IDRC Reports
STORIES ON RESEARCH IN THE DEVELOPING WORLD

Vol. 21, No. 4 (January 1994)

Constructing Egyptian Alternatives: Shale Brick Production in Egypt

by Craig Harris

Underneath the steady glare of the relentless Egyptian sun, workers toil on the banks of this country's famed water source, the Nile River. They mould bricks from top soil and Nile silt and then heat them in the smoking kiln, dancing gingerly on the roof to make sure the fruits of their labours are shaped and stored properly. The workers are engaged in the hectic, competitive trade of making and supplying bricks to Egypt's construction industry.

"These workers and the raw materials they use are the cornerstones of Egyptian small-scale brick production," says Dr. M. Ramez of the General Organization for Housing, Building and Planning Research (GOHBPR) in Egypt, a government research organization. Although labour and Nile silt have traditionally been the cornerstones of brick-making, both have suffered from recent changes and problems within the industry.

The limited availability of prime land around the Nile and the fierce competition over this precious resource forced the Egyptian government to ban the use of agricultural land for brick production in the mid-1980s.

When brick companies took the top soil and silt from the land, as they did throughout the 1970s and early 1980s, they rendered it almost useless for agricultural production. The soil degradation and setbacks in agricultural productivity were simply too high a price to pay for allowing brick producers to use the land, the Egyptian government decided.

But the government's ban had human costs as well. Dr. Ramez and fellow researchers estimated that by 1987 about half of the 2,600 small-scale brick plants were shut down owing to a shortage of raw materials. Almost 130,000 people lost their jobs as a result. There were also other effects, such as construction slowdowns that hit the poorer groups in Egyptian society who desperately required low-cost housing.

With the assistance of IDRC, Dr. Ramez has worked towards solving the dilemma facing Egyptian small-scale brick producers through a project called shale brick production. He and his fellow researchers have concentrated their efforts on alternative, more abundant Egyptian natural resources for brick production. One material, known as shale, has been an increasingly effective substitute for Nile silt.

ABUNDANT ALTERNATIVE

Shale is what geologists refer to as a "semi-consolidated rock" made of fine grained aluminous materials, generally clays. Shale can be found in the desert and along the Nile, where it forms rock outcrops over which it is impossible to farm. The material is abundant researchers have estimated that there are about 500 million cubic metres of shale in the desert and along the Nile River -- but it is less suited to brick-making

than the top soil and silt. It still needs further refinement if it is to assist small-scale brick producers in their quest for new raw materials, Dr. Ramez notes.

This straining of demand against natural resources is nothing new in Egypt. In a country with limited arable land and a population that has increased from 16 million people to over 50 million in the past fifty years there is bound to be fierce competition over limited basic resources.

The construction industry has been a classic example. The demand for housing and construction has risen dramatically over the past twenty years. To keep pace, the production of bricks has jumped from 2.7 billion units in 1976 to 5 billion in 1981 to almost 10 billion in 1986.

Farmers with land on the Nile started to rent their land to brick companies in return for quick money. But the implications were serious. Unsustainable exploitation by the brick companies pushed the issue of land availability along the Nile to a head.

When the ban was announced by the government in 1984, some companies ignored it and tried to remove silt and top soil from the land surrounding the Nile in secret, as if it were precious gold. The penalties were stiffened from fines to jail sentences. Clearly, it was a no-win situation that called out for developing new materials to make bricks.

At this stage, Dr. Ramez and the GOHBPR stepped forward. As early as 1977, Dr. Ramez had succeeded in developing a prototype for brick production using shale as the raw material. He tried to maintain the basic infrastructure of traditional brick-making, realizing that major technological changes would be difficult to introduce.

"It was an efficient pilot-scale plant but it closed after two years," he says. "At that time, few were really interested in new techniques of brick production." It wasn't until the government decree that companies were forced to either try alternative methods of production or face closure. By 1986, when enforcement of the ban was becoming very strict, more than 500 plants modernized and switched to using shale as the raw material for brick production.

"Although this was a positive sign, there were still many setbacks at this stage," Dr. Ramez recalls. Owing to increasing demand, many small-scale plants zealously over-produced without paying attention to the physical limitations of the shale. This resulted in inferior-quality bricks. "If you held up some of these bricks they would crumble in your hands," Dr. Ramez says. Indeed, the standard measure of brick strength (kilograms per square centimetre) revealed a generally poor quality in most of the bricks of only 10 to 15 kg/cm^2.

Early in the research, Dr. Ramez and fellow researchers at GOHBPR recognized the physical limitations of shale in brick production. The presence in the shale of a peculiar clay mineral called montmorillonite caused excessive swelling and shrinking when it was made into bricks. In addition, high levels of sodium chloride (salt) in the shale contributed to the cracking of bricks upon drying. The salt also corroded equipment in the brick plants.

OVERCOMING SHALE'S LIMITATIONS

To counteract these problems, researchers have been experimenting in mixing shale with materials such as slag, heated clay, lime and carbonates to reduce the shrinking and cracking of the bricks. An added challenge was to find technology for producing bricks that would be as low cost as traditional methods.

"One thing I realized from the start is that it is very difficult to change traditional production patterns," says Dr. Ramez. "These production patterns in the brick-making industry are still very labour-intensive and use little technology, often relying on the sun to dry bricks."

So Dr. Ramez and researchers at GOHBPR developed a simple production technique that involved

grinding and mixing the shale with other materials, moulding and extruding this into bricks and then drying the bricks until they become hardened. It has been tested at both the GOHBPR site in Cairo and in a pilot plant in Beni Suef, about 60 km south of Cairo.

Dr. Ramez says that many of the small-scale brick producers who have converted over to shale are beginning to take advantage of the project's research results. "We have noted an improvement in the quality of brick that many of these small-scale plants are making," he says. Indeed, the strength of shale bricks has increased from 10-15 kg/cm^2 to 50-70 kg/cm^2.

Since 1988, this project has attempted to adapt the production process to environmental circumstances and increase the quality and productivity of small-scale brick plants. "Our immediate objective was to successfully incorporate shale into the brick-making industry," says Dr. Ramez. "But our long-term goal was to ensure the continued viability of small-scale plants for both their employees and the people who relied on them for low-cost housing."

FOR MORE INFORMATION, CONTACT:

Dr M.R.H. Ramez
General Organization for Housing, Building and Planning Research
P.O. Box 1770
Tahrir Street, Dokki
Cairo, Egypt

ISSN 0315-9981. This magazine is listed in the Canadian Magazine Index.

- Subscription information
- Return to the IDRC Reports homepage
- Return to the IDRC homepage