

Growing Food On The Trip To Space

UNIVERSITY PARK (Centre Co.) — Tomorrow's astronauts will add two unusual descriptions to their job titles: farmer and vegetarian.

NASA's Controlled Ecological Life Support System (CELSS) project is the theme of the Penn State National Space Grant College booth at the Pennsylvania Farm Show, Jan. 9-14.

For long-term survival in space, NASA astronauts will be required to grow their own food. They will plant, harvest, and consume a range of redesigned vegetables and legumes specially developed to grow fast in confined areas and provide them with complete dietary protein to be totally edible — right down to the hulls and stems.

On display will be the progress of CELSS, one of NASA's quieter efforts, in supplying each astronaut via plants with the daily human essential of about one pound of food, three-quarters of a gallon of recycled water, and 800 liters of oxygen — all in a closed environment where everything must be recycled.

Today's space travel is limited by the weight of carrying such supplies, as well as the plant and human wastes that accumulate. But with extended stays on the moon or a three-year trip to Mars on the horizon, carrying such vast amounts of food and waste are impossible. Enter the CELSS project.

CELSS use both chemical and biological processes to solve not only food but oxygen and water requirements to support human life in space. Plants and algae will

be used for water purification and oxygen release as well as for food.

NASA researchers are adapting rice, cow peas, brassica, carrots, and lettuce for astronaut farming projects in space. The goal? To produce nutritious and delicious foods that can be eaten in their entirety, producing no garbage.

Cow peas, for instance, can be eaten as a vegetable in the baby pod form, as a salad made from its leaves, as a legume using the mature peas, and to finish it off, remaining stems and roots can be combined with rice to produce a highly nutritious complete protein pasta. Result? No waste, no garbage, released oxygen, and purified recycled water.

Astronauts' vegetarian diet will also include genetically altered rice "beefed up" by adding two essential amino acids to produce a whole protein.

The implications are clear for space ship Earth: less than an acre of arable land is currently available to feed each person on Earth, plus another acre available for additional food production through grazing. But as the world's population doubles in the next forty years, arable land will remain constant.

Ever more recycling of resources will be necessary, including miniaturization of plants that have faster growing seasons on smaller amounts of ground while providing more complete protein — exactly what CELSS is developing.

Genetically altered rice is expected to help solve lingering nutrition problems for the 40 percent of the Earth's population whose

diet is based on rice.

Futurists predict that homes one day will contain a refrigerator-sized growing chamber or "salad machine" adapted from space travel to provide home grown lettuce, carrots, and other vegetables, pesticide-free.

"NASA must reach for the stars and bring back to America dual-use technology to improve life on Earth," said Daniel Goldin,

NASA's top administrator.

The Penn State National Space Grant College and Fellowship Program, a NASA-funded educational program under its director Dr. Sylvia Stein, is part of the Pennsylvania Space Grant Consortium, an eight-institution coalition dedicated to improving science and technology education at all levels from elementary to grad-

uate school.

For more information about the CELSS project, see Farm Show booth 538 (main floor) or contact the Penn State National Space Grant College at 101 S. Frear, University Park, PA 16802-1680, (814) 863-7688. Contact Dr. Hector Flores, professor of plant pathology, College of Agricultural Sciences, Penn State, (814) 865-2955.

Exhibit To Highlight Ag Safety, Health

HARRISBURG (Dauphin Co.) — Farm safety specialists in Penn State's College of Agricultural Sciences are asking farmers to consider the potential for serious accidents involving power takeoff (PTO) drivelines. In 1992, one person died and two others were seriously injured in PTO accidents in Pennsylvania.

Farmers can learn more about PTOs and other farm safety topics by visiting the Penn State College of Agricultural Sciences exhibit at the 1993 Pennsylvania Farm Show, January 9-14 in Harrisburg. The exhibit will feature Penn State's efforts to promote agricultural safety and health, including a recently developed PTO accident simulator.

PTO drivelines enable farmers to use their tractor's engine to drive other equipment. But arms and legs, loose clothing, jewelry or hair can catch in the driveline, instantly reeling the victim into

the rapidly spinning mechanism. Victims have included female farmers whose hair became entangled in spinning PTO shafts, causing serious scalp injuries.

"Imagine being pulled into a metal shaft that spins between 540 and 1,000 times per minute," said Dr. Dennis Murphy, professor of agricultural engineering. "In the blink of an eye, you could lose your arms, your legs or your life."

The PTO accident simulator safely shows participants the speed of PTO accidents. "The simulator lets visitors experience firsthand just how dangerous farm tractor and equipment power takeoff shafts can be," said Murphy.

The computer-driven simulator tests how quickly participants could pull away from the driveline in an accident. The simulator randomly selects the timing of the "accident" so the person isn't expecting it. "This approximates the surprise present in a real-life situation," Murphy said.

After the "accident," the simulator displays the shaft's speed

and horsepower as well as the person's reaction time. Using these factors, the simulator calculates how far the victim would have been wrapped around the driveline in a real accident.

"It's impossible to react quickly enough to avoid harm," Murphy said. "Some people react extremely quickly, but all would be wrapped between one to three feet around a real PTO shaft."

Murphy urges farmers who work around PTO's to observe basic safety rules. "Make sure that all PTO shields are in place and working properly, and replace defective parts," he said. "Keep loose clothing, long hair and untied shoe strings at a safe distance from an operating PTO."

The 1993 Farm Show will open to the public on Saturday, January 9, and close on Thursday, January 14. Hours are 8 a.m. to 9 p.m. Saturday, Monday, Tuesday and Wednesday; 11 a.m. to 6 p.m. Sunday; and 8 a.m. to 4 p.m. Thursday. Parking is \$2 and admission is free.

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