Agricultural Research Service

The Agricultural Research Service (ARS) is the principal in-house research Agency of the U.S. Department of Agriculture.

ARS research has long been associated with higher yields and more environmentally sensitive farming techniques. But the impact of ARS research extends far beyond the farm gate and the dinner table. Agricultural research is as much about human health as it is about growing corn.

For example, ARS recently developed a fat substitute called Oatrim. Not only does this technology benefit farmers by providing a new use for oats, it also enables processors to produce tastier low-fat foods. Consumers may reap the biggest benefits: Oatrim-rich diets lower the bad (LDL) type of cholesterol without decreasing the good (HDL) type, and they improve glucose tolerance.

ARS research is also as much about development of industrial products such as printing ink from soybeans and other crops as it is about development of high-yielding wheat varieties. And like Oatrim, printing inks made from 100-percent soybean

oil instead of petroleum solve more than one problem. Unlike petroleum, soybeans are a renewable resource, and this technology diversifies markets for soybean farmers and choices for ink manufacturers and printers.

ARS research provides solutions to a wide range of problems related to agriculture—problems that require long-term commitment of resources or that are unlikely to have solutions with a quick commercial payoff that would tempt private industry to do the research.

These problems range from fighting the ongoing battle to protect crops and livestock from costly pests and diseases, to improving quality and safety of agricultural commodities and products for humans, to making the best use of natural resources. All the while, the research results must help ensure profitability for producers and processors while keeping costs down for consumers.

To develop solutions to these problems, ARS scientists carry out basic, applied, and developmental research. These are inextricably linked. Scientists cannot do applied and developmental research without the foundation provided by basic research; and ARS basic research must point toward specific uses for new knowledge resulting from the research. Also, basic research is necessary because it helps in anticipating new problems and providing information needed for rational nationwide policies.

For more information about ARS, see its Home Page at *www.ars.usda.gov*

- ***A Year in Research: Selected Highlights***
  - ***Stopping Lyme Disease at Its Source***

    Ticks that transmit Lyme disease to humans may find it deadly to hop on a white-tailed deer. That's because of a new deer feeder dubbed "the four poster" and patented by ARS. The feeder gets its name from four pesticide-loaded rollers that rub tick-killing chemicals on a deer's head and neck as it sticks its head inside to feast on corn.

    Eliminating adult ticks prevents egg laying, thus preventing another generation. Treated deer help eliminate ticks from wooded areas rather than leaving the pests behind to find another host.
  - ***What We Eat in America***

    American diets are changing in content and variety, and in the location where the foods are bought and eaten, according to data from the first year of the ongoing 3-year survey, "What We Eat in America."

    This statistical snapshot of the American diet reveals that consumption of dietary fat has continued a downward trend. Vegetable consumption is low, especially consumption of dark green and deep-yellow vegetables. And fruit consumption has risen 20 percent since the late 1970's, mostly because of an increase in fruit juices.

    The biggest change is an increase in grain products. Consumption of grain mixtures such as lasagna and pizza has

increased 115 percent in the last 17 years. Snack foods have soared 200 percent. Ready-to-eat cereals are up 60 percent.

- ***Bringing Forth a Better Tomato***
  Tomato plants grown from tissue culture promise fruit that's consumer-friendly. ARS scientists developed a special tissue culture medium that's unfriendly to plants with a low sugar/solids content. Survivors in the medium bear fruit with enhanced sweetness, increased meatiness, and extended shelf life. Testing is being conducted by an Oakland, CA, firm under a Cooperative Research and Development Agreement.
- ***Parasite-Free Pork***
  A genetically engineered protein provides a rapid and sensitive test for diagnosing pigs carrying Trichinella spiralis*, the organism that causes trichinosis in humans. ARS scientists isolated a naturally derived parasite protein, called an antigen, that triggers the body's immune system to send out antibodies to fight off the parasite. In studies, the natural antigen detected 98 percent of cases in experimentally infected swine. To improve the test, scientists have copied and reproduced the parasite's gene that makes the antigen. The improved antigen will aid the pork industry in making parasite-free pork available to consumers.*
- ***Online Window to ARS Research***
  TEKTRAN, an online database of information from ARS research labs, contains about 13,000 summaries of research findings. Available on the World Wide Web, TEKTRAN also offers links for investigating new ARS technologies available for licensing. Browsers can conduct a full-text search of the summaries, including titles, keywords, and author information. They can also search by categories such as nutrition, germplasm, pests, and soil management. The address is: http://www.nal.usda.gov/ttic/tektran/tektran.html
- ***Remote-Sensing System***
  A remote-sensing system developed by ARS is the scientific launch pad for a four-satellite commercial network planned for Earth orbit in 1999. It is expected to reveal such details as too much or too little soil moisture; nutrient deficiency in a crop; and emerging weed, insect, and disease outbreaks. The system would be the first commercial system to deliver data, up to twice daily, to farmers within 24 hours of being obtained from satellites.
- ***New Test for Rice***
  A new test will help breeders find rice plants that have genes for greater resistance to zinc deficiency, a condition that costs farmers millions of dollars in lost yields annually. ARS scientists developed the test in which rice seedlings grow in a special

nutrient solution that lowers zinc availability, while providing all other nutrients needed for normal growth. By supplying all the needed nutrients except the one being tested for, the solution avoids the risk of creating a deficiency of another nutrient that could cause confusing results. Field tests have borne out the lab results.

- ***Befriending a Foe of the Gypsy Moth***
  Two decades of persistence by ARS scientists have renewed attempts to establish a small Asian wasp in the United States. Gypsy moth caterpillars are the worst insect pests of forest and shade trees in the East. But after an egg of a Rogas indiscretus *wasp hatches inside the caterpillar, the young wasp eats the pest's insides. From 1968 to 1977, scientists released about 30,000* Rogas *wasps, which promptly vanished. But in 1994, the last year of a 20-year monitoring study, scientists spotted several Rogas cocoons. The discovery led to the first new* Rogas *shipment in decades—about 200 cocoons collected in India and shipped to an ARS lab in Delaware. Several thousand wasps are planned for release in Maryland, Michigan, and Pennsylvania in 1997.*
- ***Tracing Leptospirosis to Its Source***
  An outbreak of human leptospirosis in Nicaragua was traced to its source—dogs—using a diagnostic test developed by ARS veterinarians. Before ARS diagnostic work, other researchers and health officials suspected rats as the source of the bacteria. The disease produced pulmonary hemorrhaging leading to illness and death in thousands of Nicaraguans. Humans can get leptospirosis from exposure to animal urine through contaminated soil or water.
- ***Cotton With Built-in Odor Resistance***
  A new antibacterial agent for cotton products uses peroxide and magnesium to kill microbes and retain the antibacterial properties for over 50 washes. Normally, industries such as diaper services use a chemical wash every time they clean diapers to impart these qualities. But now, the odor resistance can be built in. Other potential markets for the treatment, which is available for commercial licensing, could include athletic wear such as socks or shoe insoles.
- ***Good Reasons To Encapsulate Herbicides***
  When ARS scientists measured vapor losses after application of alachlor and atrazine to unplowed cornfields, the results verified the advantages of encapsulating herbicides in cornstarch. Herbicides that are sprayed on crop fields are exposed to wind, rain, and warm temperatures that facilitate herbicide loss into the air as a vapor. Scientists found that these airborne herbicides can land in waterways as far as 150 miles away. Encapsulating herbicides in cornstarch packaging delivers them to the right spot in the soil, reducing the chance that they'll be lost in the air. Encapsulating also decreases the risk of ground water contamination.

- ***Saline-Tolerant Sunflowers***
  Cultivated sunflowers may become a common sight on land that's now unproductive or produces poor crops because it's overloaded with mineral salts. ARS geneticists have identified genes in a species of wild sunflower called Helianthus paradoxus *that enable seedlings to withstand the salts. That salinity tolerance trait has been bred into some experimental sunflower lines. This trait could also provide drought tolerance that would boost acreages capable of producing sunflowers. Salts usually build up in soils of dry areas that have been irrigated excessively.*