ASTRONAUTS SOW SEEDS OF FARMING IN SPACE

The Palm Beach Post - Friday, December 20, 1996

Author: *JENNY STALETOVICH ; Palm Beach Post Staff Writer*

Old MacDonald has traded in his overalls for a space suit.

But on this farm, there are neither ducks, nor cows, nor pigs. Instead, there are integration containers, environmental data systems and a Svet chamber to grow wheat. And the wheat - sown and grown in a shoe-box-size metal box - is as green and beautiful to its space farmers as any grown on Earth.

This month, farmer-astronaut John Blaha harvested the first crop aboard the orbiting space station Mir, taking a giant step toward long-term life in space.

"We've had the first space farm," said Utah State University's Dr. Frank Salisbury, who pioneered the program with NASA and Russian scientists.

"We've had plants up there for years, but this complete cycle with a crop plant is the first," added Salisbury, who retires in June following a 42-year career dedicated to space farming.

During a media hookup with Mir on Thursday, Blaha led a short tour of the Mir's greenhouse module, pointing out a new crop that has already grown 5 inches in two weeks.

"It's quite a very complex experiment as you can see," he said as he bounded through the micro-gravity farm.

Growing the wheat is part of what scientists call a "regenerative life support system," or a space farm that is almost entirely self-sufficient.

The wheat was harvested Dec. 6 from 32 dwarf plants grown in a material resembling cat litter. About 400 seeds had to be rounded up by Blaha after they floated free during the harvest. What the farmers suspect is that it's cheaper to grow food than ship it, Salisbury said.

It costs about $10,000 to send a two-pound meal into orbit. "That would be an expensive steak."

More importantly, plants are used to purify water, soak up carbon dioxide and produce oxygen and food. What's left over - human and plant waste - gets reused as fertilizer. Scientists found that while it's unlikely they'll top Earth harvests - about 18,593 million bushels in 1995 - anytime soon, they can grow higher yielding plants in half the time it takes on Earth.

"Wheat has been our model crop that we've used to prove the feasibility of the system," said Dr. David Bubenheim, Salisbury's research partner at NASA's Ames Research Center outside San Francisco.

No easy step when you consider space lacks most of the elements that make things grow.

Growing food in space has been studied since the 1960s. The Russians started first, creating a program in Siberia, Salisbury said. In 1972, he heard the Russians had built a chamber supporting both crops and humans and knew they were gaining ground. But soon after, NASA abandoned the idea. The Russians plodded on, he said.

"We hardly knew about them in the cold, the very cold, cold part of the war," he said.

Then, in the early 1980s, Salisbury met and became friends with the director of the Russian program. In 1990, he and other NASA scientists were invited to grow crops on Mir. NASA had resumed its studies in the late 1970s, Bubenheim said, and provided the necessary grants.

"I'm glad we got to beat them," Salisbury says now of his team's findings.

Attempts at micro-gravity plants have failed for various reasons, some complex and some simple. Once, when the watering system faltered, cosmonauts forgot to water them.

Light posed the biggest problem, Salisbury said.

"We never had enough lights. NASA engineers would say you can have 80 watts and you need 200 to even come close."

Finally, researchers developed a complex growth chamber that holds the seeds and growing material as well as pipes in water, sucks up exhaust and produces better light with less power. All this had to contain the farmers' "fields" in the absence of gravity.

"Cosmonauts get very upset when those little pieces of kitty litter come floating around," Salisbury said. "One of our colleagues was awakened in the middle of the night by an angry cosmonaut calling down to say that stuff was floating around."

Their discoveries have led them to conclude that plants respond to a complicated mix of stimuli when they grow.

"Gravity is not the only stimulus that allows plants to identify an up and down and it appears other environmental factors like light, (and)maybe water in the root zone. Those things provide cues for the plant to orient itself," Bubenheim said.

The space wheat grew surprisingly straight, he said.

But they won't be able to examine the actual wheat until shuttle Atlantis retrieves Blaha and his harvest from Mir next month. They'll also get samples from another 68 plants planted and harvested at different stages of growth.

Scientists have already determined that it takes about 10 square meters to grow enough wheat to produce the 3,000 calories a day necessary to support a person, Bubenheim said. But since man can't live on wheat alone, scientists went a step further. They found that it takes about 25 square meters to grow enough kinds of vegetables to provide a balanced diet.

Altogether, NASA is working with about 100 different plants but focusing on 10, including tomatoes, potatoes, sweet potatoes, strawberries, lettuce and a South American grain called quinoa.

The next obstacle is recipes. NASA chefs, Salisbury and Bubenheim said, are busy in the kitchen.

Like other discoveries in space (remember Tang and Teflon), space wheat - or at least the way it's grown - is likely to show up on Earth.

Already, Bubenheim is working with researchers in the drought-prone Middle East, helping farmers determine when to fertilize and irrigate to best conserve water and cut back on agricultural run-off in sandy soils.

And most importantly, discoveries are being used in the South Pole, which researchers from the National Science Foundation are using as a test kitchen for growing food for Mars, Bubenheim said.

"The long term is to develop regenerative life support systems to enable travel and extended scientific missions on other planets like Mars," he said. "And we're gearing up to go to Mars. We're within 10 years."

Caption: GRAPHIC (B&W)

STEVE MADDEN/Staff Artist SPACE HARVEST NASA's space farmers are working to perfect a system to grow wheat in near-zero gravity. They hope future harvests will sustain space travelers on Mars or in space stations. Here's a look at a growth chamber being used on the MIR space station
Memo: Ran all editions.

Edition: *FINAL*
Section: *A SECTION*
Page: *1A*
Index Terms: *SPACE AGRICULTURE RESEARCH*
Record Number: *PBP12200101*