damage the bones.

The corps then called in two scientific curators—Michael Trimble, the corps' chief of curation, and Madeleine Fang of the Hearst Museum of Anthropology at the University of California, Berkeley—to inventory and repackage the bones. They found that Kennewick Man now has three pubis bones, says Conway—which means that one doesn't belong to the original skeleton.

Newspaper accounts—a key source of information about Kennewick Man these days—cited corps sources as saying that the extra bone was among the original material handed over by Chatters. That prompted rumors of sloppy research and even suspicions that the original skeleton collected by Chatters was a hoax, concocted from various remains, several archaeologists told *Science*. Asked for clarification, Conway told *Science* "this [pubis] bone was not part of the original material collected by Chatters and turned over to the corps." Rather, the extra bone was gathered during the later surveys.

The latest round of research began when Gary Huckleberry, a geoarchaeologist at Washington State University in Pullman, and a team of independent scientists including Chatters asked to study the sedimentary environment of the site. Huckleberry wanted to dig a trench, 1.5 meters deep and 15 to 30 meters long, to understand the skeleton's geologic context. The Umatilla Tribe opposed the digging, saying that the site is a cemetery and is culturally sensitive. The tribe then filed its own research plan to search for artifacts by screening sediments. And the corps decided to investigate the age of the sediments, says Lillian Wakeley, a corps geologist from the Waterways Experiment Station in Vicksburg, Mississippi, who oversaw last week's project.

Wakeley described the group effort as "one big hug," but Huckleberry's crew says their research was limited and that they were not allowed to dig a trench. "Hug, schmug," says Chatters. The corps geologists did confirm that the age of the sediments supports the radiocarbon date for the skeleton, but the Native Americans failed to uncover any relevant artifacts.

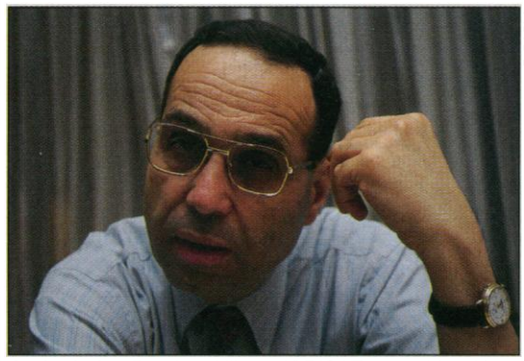
Chatters estimates that the skeleton is now 90% to 95% complete. Any chance of recovering the few remaining pieces are slim, however. Corps spokesperson Dutch Meier says that sometime in early January, the corps will cover the beach with an undisclosed quantity of rock to protect it from further erosion. The site is "not getting the kind of rigorous study" it deserves, laments Robson Bonnichsen, director of the Center for Study of the First Americans at Oregon State University in Corvallis. "And now they're going to bury it."

–Virginia Morell

AGRICULTURAL RESEARCH

Midlife Crisis Threatens Center for Semiarid Crops

PATANCHERU, INDIA—Twenty-five years ago, the industrialized world launched an effort to improve prospects for the 850 million people living under harsh conditions in the semiarid tropics in Africa and Asia. Their goal in establishing the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) here was to transform production of the region's chief subsistence crops—sorghum, pearl millet, chickpea, pigeon pea, and groundnut—in the same way the Green Revolution had transformed the cultivation of wheat and rice. But few of ICRISAT's scientists are in a mood to celebrate the institution's silver jubilee, which was marked last month. Indeed, this fall an external review noted somberly that "senior staff are hesitant in recommending ICRISAT as a place to work."



P. BAGLA

At the helm. Barghouti likens ICRISAT to "a ship with a broken engine being steered in muddy waters."

It's not hard to see why. A severe budget shortfall (see graph) has triggered massive staff cuts and raised concern about organizational deficiencies. Those problems, in turn, led to a thorough house cleaning of senior management this summer. The turmoil comes on top of persistent criticism that the institute has had too little impact on the practices of local farmers, despite a gene bank of 110,000 plant varieties and its success in developing a fast-growing, high-yield hybrid of pigeon pea. Ironically, the crisis comes amid forecasts that the arid regions are spreading and that climate variability poses an increasing threat to productivity.

The crisis is real, admits Director-General Shawki M. Barghouti, a Jordanian agronomist who took the helm on 1 September. "ICRISAT today is akin to a ship with a broken engine being steered in muddy waters where the going is certainly not easy," says Barghouti, who succeeded James Ryan, an Australian agricultural economist who left in July after a 6-year tenure.

ICRISAT's scientists admit that the turmoil is making it harder to stay on task. "Protecting their positions takes up most of their effort. As a consequence, they have little time to do innovative research," says Yeshwant Nene, a plant pathologist and senior ICRISAT official who retired last year. Surinder Mohan Virmani, an agro-climatologist who survived the layoffs, estimates that a 50% cut in his research budget has set him back a year. If the situation does not improve soon, he says, "long-term research could suffer drastically."

Some of the problems facing ICRISAT are familiar to other members of the Washington, D.C.–based network known as the Consultative Group on International Agricultural Research (CGIAR), which includes ICRISAT. For example, the International Rice Research Institute in Los Baños, the Philippines, laid off 576 workers this year, most of them administrative staff, after it lost about a quarter of its $30 million budget. The center in Mexico City that pioneered the development of high-yielding varieties of wheat and maize (CIMMYT) also imposed large layoffs this year after budget cuts. "These older institutions of the CGIAR system were doing traditional research and had collected a lot of flab over the years. Some downsizing was essential to make them lean and efficient," says Virender Lal Chopra, a plant geneticist at the Indian Agricultural Research Institute (IARI) in New Delhi and vice chair of CIMMYT's board of trustees.

But ICRISAT's woes go beyond the need to streamline its operations and are not amenable to quick fixes, say those who have reviewed its activities. Its challenge is in some ways greater than that of the centers that nurtured the original Green Revolution, because it deals with a broader range of crops—called "orphan crops" because they are mainly grown by subsistence farmers and have little commercial value—and serves a diverse eco-region. (Besides its Indian headquarters, ICRISAT operates half a dozen research stations in central Africa and small programs in Latin America and Australia.)

Experts say a sharper focus over the years on fewer varieties more applicable to local conditions would have helped. "ICRISAT

spread itself too thin and lost touch with the harsh conditions that prevail in the fields," says Devinder Sharma, a food policy analyst with the Forum for Biotechnology and Food Security in New Delhi. A 1990 suggestion by outside reviewers for a more "operational mandate" was never followed, however, and the recent external review panel concluded that "the need to formulate a clear operational mandate is even more urgent [today]." Barghouti, who most recently was a senior administrator at the World Bank, expects to have such a plan by February.

But a fuzzy mandate isn't the whole problem. Many experts believe that ICRISAT has too little to show for its 25 years on the scene. "Except for bringing out glossy publications, there has been little impact of ICRISAT research," says Suresh Kumar Sinha, an agricultural physiologist and former director of the IARI. "Does any farmer know or use ICRISAT varieties within a 500-kilometer radius?" he wonders. Sinha says he reluctantly abandoned a study of ICRISAT's impact on local farmers after the institute "nipped it in the bud."

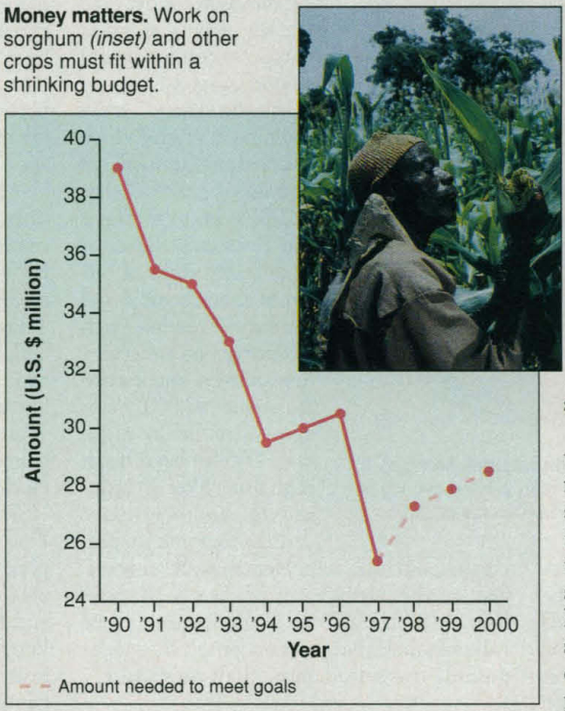
Studies by the Indian Council of Agricultural Research found that 80% of the varieties of sorghum released in India and 85% of the varieties of pearl millet—both mandate crops of ICRISAT—have instead been developed by the local national agricultural system. Similarly, the recent external review panel, headed by Ron Coffman of Cornell University's College of Agriculture, reported that "evidence is still lacking that ICRISAT's sorghum breeding program has had significant impact in improving sorghum production in the African semi-arid tropical region." It also cited "a large gap ... between potential and realized yields" in groundnuts and "the paucity of documented impacts."

However, ICRISAT can't do it alone, says Barghouti. "International research can have impact only through the cooperation of local scientists," he says. "International scientists should not be running around the countryside meeting farmers without the cooperation of the local scientist." At the same time, Ryan says, ICRISAT has released over 350 crop varieties, and its active gene bank is the largest of all the CGIAR system and accounts for more than 20% of CGIAR's gene-pool holdings. He adds that "a lot of these locally bred Indian varieties have ICRISAT blood in them."

Productivity isn't the only problem facing ICRISAT. Many observers say that Ryan's management practices also contributed to ICRISAT's current unhappy status. A corporate structure that he created, with scientists reporting to a new layer of top management, led to "a plethora of directors," say the external reviewers, who called for a simpler structure that would increase direct contact between senior managers and staff. Ryan defends the approach, saying that it was the best fit for an organization "with work spread over four continents."

Ryan has also been faulted for the way in which he trimmed staff, with critics saying that he sometimes ignored merit in wielding the ax. His actions triggered a 2-day sit-in by staff and prompted the external review panel to recommend that future staff reductions "be carried out in ... a transparent and defensible basis." Rajendra Singh Paroda, an Indian plant geneticist who recently took over as chair of the board of trustees of ICRISAT, says the resulting turmoil posed a threat to the institute and had to be resolved. "If the top management could not manage and work alongside its own staff, we had no option but to replace them," he says. In addition to Ryan, the board accepted the resignations of four top officials.

Money matters. Work on sorghum *(inset)* and other crops must fit within a shrinking budget.



SOURCE: ICRISAT PHOTO: ICRISAT

The trustees themselves have come in for some harsh criticism. Coffman's report accused the board of "not being ready to face the reality of the current financial environment, and not helping management to develop a clear long-term institutional vision and funding strategy to deal with it." Coffman says that ICRISAT needs to build partnerships with major research institutes around the world, such as Cornell, to apply modern genomics to improve crop productivity.

Outside forces have also contributed to the current crisis. Agricultural research around the world is beset by "donor fatigue," in which longtime benefactors shift their support to newer initiatives. The overall annual budget for CGIAR institutions has hovered around $315 million for several years, despite the addition of five new institutes since 1991. "Two decades ago, multilateral funding was in vogue," says IARI's Chopra. "But today, donors feel bilateral arrangements give better value for money."

A particularly heavy blow has been the decline in funding over the past 5 years from ICRISAT's largest donor, the U.S. Agency for International Development, from $4.1 million to $2.2 million. "We feel more money should go to Africa, where local expertise still does not exist," says Robert Bertram, a plant geneticist who advises the agency.

Some observers have even questioned ICRISAT's presence in a country where the national agricultural research system is heavily developed. "Much of its original mission has become redundant in a country that is quite capable of doing much of the work itself," says Coffman. In fact, his panel recommended that the director-general be based in Africa as part of a move to transform the institute. The move, it says, would help ICRISAT monitor the rising share of its resources—more than half by 2000—devoted to Africa. Although Barghouti says no such move is in the offing, he pledges to create "a solid African program with a well-articulated strategy and strong leadership."

Toward that goal, the Indian campus will identify the appropriate breeding stock from its massive gene pool and make available the mother lines to the breeders. Adapting those varieties to specific regions will be the job of the national agricultural research systems, although ICRISAT may lend a hand in countries lacking a strong national system. The hope is that such structural changes will turn around an ailing ship and put it on a more sustainable course. In the meantime, CGIAR officials hope that a one-time, $3.5 million injection of funds will help ICRISAT make the transition.

"The institute is still robust, and we look for a bright future once the operational mandate is in place," says Barghouti. In 1996, ICRISAT was awarded the much-coveted King Baudouin Award by the Technical Advisory Committee of CGIAR, recognizing its work in developing downy, mildew-resistant varieties of pearl millet. The chair of CGIAR, Ismail Serageldin of the World Bank, believes that the "worst is over." If true, then ICRISAT may be able to look forward to many more productive years.

–Pallava Bagla

Pallava Bagla is based in New Delhi.