the informal upright style bends slightly to the front. This bend helps to give the style its look of informality.

slanted. This makes them well suited to the informal upright style. Check the tree's slant by looking down at the trunk from above—from this angle the top should slant to the front. If this view is not attractive, you may move the rootball to slant the tree in another direction.

If you choose a vertical tree at the nursery, and want to train it in the informal upright style, simply tilt the plant when potting it. When you do this, trim the branches and foliage so they are scaled to the size of the tree.

The informal upright style looks best in an oval or rectangular container. It should be planted, not in the center of the container, but a third of the distance from one end.

In **the slanting style,** the trunk has a more acute angle than in the previous styles. The lowest branch should spread in the direction opposite to that in which the tree slants. The top of the tree is bent slightly toward the front. (See figs. 5 and 6.)

PN–2709

FIGURE 5.—Lodgepole pine was 67 years old when it was collected from the Sierra Nevada mountains of California; it was trained in the slanting style of bonsai.

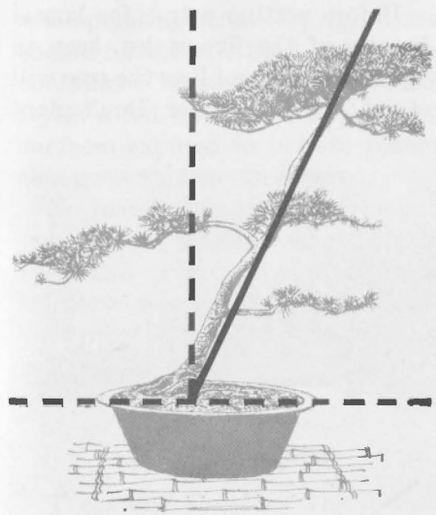


FIGURE 6.—In the slanting style the trunk has a more acute angle than in the informal upright style. The lowest branch spreads in a direction opposite to that in which the tree slants.

The lower branches are arranged in groups of three, starting about one-third the way up the trunk.

Slanting trees in nature are called "leaners" — trees that have been forced by the wind and gravity into nonvertical growth. The attitude of the slanting style falls between the upright and the cascade styles. This style looks best planted in the center of a round or square container.

In **the cascade style** the trunk starts by growing upward from the soil, then turns downward abruptly, and reaches a point below the bottom edge of the container. For this reason, the container should be placed on the edge of the table, or on a small stand. (See figs. 7 and 8.)

The cascade style has most of its foliage *below* the soil surface. This style is representative of a natural tree that is growing down the face of an embankment.

Training a tree in the cascade

PN–2710

FIGURE 7.—Firethorn bonsai, trained in the cascade style, has a characteristic leader which descends below the bottom edge of the container.

style takes longer than in the slanting style. Choose a low-growing species instead of forcing a tree that normally grows upright into an unnatural form. Bend the whole tree forward so one back branch is vertical and the side branches fall naturally.

FIGURE 8.—The cascade style of bonsai represents a natural tree growing down the face of an embankment. A cascaded planting usually looks best in a round or hexagonal container.

A cascaded planting usually looks best in a round or hexagonal container that is higher than it is wide. The tree should be planted off-center from the cascading side.

The semicascade style has a trunk that is allowed to grow straight for a certain distance, and then is cascaded down at *a less abrupt angle* than in the cascade style. (See figs. 9 and 10.)

The cascading branches are thought of as the front of the tree, and the back branches are trained closer to the trunk than in the other styles. The semicascade should not reach below the bottom of the container, but should go below the level of the soil surface.

Plants that are well adapted to the cascade and semicascade styles are prostrate junipers, and flowering plants such as chrysanthemums, wisteria, willows, and star jasmine.

Before potting a tree for bonsai in any of the five styles, keep in mind the image of how the tree will stand in the container. Don't plant a tree one way, and then uproot it to make a change.

PN–2711

FIGURE 9.—Cotoneaster in round container was trained in the semicascade style.

FIGURE 10.—The semicascade style has a curving trunk that does not reach the bottom of the container as in the cascade style. Prostrate junipers and flowering plants are well adapted to both of these styles.

Keep your overall theme in mind when planting bonsai. Upright trees should have a stabilized look in the container; slanted and cascaded styles often have their upper root surfaces exposed to imitate plants that grow this way in nature.

No matter what style of bonsai you choose—whether single trunk specimens or groups of trees from single roots—everything depends on your selection of plant material, and your ability to visualize the bonsai's final form.

BONSAI GUIDE

Trees and shrubs.—The following alphabetical list of plants includes trees and shrubs suitable for traditional bonsai. This is not intended to be a complete list. Specialty nurseries often have a wide selection of dwarf and semi-dwarf varieties of many of these species. Dwarf plants, however, do not always convey the same impression as their full size counterparts because their growth habit is quite different.

APRICOT:
- *Prunus* species

ARBORVITAE:
- American, *Thuja occidentalis*
- Oriental, *Thuja orientalis*

AZALEA:
- Hiryu, *Rhododendron obtusum*
- Indica azalea, *Rhododendron indicum*
- Kurume, *Rhododendron hybrids*

BEECH:
- American, *Fagus grandifolia*
- European, *Fagus sylvatica*

BIRCH:
- White, *Betula alba*

BOX:
- *Buxus* species

PN–2712

FIGURE 11.—A group planting in any of the bonsai styles makes use of only one species of tree. Cryptomeria is shown here.

BURNINGBUSH:
Euonymus nana
CEDAR:
Atlas, *Cedrus atlantica*
Deodar, *Cedrus deodara*
CHERRY:
Prunus species
COTONEASTER:
Cotoneaster species
CRABAPPLE:
Malus species
CRYPTOMERIA:
Cryptomeria japonica and cultivars
CYPRESS:
Bald, *Taxodium distichum*
Dwarf hinoki, *Chamaecyparis obtusa var. compacta*
ELM:
American, *Ulmus americana*
Chinese, *Ulmus parvifolia*
Siberian, *Ulmus pumila*
FIR:
Abies species
FIRETHORN:
Pyracantha species
GINKGO:
Ginkgo biloba
GOLDENRAIN:
Koelreuteria paniculata
GUM:
Sweet, *Liquidambar styraciflua*
HAWTHORN:
English, *Crataegus oxyacantha*
Washington, *crataegus phaenopyrum*
HEATHER:
Calluna vulgaris
HEMLOCK:
Canadian, *Tsuga canadensis* and cultivars
HORNBEAM:
American, *Carpinus caroliniana*
Japanese, *Carpinus japonica*
IVY:
Hedera helix and cultivars
JASMINE:
Winter, *Jasminum nudiflorum*
JUNIPER:
Juniperus species and cultivars
LOCUST:
Black, *Robinia pseudoacacia*
MAPLE:
Amur, *Acer ginnala*
Hedge, *Acer campestre*
Trident, *Acer buergerianum*
OAK:
English, *Quercus robur*
Pin, *Quercus palustris*

Scarlet, *Quercus coccinea*
White, *Quercus alba*
PEACH:
Prunus species
PINE:
Bristlecone, *Pinus aristata*
Japanese white, *Pinus parviflora*
Japanese black, *Pinus thunbergi*
Mugo, *Pinus mugo mughus*
Swiss stone, *Pinus cembra*
White, *Pinus strobus*
PLUM:
Prunus species
POMEGRANATE:
Dwarf, *Punica granatum nana*
QUINCE:
Japanese, *Chaenomeles japonica*
SNOWBELL:
Japanese, *Styrax japonica*
SPRUCE:
Picea species and cultivars
WILLOW:
Weeping, *Salix blanda*
WISTERIA:
Japanese, *Wisteria floribunda*
YEW:
Taxus species and cultivars
ZELKOVA:
Graybark elm, *Zelkova serrata*

House plants.—American gardeners have taken bonsai concepts and have applied them to house plants. By combining traditional procedures for handling house plants with bonsai concepts of design, growers have created different bonsai styles. The following alphabetical list consists of woody plants (native to the tropics and subtropics of the world) that have been grown as indoor bonsai. These plants can be obtained from either local or specialized nurseries.

ACACIA:
Acacia baileyana
ARALIA:
Polyscias balfouriana
Polyscias fruticosa
Polyscias guilfoylei
BIRD'S EYE BUSH:
Ochna multiflora
CAMELLIA:
Camellia japonica
Camellia sasanqua
CAPE-JASMINE:
Gardenia jasminoides radicans
Gardenia jasminoides
CITRUS:
Citrus species (calamondin, kumquat, lemon, lime, orange, and tangerine)
CHERRY:
Surinam, *Eugenia uniflora*
CYPRESS:
Arizona, *Cupressus arizonica*
Monterey, *Cupressus macrocarpa*
FIG:
Mistletoe, *Ficus diversifolia*
HERB:
Elfin, *Cuphea hyssopifolia*
HIBISCUS:
Hibiscus rosa-sinensis Cooperi
HOLLY:
Miniature, *Malpighia coccigera*
JACARANDA:
Jacaranda acutifolia
JADE:
Crassula species
JASMINE:
Jasminum parkeri
Orange, *Murraea exotica*
Star, *Trachelospermum jasminoides*
LAUREL:
Indian, *Ficus retusa*
MYRTLE:
Classic, *Myrtus communis*
OAK:
Cork, *Quercus suber*
Indoor, *Nicodemia diversifolia*
Silk, *Grevillea robusta*

ORCHID TREE:
Bauhinia variegata
OLIVE:
Common, *Olea europaea*
OXERA PULCHELLA
PEPPER TREE:
California, *Schinus molle*
PISTACHIO:
Chinese, *Pistacia chinensis*
PLUM:
Natal, *Carissa grandiflora*
POINCIANA:
Royal, *Delonix regia*
POMEGRANATE:
Dwarf, *Punica granatum nana*
POPINAC:
White, *Leucaena glauca*
POWDERPUFF TREE:
Calliandra surinamensis
SERISS FOETIDA
SHOWER TREE:
Cassia eremophila

For more information on house plants and their care, see Home and Garden Bulletin 82, "Selecting and Growing House Plants." Single copies are available free from the U.S. Department of Agriculture, Washington, D.C. 20250. Send your request on a post card. Include your ZIP code in your return address.

You can also obtain books that supply information about growing plants indoors from your local library.

Some publications aimed at American bonsai growers include:

Bonsai Bulletin, Post Office Box E, Bronx, N.Y. 10466.

Bonsai Journal, American Bonsai Society, 229 North Shore Dr., Lake Waukomis, Kansas City, Mo. 64151.

Bonsai Magazine, Bonsai Clubs International, Post Office Box 1032, Los Altos, Calif. 94022.

Texas Bonsai, Post Office Box 11054, Dallas, Tex. 75223.

OBTAINING THE PLANTS

There are many ways to obtain bonsai. At the beginning it is best to work with the more common plants. Most are obtainable at local nurseries. Plants that are native to the area where you live often make fine subjects for bonsai. But make sure these plants meet the bonsai requirements of size, leaf, trunk, and scale. (See fig. 11.)

Some old favorites grown as bonsai because of their classical good looks are: Sargent juniper (*Juniperus chinensis sargentii*); Japanese black pin (*Pinus thunbergii*); wisteria (*Wisteria floribunda*, *Wisteria sinensis*); flowering cherries (*Prunus subhirtella*, *Prunus yedoensis*); and graybark elm or sawleaf zelkova (*Zelkova serrata*).

Among the plants recommended for the beginner are: Firethorn (*Pyracantha coccinea* or *Pyracantha fortuneana*) which is an evergreen with small leaves; Cotoneaster (*Cotoneaster dammeri*) which has characteristics similar to those of firethorn; the Dwarf pomegranate (*Punica granatum nana*) which is deciduous, and has tiny green leaves; and Juniper (*Juniperus scopulorum* or *Juniperus virginiana*) which is a hardy evergreen with heavy foliage that takes well to pruning.

In addition to nursery stock, plants for bonsai can be collected from the wild or propagated from plants in your garden. (See discussion of propagation on page 19.)

Growers can now purchase mature bonsai created in this country; these plants have recently become available at selected nurseries. Mature bonsai plants also can be imported from Japan, but only deciduous varieties ship well.

Collecting plants from the wild.—The job of finding plants in the wild that adapt well to bonsai is difficult for the beginner. Traveling in wild terrain where such specimens are found can be hazardous. Also, at least a year must pass before a plant collected this way can be containerized, and much care is necessary to insure survival during this period. Wild plants, however, often look older than they actually are and make handsome specimens.

The best time for collecting plants in the wild is during March or April, when new growth or leaves have not yet begun to sprout. Here, the collector must recognize when the wild plant is in its dormant period.

On a collecting trip the following items will be helpful: a small collapsible shovel; polyethylene sheeting and string for wrapping root balls; sphagnum moss for packing around the root ball; a container of water for wetting leaves and root ball; and a small crowbar for getting roots out of rocks.

Remember the following points when taking plants from the wild:

1. Get permission to dig from the owner of the property.

2. Do not randomly dig wild plants. Make sure that the plant you are removing is not on your State conservation list. Remember that nothing can be removed from national parks and similarly conserved areas.

3. When digging the plant you want, try not to injure the taproots. Get as much soil around the roots as possible. Older trees will require greater care and a slower training schedule.

4. After you cover the roots and soil with wet sphagnum, wrap the rootball in polyethylene film. Wet the branches with water frequently.

5. At home, unwrap the rootball carefully. (It is not necessary to unwrap the rootball if it is wrapped in burlap.) Plant the tree in loose garden soil in a location that is protected from the sun and wind.

6. Water, and examine the roots of the new plant for several months. Feed the plant sparingly.

7. After at least 1 year, the plant can be dug up and placed in a container. (Large trees may have to go into a succession of smaller containers before they are ready.) Trim the roots around the base carefully so the plant will fit into its container.

8. If shaping is necessary when potting a collected tree, prune the branches lightly.

9. Two years after the plant has been collected from the wild, start it on a regular training program.

Importing mature plants.—If you are going to import bonsai trees from Japan, it is best to do so during their dormant period. Such plants are subject to severe fumigation before they are allowed to enter this country and thus are likely to be harmed by fumigation.

To find out which trees can be imported, check with Plant Protection and Quarantine Programs, Animal and Plant Health Inspec-

tion Service, U.S. Department of Agriculture, Hyattsville, Md. 20782.

Bonsai plants are now available that have been trained in the United States. These plants do not have import restrictions and have the advantage of being acclimated to various areas of the country.

The nursery plant.—The easiest and best method for the beginner to obtain bonsai is to buy nursery stock and develop his own. These plants come in 1- to 5-gallon cans and their root systems have become adapted to cramped conditions.

Buy only young, healthy plants when purchasing nursery stock. When searching for potential bonsai among nursery stock, do the following:

- Look for plants that are well rooted and well branched. The plant must be able to withstand severe initial pruning.
- Inspect the overall plant and then push back the foliage and examine the base from all sides. See if the foliage is full enough to be shaped into an interesting bonsai. Check to see if branches are where you will need them.
- Do not purchase a plant that cannot be easily transplanted to a pot.

Do not thin the root system excessively all at once when placing the plant in a smaller container. By thinning the roots gradually and reducing the root system safely over a period of years, you will not damage the plant. If you prune and shape first and neglect thinning the roots, some plants may die.

SHAPING YOUR BONSAI

Strive for flowing form when shaping bonsai. Visualize the overall theme and try to get a three-dimensional effect. Remember to select the front, back, and sides of your bonsai before pruning, and don't forget to examine the roots that will influence the growth of these areas.

For overall design the "Rule of Thirds" is a simple concept to use as a basis for obtaining a pleasing form for your bonsai. The "Rule of Thirds" (see fig. 12) assures you of getting the proper division of space. In this aid to design, the total space is divided into thirds—both horizontally and vertically.

Use your pruning shears judiciously to make changes that benefit your bonsai. Fine adjustments are made by wiring and bending and thinning (removal of branches).

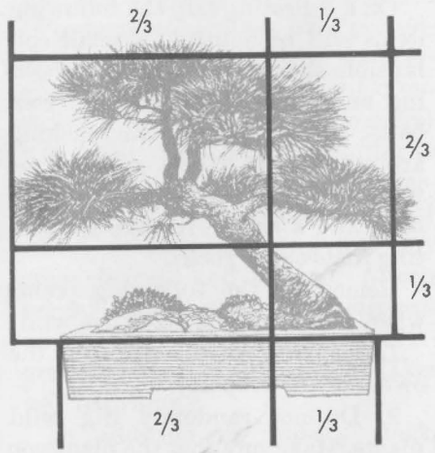


FIGURE 12.—The "Rule of Thirds" is a useful design aid when planning the overall form of your bonsai. The total space of plant and container is divided into thirds, both horizontally and vertically.

Remember that a badly designed bonsai will not grow well.

Before shaping a plant into a bonsai, decide whether the best attitude of the tree is upright, slanted, cascaded, or semicascaded. Examine the general form of the tree and note whether it is straight or twisted. Match the potential of a tree to the style that fits it best. Decide whether the base will rise from the soil level or whether you will expose bare roots.

Three basic operations are necessary to establish the basic form in bonsai culture: pruning, nipping, and wiring.

You will need the following basic tools: a pair of sharp hook-and-blade pruning shears; a garden trowel; blunt sticks; a pair of sturdy wire cutters; copper wire of various lengths; and a sprinkling can. Also useful are scissors for trimming leaves, tweezers for nipping, and brushes for cleaning top soil.

Pruning.—Nursery plants are often overgrown and need much pruning to establish their best form. Through pruning, you control growth and form by removing excess foliage and ugly limbs.

Some points to remember when pruning are:

- Make all cuts above a bud, a side branch, or a main fork of the tree. Remove all buds except those on the outside of the trunk to force the growth outward and upward.
- Leave stubs flush with stem; long stubs serve as an entry for insects.
- Avoid cutting back so far that you weaken the main branches.

When pruning, keep branches growing toward an open space instead of toward each other or the trunk. Do not shear bonsai as you would cut a hedge; shearing makes the plant look artificial.

After deciding on the foliage form for your bonsai, remove all crossed branches and any dead branches. Then thin other branches until the tree takes on the form you selected.

If you want to slant a tree that has been growing in an upright position and insure that branches take a normal shape, prune it in an upright attitude, and then tip it to where it should be and work on it that way.

Next, cut back new growth and thin out excess branches. When pruning an upright style, remove unneeded side branches and leave the center ones that will fill out as they grow.

Space out your pruning schedule, even if the plant has heavy foliage. Plants must have a certain number of leaves for photosynthesis.

Protect pruning scars when removing heavy wood from thick branches or from the trunk. Cut the wood as close to the trunk as possible, pare the stump flush, then scoop it out with a chisel, making a shallow wound that will heal without looking unsightly. Treat these wounds with grafting compound and they will be unnoticeable after healing. Several years must pass before bark will grow over these cut surfaces and replace the scar tissue.

Nipping.—A tree usually requires only one heavy pruning in its life to establish its basic form. After

this initial pruning, shaping is done by nipping. Nipping, or pinching back, is done to shape and develop the trunk and to control the overall size of the plant. Nipping controls new growth before it becomes so dense that it must be pruned.

A twiggy plant can be made more dense when it is nipped. When all terminal buds on a branch have been pinched, several side shoots develop. In this way side growth is stimulated. This will give the plant a bushier appearance.

Nipping is done not only to shape a plant but to develop more luxuriant foliage. As the new growth tips show up, nip them with your fingers, twisting rather than cutting or pulling. Also nip off tiny spurs that appear on the trunk or along heavy branches. These may develop into unsightly suckers that will leave scars when removed. Do not overdo this removal; be careful not to damage the foliage you leave on the plant.

After the top of a bonsai is pruned, trim the roots. Try to keep all fibrous roots and maintain a balance, if possible, of one branch for one root. Remove any roots that were damaged in digging. Leave the surface root system intact and make it appear as if the roots cling to the soil surface. Prune roots with sharp, sloping cuts to avoid damaging them.

Wiring.—The wiring and bending of branches that give bonsai its shape is unique to the art. Wiring is done after pruning when the tree has been thinned to essential branches.

Copper wire is usually used for shaping bonsai because it is flexible. The sizes of copper wire that are best for bonsai work are: 10, 12, 14, 16, and 18. (No. 8 wire is heavy and should be used only for the trunk.) Wire as light as No. 16 should be used for very thin branches, and for tying rather than bending.

Wire evergreen trees only during their dormant period when the branches can be shaped without damaging growth. Wire deciduous trees only during their growing season.

The day before you wire a plant do not water it; this will make the branches more flexible. Once a branch has taken on its trained form, remove the wire, straighten out its twists, and flatten it with a mallet for reuse.

Wiring and shaping should begin at the lowest point on the tree, working upward. Do the following when wiring:

1. Anchor the end of the wire at the base of the tree before winding it. Push the end of the wire deep into the soil.

2. Wire from the trunk to the main branch. Use a foam pad under the wire to prevent damaging the bark. Keep the turns about ¼-inch apart and spiral upward at a 45° angle. Do not wire too tightly, and do not damage leaves or stems.

One length of wire can serve for two branches by anchoring the center of the wire at the trunk.

After wiring, the plant is shaped or bent by hand. The trunk and main branches are gradually bent in the planned direction. Never try to straighten a branch that has been bent; this may split the bark.

Branches sometimes snap, even when carefully wired and bent. If the branch is not completely broken rejoin the broken ends, and wind some garden tape around the break. These fractures often heal quickly. If a branch snaps off, prune back cleanly at the first side branch.

Wire should be kept on the plant for not more than 1 year. Remove the wire before the bark becomes constricted; ridges will form if the wire is left on too long. When removing a wire, start at the outermost end of branches, and take care not to harm leaves, twigs, or bark.

CONTAINERS FOR BONSAI

Most plant material for bonsai has long roots that will not fit into a bonsai container. For this reason a training pot is used. The training pot is larger than a bonsai container and holds the heavy roots, which are gradually cut back, for a period of years until small, fibrous roots develop.

All kinds of containers are used for training pots: clay saucers, plastic containers, and wooden boxes of many different sizes. Many of these clay and plastic pots are available at garden centers. The azalea pot and the bulb pan are especially suitable. The pot should be just large enough to accommodate the tree's root system. It should be similar in shape to the bonsai pot which will eventually replace it.

For example, an upright tree, destined for a low, flat container, should be grown in a fairly low training pot. A cascading tree, to be planted later in a high bonsai pot, should be trained in an ordinary flower pot.

Make sure that all training pots you use have drain holes at least ½ inch in diameter.

Choose a pot in which to display your bonsai when the training of your bonsai is sufficiently advanced. The size and shape of this pot will depend on the size and shape of the tree.

Trees trained in the cascade and semicascade styles look best in round or rectangular pots. Plant the trunk in the center of the pot with the branches sweeping down over the side.

Place upright trees slightly off-center (one-third the distance from one end) in oval or rectangular pots. Place trees with thick trunks and dense foliage in deep, heavy pots.

PN–2713

FIGURE 13.—The trunk of this bonsai plant (*Berchemia paucifolia*) has cracks and scaly ridges that give it a look of age. Note the off-center placement of tree in round container.

Branches of a bonsai should harmonize with the shape of a pot. If the branches are longer at one side than the other, place the trunk off-center in the pot. (See fig. 13.)

The color of the pot should contrast with the tree's foliage. Use white, tan, or green pots for trees with brightly colored flowers or fruits. Use unglazed pots with pines and deciduous trees.

Generally, bonsai containers come in five shapes: round, oval, square, rectangular, and hexagonal. In each shape there is a wide variety of sizes.

Bonsai containers can be obtained from some of the larger nurseries. Chinese or Japanese hardware stores, and stores that specialize in imported items, also offer containers.

Bonsai plants must be anchored to their containers until the roots take hold. One method used to anchor the plant is to tie it down with wires leading up through the screens that are placed over the drainage holes in the container. After tying the plant to the container, adjust the plant's elevation.

Potting

At the end of the first year, the tree is usually transplanted from its training pot (or from the ground) into a pot suitable to its dimensions. Retain some of the original soil, and trim the roots if necessary. Cut away any abundant growth of new roots at the base of the trunk before repotting.

If only a few roots have formed around the taproot, prune these roots slightly. Prune the taproot again at the end of the second year, and cut it short at the end of the third year. This final cutting should be done when new roots have appeared at the base.

Repotting

Repotting of bonsai plants is usually needed when soil insects damage the plants, when the pot breaks, or when the soil is in poor condition. Sometimes, however, a soil condition can be corrected without repotting and disturbing the roots of the plant. This is done by adding new soil around the outer surface, or by removing plugs of soil and replacing them with a free-draining soil mix.

The health of trees grown as bonsai depends largely on the care of changing the soil in the pots and the proper pruning of surface roots.

A healthy bonsai puts out new surface roots every year. The growth of these roots makes it difficult for vital water and air to penetrate the soil. The surface roots will be nourished but the main root near the trunk will die. Therefore, periodically cut back the main root and thin out the surface roots.

A tree's rate of growth determines the frequency of repotting. Pines and spruces, for example, need repotting only once every 3 to 5 years; flowering and fruiting trees, every year or—depending on the variety—every second year. Repot quick-growing species, such as willow and crape myrtle, at least twice a year. These intervals apply to healthy trees that have received proper care.

Repot your plants in the early spring when the first new buds appear. A secondary season occurs in late summer or early autumn when, for a short time, the roots check their growth. It is dangerous to repot in late spring and early summer when the leaves are just open and still tender.

When the tree is in a dormant state it is unable to establish itself in the new soil and root diseases are likely. For this reason, bonsai must never be repotted in winter, except when kept in greenhouse culture.

GROWTH MEDIA

Soil mixtures vary a great deal depending on geographical area and personal preferences. There are many conflicting ideas on the type of mix to use.

Many growers find that bagged potting soil is satisfactory for potting bonsai plants. If you use bagged soils, make sure they contain sphagnum peat moss and coarse perlite in equal quantities. Bagged soils are available in most garden supply houses.

Generally, mixing soil should have rapid drainage, a structure that permits fine roots to develop, and contains decaying humus and mineral nutrients. It should also be free of root rot and have a pH similar to the tree's native soil. Try to avoid high levels of dry fertilizers in the soil mix. Screen bagged soil to remove the fine clay particles.

A good basic mix consists of one-third clay, one-third humus, and one-third sand. If you live in an area where humus is not available, then obtaining an artificial soil mix from your garden store or nursery is the only answer. River or quarry sand can be purchased from lumber yards and variety stores where it is sold under the name of white aquarium sand.

SEASONAL CARE

Bonsai from miniature forest trees must live outdoors all the time. They are brought into the house for short periods on special occasions. Bonsai from forest trees will die if kept too long indoors, particularly in overheated rooms. These bonsai may be brought inside once or twice a week for 2 or 3 hours—during winter, spring, and autumn. They should not be brought inside in summer unless the room is well ventilated.

Summer care.—Bonsai are very sensitive and thrive best in localities that offer cool nights, sunny days, and mist or rain almost daily. Most of the United States does not have this climate, so special provisions must be made to compensate for the lack of desired climatic conditions. Extremes in temperature, light, rain, and wind are to be avoided.

Place your bonsai on a platform or table in your garden where the plants can receive 3 to 5 hours of direct sunlight a day. The site should be shaded, preferably in the afternoon. If the area is subject to drying winds, put up screening around the plants to protect them. Screening also serves to provide the plants with shade.

Water the entire bonsai—plant and soil—daily. If you skip even 1 day you can permanently damage

the plant. Make sure your plants are located where rain can fall on them. However, plants should not remain wet or water-logged for long periods.

Fertilizer.—To maintain plant growth use fertilizer to supply nutrients. Maintain the nutrient level in the soil mix throughout active growth with monthly applications of a diluted liquid fertilizer. Apply fertilizer only before and during active growth. For liquid fertilizer you can use a typical house-plant fertilizer (20–20–20 or its equivalent) diluted to one-quarter to one-half the strength on the label.

Fall care.—During this period bonsai must be prepared to endure the approaching cold. Plant growth must be slowed. Water plants less frequently to slow growth, and, when growth slows, reduce applications of fertilizers.

Do not prune or cut any branches after mid-August. Do not use artificial night lighting (incandescent filament lamps) on plants after August 1. To reduce winter dieback of flowering trees and maples make light applications of 0–10–10 fertilizer.

Winter care.—A major problem in winter is to protect bonsai against low temperatures and drying winds. Bonsai can only be left outdoors in Climates where temperatures drop no lower than 28° F. This is not the case throughout most of the United States, so a greenhouse, pit, or coldframe is necessary.

Winter frosts will seldom bother bonsai that are sheltered under the foliage of a spreading tree. Watch out, however, during the frost period for drying soil.

Coldframes.—It is easy to construct a simple coldframe for bonsai. Before the ground is frozen, dig a hole at least 1½ feet in the soil. Make the hole as long and as wide as you need for all your plants. Line the sides of this hole with exterior grade plywood which extends 6 inches above the surface. Put 4 to 6 inches of gravel in the bottom of the hole, set your plant containers on this gravel, and spread straw around and over them. Put a loose-fitting cover on the frame made of polyethylene sheeting or any similar material.

Be sure the top of your coldframe is strong enough to withstand a heavy load of snow. Ventilate on days when the air temperature is above 40° F. to keep the plants cool and dormant.

To purchase a cold frame kit, check your local nurseries or see catalogs of mail-order garden supply houses.

Spring care.—Spring is the time when new bonsai are started. It is the time for any pruning and training of last season's bonsai. The plants then have a whole growing season to readjust to these changes.

Watering.—In the summer, during hot weather when the temperatures are over 90°, water the bonsai plants one or more times a day. If the plants are in an unusually sandy soil they will require watering three or more times a day.

In early autumn, follow the watering directions for late spring. In late autumn, follow the watering directions for early spring.

In winter, keep the trees in a coldframe and ventilate the plants on one or more sides to keep them dormant. Check for dryness every 2 weeks. Water the plants every second day, or less, as required. Keep in mind that far more bonsai are killed by overwatering than by a lack of water.

PROPAGATING YOUR OWN BONSAI

Seedlings. — Growing bonsai from seed is a slow process, unless you intend to grow plants whose maximum height will be 6 inches. A more nearly perfect tree can be grown from seed because the trunk can be shaped from the beginning to suit the grower.

To develop the trunk rapidly, plant seedlings in the ground outdoors; seedlings are kept outside from 2 to 5 years, depending on the type of material planted and its rate of growth.

Each spring dig up the plant and prune its roots just as if it were in a pot.

When you choose a seedling, select one that has small leaves to begin with. For example, silk oak and *cherimoya* seedlings have been successfully grown indoors.

Cuttings.—Starting bonsai from cuttings is faster than starting them from seed.

Make cuttings in the late spring and early summer, just before the buds open or after the new growth has hardened.

Plants that propagate easily from cuttings are olive, willow, cotoneaster, firethorn, azaleas, and boxwood.

Layering.—This is a simple and convenient method of rooting branches in the soil while they are still attached to the parent plant. The branches immediately have a well-established form and branch structure. Layering often results in good, balanced root systems.

Midspring is the best time to do soil layering. Choose a branch that has good form. Make sure the branch is low enough to reach the ground. Mark a point about one foot from the end of the branch and dig a hole in the ground 4 inches deep. In the soil, mix equal parts of sand and peat moss made from ground bark.

Make a slanting cut on the underside of the branch. Insert a pebble in this cut. Bend the branch back in the hole, taking care not to crack the branch. Anchor the bent branch in the hole with a wire loop, and stake the end of the branch in a vertical position. Then cover it with prepared soil, and water it.

In 9 months to a year the branch (layer) should have rooted. When this occurs, it is ready for transfer to a bonsai pot. (Remember to cut the stem just below the original cut when removing it for transfer.)

Softwood plants that are layered will root in 6 to 8 weeks. When they have rooted, be sure to cut them from the parent plant and pot them. Pinch off new buds until the layered stem develops a mature root system. Remember to keep the layered area

moist so that root systems will develop quickly.

Plants that propagate well by the layering method are: rhododendrons, maples, pomegranate, cryptomeria, and many others.

Grafting.—Grafting is complex and requires patience and practice, especially by the novice bonsai grower. It is not as successful as the other methods of propagation. One of the drawbacks for bonsai is that even after a graft has taken, an ugly scar remains. The "side" or "notch" grafting methods have the advantage of hiding the scar.

Grafting is usually done in the winter or early spring when the buds are dormant. There are numerous methods of grafting, but the most popular among bonsai enthusiasts are "cleft" and "whip" grafting.

DISPLAYING YOUR BONSAI

Indoor display.—Before you bring your bonsai indoors to display them, water them first and let them drain well. Wipe all dirt and dampness from the container.

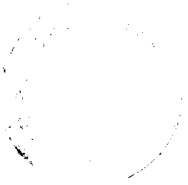
Bonsai look well placed in front of a plain wall on a raised stand. The Japanese display bonsai on a platform raised a few inches above the floor in one corner of the living room. Paintings and scrolls are hung against the wall at the back. Other objects, such as ceramic ware and flower arrangements, are grouped with bonsai on the platform.

If you set bonsai on a low stand or table, try using a small Japanese folding screen behind it. These stands can be purchased in oriental stores. It's a good idea to contrast the shape of the stand with the bonsai container; the height of the stand should harmonize with the height of the tree.

Bonsai in the garden.—Display bonsai in the garden on simple shelves set on concrete blocks. Place the shelves against an outside wall away from trees, and protect them from the sun. Other good locations for bonsai are slat benches and decks, either in the garden or adjoining the house. (See fig. 14.) Bonsai in large containers look better displayed alone. Place them on some kind of stand, rather than setting them on the ground.

PN–2714

FIGURE 14.—Bonsai tables for garden display are high enough to prevent cascaded plants from touching the ground. The lath overhead provides shade for the plants.



Photographs of bonsai in this publication furnished through the courtesy of Bonsai Clubs International, Los Altos, Calif., and Longwood Gardens, Kennett Square, Pa.

☆ U. S. GOVERNMENT PRINTING OFFICE : 1975 O - 567-820

THE
UNITED STATES

National Arboretum

Washington, D.C.

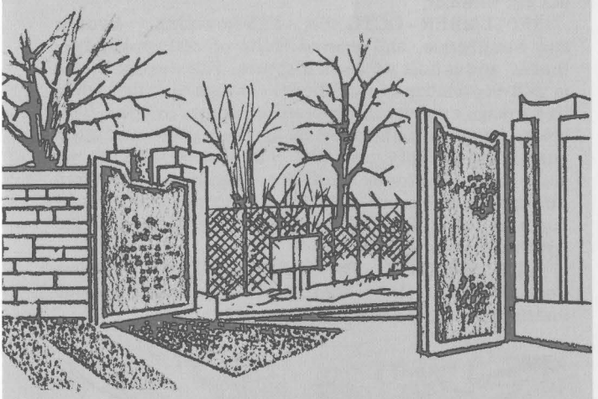
U.S. DEPARTMENT OF AGRICULTURE • PA-309

Rules for Visitors

The following regulations are necessary for the protection and functioning of the Arboretum:

- Visitors enter the Arboretum at their own risk.
- The vehicle speed limit is 15 miles per hour. Temporary parking is allowed on all blacktop roadways.
- Pets must be kept on leash.
- Children under 16 years of age must be accompanied by a parent or other responsible adult.
- All plants, fish, and wildlife are protected. Plant labels are not to be removed.
- Lunching or picnicking is not permitted.
- Please use receptacles for litter.
- The building of fires is prohibited. Visitors are requested to be especially careful during dry periods in disposing of cigars, cigarettes, and matches.
- Do not pick the flowers.

Two comfort stations are located near areas 2 and 15. Rain shelters are provided in areas 5 and 14 and drinking fountains in areas 3, 15, and 18.



Guide Service

Guide service is not regularly maintained; organized groups requiring the services of a guide should make arrangements for this service well in advance of the proposed visiting date.

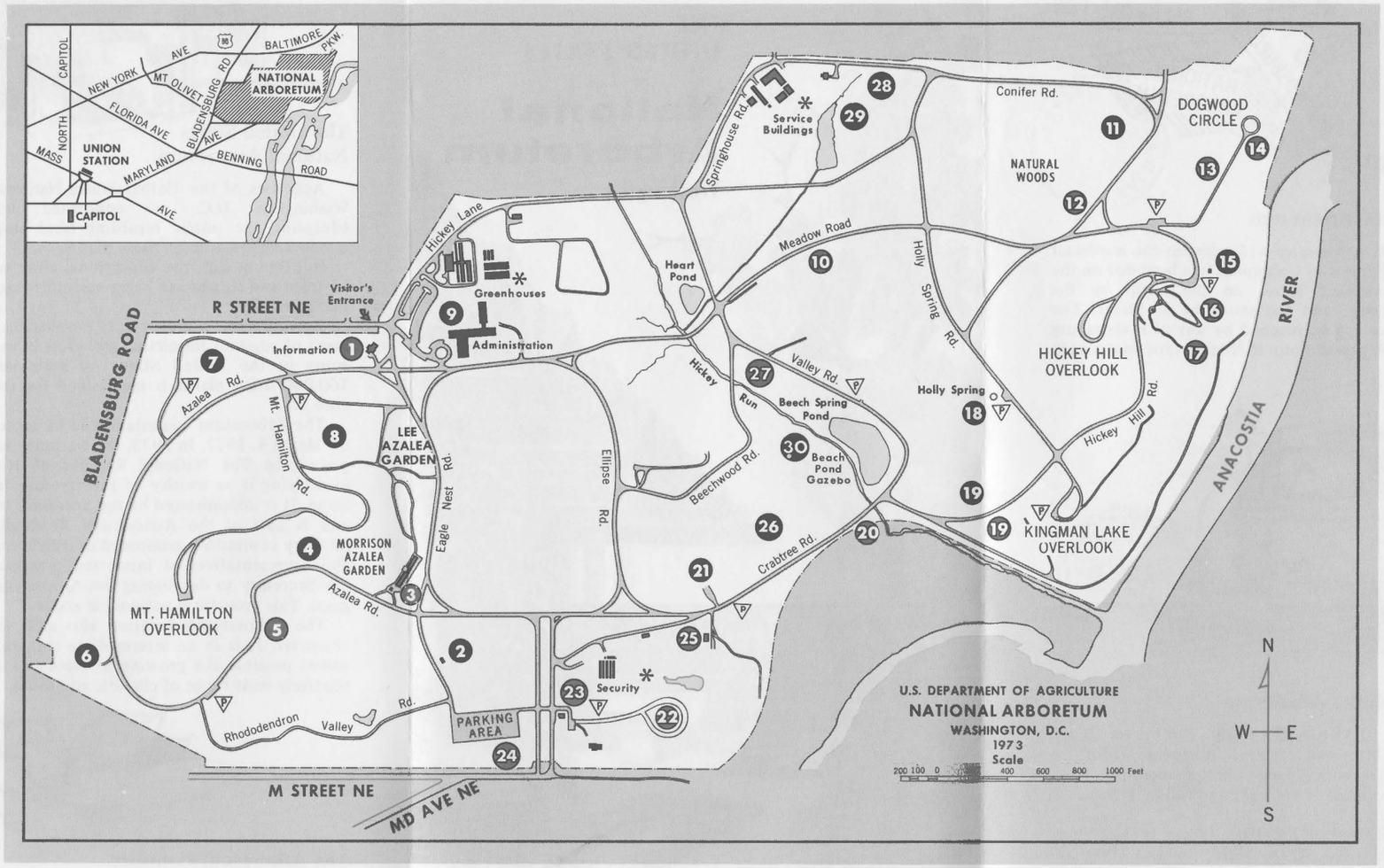
Visiting Hours

The Arboretum grounds are open every day of the year except Christmas. The visiting hours are as follows:

APRIL through OCTOBER
Monday through Friday—8 a.m. to 7 p.m.
Saturday and Sunday—10 a.m. to 7 p.m.

NOVEMBER through MARCH
Monday through Friday—8 a.m. to 5 p.m.
Saturday and Sunday—10 a.m. to 5 p.m.

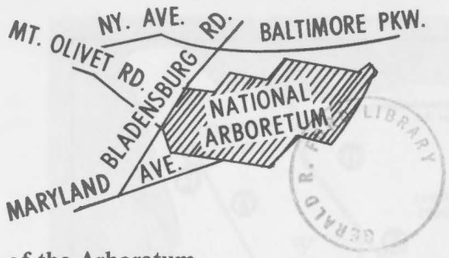
The Administration Building and the Information Center are open on weekdays from 8:00 a.m. to 4:30 p.m. and on weekends for scheduled events only. The greenhouses are not open to the public.



Items of Special Interest

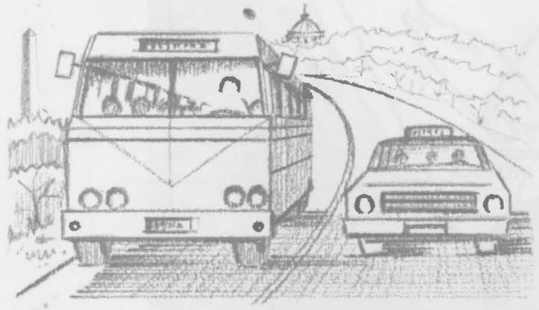
LOCATION		LOCATION		LOCATION	
1.	Information Center	11.	Gotelli Dwarf Conifer Collection	21.	Fern Valley
2.	Rest rooms	12.	Dawn Redwood	22.	Touch-and-See Nature Trail
3.	Morrison Azalea Garden, drinking fountain	13.	Dogwood	23.	Security Office
4.	Azalea Hillside	14.	Rain shelter	24.	Drinking fountain
5.	Azalea Valley, rain shelter	15.	Rest rooms, drinking fountain	25.	Drinking fountain
6.	Viburnum	16.	Camellias	26.	Daffodils, Ivy
7.	Boxwoods, Daylilies, Peonies	17.	Gazebo	27.	Crape-Myrtles, Hibiscus, and Lilacs
8.	Rhododendrons	18.	Holly Walk, drinking fountain	28.	Maple
9.	Administration Building	19.	Crabapple	29.	Spring houses
10.	Research plots	20.	Baldcypress	30.	Beach Pond Gazebo

**Not open to the public.*



Location of the Arboretum

The Arboretum occupies 415 acres in the northeast section of the District of Columbia. It is bounded on the west by Bladensburg Road, on the north by the Baltimore Parkway, and the south by M Street. The visitor's entrance can be reached by way of Bladensburg Road and turning east onto R Street. (See insert map inside.)



How to Reach the Arboretum

CARS OR TAXICABS.—From downtown Washington, take Maryland Avenue northeast from the Capitol to Bladensburg Road. Follow Bladensburg Road to R Street Northeast. Turn right and follow R Street to our visitor's entrance.

PUBLIC TRANSPORTATION.—From central Washington, take bus No. 42 to Fifteenth and D Streets Northeast; then change to bus B-2, "Mt. Rainier," to intersection of Bladensburg Road and R Street. Walk east on R Street 300 yards to the R Street gate.

Information and maps of the Arboretum grounds are available at the Information Center, located across the roadway from the Administration Building near the R Street gate.

For further information apply at the office of, or write or call

U.S. National Arboretum
Washington, D.C. 20002
Phone:399—5400

Revised July 1974

GPO : 1972 O - 472-472

THE
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The United States National Arboretum

Activities of the United States National Arboretum, Washington, D.C., are concerned primarily with educating the public regarding trees and shrubs, and conducting research on these plants.

In keeping with the educational aims, many varieties of trees and shrubs are being assembled and labeled for public display.

Research on woody plants emphasizes the development of superior forms that will grow in various climatic zones in the United States. A herbarium containing 500,000 dried plants is maintained for technical reference.

The Arboretum was established by an act of Congress on March 4, 1927. In 1973, the National Arboretum was placed on The National Register of Historic Places, identifying it as worthy of preservation for its historic value. It is administered by the Secretary of Agriculture, and is part of the Agricultural Research Service. An advisory committee, composed of public-spirited citizens and representatives of interested organizations, assists the Secretary in developing the Arboretum and its program. This program is national in scope.

The Arboretum's location also adds to its national character. It is in an intermediate climatic zone, which makes possible the growing of trees and shrubs from a relatively wide range of climatic situations.

The Arboretum Plantings

Plants are arranged in different combinations throughout the Arboretum. Nine miles of paved roads provide access to the principal plant groups. These groups are indicated on the map (inside).

In direct view of the R Street entrance is the site of the planned 30-acre "synoptic" garden, which will contain representatives of all the plantings in the Arboretum.

In the Arboretum are single-genus groupings of hollies, crabapples, and azaleas. Simple and mixed plantings are grouped for landscape effect. Other plantings are grouped for use as ground covers and bank covers. Plants in the Morrison Azalea Garden are grouped in a formal arrangement.

Plant groups of unusual interest include the azalea plantings, which are among the most extensive in the Nation; the collection of Oriental plants in the Crypto-meria Valley of the Garden Club of America; the Gotelli Dwarf Conifer Collection; the dogwood plantings of the Woman's National Farm and Garden Association; and Fern Valley, sponsored by the National Capital Area Federation of Garden Clubs and other organizations.

Seasonal Highlights

LATE MARCH—EARLY APRIL.—The early leaf greens, flowers of camellias, the first pears, magnolias, and early bulbs which have been naturalized in considerable quantity.

MID-APRIL.—Quince, magnolias, the earlier azaleas and rhododendrons, daffodils, and the flowering cherries and crabapples.

LATE APRIL AND MAY.—The main mass of azaleas, flowering dogwood, and the later crabapples are followed by native azaleas, mountainlaurel, the huge blooms of the elephant-ear magnolia and peonies.

JUNE—AUGUST.—Daylilies are followed by crape myrtles and hibiscus. Scattered shrubs bloom throughout the summer.

SEPTEMBER—OCTOBER.—Fall-flowering Lycoris and Sternbergia, and massed fruits of crabapples, firethorns, and a host of berried shrubs. Fall display begins in mid-September and continues through October, when tree foliage exhibits its spectacular change in color. This color change is highlighted by the rich yellows of tulip poplar and hickory, and the reds and bronzes of the gums and dogwoods that are abundantly scattered throughout the native woodlands. Through October and much of November, fall-blooming camellias provide the last flower show of the year.

ALL SEASON.—The Gotelli Dwarf Conifer Collection, the Holly Walk, and Fern Valley provide interest throughout the growing season.

Bicentennial Breakfast Menus

This is the year of America's 200th birthday. Here are a few breakfast menu suggestions to help you celebrate the Bicentennial through the School Breakfast Program. This program—run cooperatively by Federal, State, and local governments—provides an opportunity for children to receive a nutritious breakfast at school. Administered nationally by the U.S. Department of Agriculture's Food and Nutrition Service, it is available to all public and nonprofit private schools of high school grade and under.

The following menus do not indicate portion sizes. Keep in mind, however, that one-half pint of milk, one-half cup of fruit or full-strength fruit or vegetable juice, and one slice of whole-grain or enriched bread or allowable substitutes are the minimum breakfast program requirements. USDA also recommends that protein-rich foods such as eggs, meat, fish, poultry, cheese or peanut butter be served as often as possible.

These menus offer some ideas for relating our bicentennial heritage to the breakfast program. Teachers and students in your school may have suggestions for names of menu items which correspond more directly with their classroom history lessons.

Bicentennial Breakfast Menus

Theme: American Revolutionary War Groups

Patriot Peaches
Sons of Liberty Loaf *(blueberry muffin)*
Minutemen Milk

Theme: Famous American Women of the Revolutionary War

Elizabeth Clark Cooler *(orange juice)*
Betsy Ross Crunchies in
Molly Pitcher Milk *(dry cereal in milk)*

Theme: Famous American Men of the Revolutionary War

Benjamin Franklin Fruit *(canned peaches)*
George Washington Wurst *(sausage)*
Thomas Paine's Cerealized Oats *(oatmeal)*
Patrick Henry's Liberty Milk

Theme: Liberty Breakfast

Paul Revere Peaches *(canned peaches)*
Sons of Liberty Bacon
Puritan Pancakes *(pancakes with butter and syrup)*
Washington Milk

Theme: Puritan Pride

Plymouth Juice *(orange juice)*
Yankee Doodle Porridge *(hot oatmeal)* with
Mayflower Milk

Theme: The Spirit of the Revolution

Thomas Paine Plums
Spirit of '76 Eggs *(scrambled eggs with pimento)*
Mayflower Milk served over
Minutemen Rice Crispies

Theme: Soldiers' Breakfast

Concord Grape Juice
Log Cabin *(peanut butter and jelly sandwich)*
Minutemen Milk

Theme: Gold Rush

Westward Ho Fruit Cocktail *(canned mixed fruit)*
Pioneer's Ice Cream *(corn meal mush)*
Covered Wagon Milk

Theme: Deep South Breakfast

Confederate Nectar *(orange juice)*
Dixie Scramble *(scrambled eggs with cheese)*
Cotton Balls and Sunshine *(grits and butter)*
Magnolia Juice *(milk)*

Theme: Thanksgiving Breakfast

Wild Blueberries *(fresh or canned berries)*
Plymouth Pancakes with Syrup
Milk

Theme: Golden West Breakfast

Golden State Orange *(wedges)*
Miner's Sausage or
Gold Rush Scrambled Eggs
Sourdough Rolls
Milk

Theme: Southern Pride

Georgia Spiced Peach Half
Country Ham
Plantation Biscuits
Milk

For more information, contact:

In Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont: U.S. Department of Agriculture; Food and Nutrition Service; New England Regional Office; 34 Third Avenue; Burlington, Massachusetts 01803;

In Delaware, District of Columbia, Maryland, New Jersey, New York, Pennsylvania, Puerto Rico, Virginia, Virgin Islands, and West Virginia: U.S. Department of Agriculture; Food and Nutrition Service; Mid-Atlantic Regional Office; 729 Alexander Road; Princeton, New Jersey 08540;

In Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee: U.S. Department of Agriculture; Food and Nutrition Service; Southeast Regional Office; 1100 Spring Street, N.W.; Atlanta, Georgia 30309;

In Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Ohio, and Wisconsin: U.S. Department of Agriculture; Food and Nutrition Service; Midwest Regional Office; 536 South Clark Street; Chicago, Illinois 60605;

In Arkansas, Colorado, Louisiana, Montana, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah, and Wyoming: U.S. Department of Agriculture; Food and Nutrition Service; West-Central Regional Office; 1100 Commerce Street, Room 5-D-22; Dallas, Texas 75242;

In Alaska, American Samoa, Arizona, California, Guam, Hawaii, Idaho, Nevada, Oregon, Trust Territory, and Washington: U.S. Department of Agriculture; Food and Nutrition Service; Western Regional Office; 550 Kearny Street, Room 400; San Fransisco, California 94108.

Child Nutrition Programs of the United States Department of Agriculture are available to all children without regard to race, creed, color, or national origin.

FNS-153 U.S. Department of Agriculture Food and Nutrition Service February 1976

GPO 900-602