

# International

The New York Times



Left, Roberto Guerrini with a bag of his rice. Center, grains ready to be bagged. Right, packages on the shelves. Mr. Guerrini's rice paddies along the Po River basin are being starved by rising temperatures and little rain. "Water management is 80 percent of rice farming," he said. "If you can't manage it properly, you lose the harvest."



PHOTOGRAPHS BY ALESSANDRO GRASSANI FOR THE NEW YORK TIMES

The Po's dry riverbed in Linarolo, Italy, south of Milan. The river's basin accounts for about 30 percent of the country's agricultural output, but drought has reduced the river to a trickle in several areas.

## Growing Drought Imperils Northern Italy's Rice Harvest

By ELISABETTA POVOLEDO

ARRO, Italy — Every morning at dawn, Roberto Guerrini walks the perimeters of the paddies in northern Italy where his family has grown rice for four generations to ensure that there are no holes — often caused by burrowing animals — in any of the earthen embankments.

Not a drop of water must be wasted. The drought conditions are so harsh that the government last week declared a state of emergency for much of northern Italy, and there is a growing fear in one of the country's most fertile regions that things will never be the same.

Mr. Guerrini, along with tens of thousands of other farmers in the Po River basin, is struggling to cope with conditions that are likely to strike with more frequency and with greater intensity in an era of climate change.

"We know from studies on climate change that in recent decades, the northern regions along the Alps have been increasingly dry during the winters, rain has become scarcer even in the spring, while temperatures are higher," said Massimiliano Pasqui, a climate change expert at Italy's National Research Council. "This year, we arrived at a situation where these three elements combined at the same time to produce this extreme drought."

The consequences can be seen around the region. At least 11 people died when a glacier collapsed on July 3 in the Dolomites, a tragedy that Prime Minister Mario Draghi attributed to climate change. Towns throughout the region have been rationing water for months. Cars remain dusty, pools are unfilled and in some cities tap water is shut off during the night. In Castenaso, just east of Bologna, hairdressers and barbers are banned from double shampoos.

Global warming increases the likelihood of drought, and even if scientists are still studying the connection between the unforgiving summer in the Po River basin and the broader phenomenon of climate change, dry periods of varying severity are becoming the new normal for farmers everywhere.

Higher temperatures can dry out soils and vegetation and cause more precipi-

tation to fall as rain than snow, which can affect water availability for agriculture. Climate change can also affect precipitation patterns around the world, making dry areas drier.

That, in turn, forces farmers to make hard decisions about which crops to plant, how much water to give them and whether to abandon some fields altogether.

In Italy, the problem is most pronounced for farms in the Po River basin, which accounts for about 30 percent of the national agricultural output by market value, according to Coldiretti, a confederation of national agricultural producers. The drought will ultimately cost farmers this year about 3 billion euros, or \$3.05 billion, the confederation said, the hardest hit for the area in 70 years.

Crossing from the Alps to the Adriatic, the Po River, Italy's longest waterway, has for centuries been part of an intricate system that helped to irrigate what Napoleon described as "the most fertile plains in the world."

Now, in some stretches, the Po has dwindled to a trickle. Rowing clubs have hung up their oars, sun-seeking teenagers fresh out of school have set up beach umbrellas on the riverbed, and in Gualtieri, a town on the central Po, two ships that were sunk in 1944 emerged earlier this year as the water receded.

Images taken by the European Space Agency tracking the river and surrounding soil for the past three years were recently published with the bleak headline: "Po River Dries Up."

Mr. Guerrini grows, among other things, arborio and carnaroli, Italy's preferred varieties of risotto, in the hamlet of Arro (population 214), a name apparently derived from "arroz," the Spanish word for rice, a nod to long-ago settlers.

Rain had been so scarce over the winter that Mr. Guerrini seeded fewer rice fields — "they'd been talking about a drought for months," he said — but even so, weeks of clear skies and high temperatures were taking a toll on his crops.

"Water management is 80 percent of rice farming," Mr. Guerrini said. "If you can't manage it properly, you lose the harvest."



Dry riverbed in Linarolo. "I am trying to save the salvageable," one farmer said. This week, the Po measured 2.49 meters below its regular water level.

The heat was causing the plants to mature earlier — "not good for the quality," he said — and he feared the grains would never reach their full plumpness, shriveling instead in the relentless summer sun. Making matters worse, rice blast, a fungal disease that normally arrives later in the season, had made an early appearance.

Meuccio Berselli, general secretary of the Po River Basin Authority, said the basin was experiencing its sixth drought in the past two decades, and there was no doubt in his mind about why it was happening. "For years we've been saying that we have to accelerate our adaptation to climate change, which can no longer be disputed," he said.

Rice paddies, which are kept moist by a mazelike irrigation system strictly regulated by local irrigation consortiums, are very much at risk. Upriver, closer to the Alps, the situation is serious if not yet dire, but downriver, many rice farmers are suffering.

"I am trying to save the salvageable," said Gianluigi Tacchini, who grows rice

and other crops in Santa Cristina e Bissone, where this week the Po River was measured 2.49 meters below its regular water level.

Instead of watering his paddies every eight to 10 days, Mr. Tacchini was stretching the gap to 18 days and had been forced to abandon some fields altogether. He estimated he had already lost half of his crops, and risks losing the entire season.

Paolo Carrà, the president of Italy's national rice board, said it was "premature" to assess the situation until September, when rice is typically harvested, "but there are signals that in some areas, rice crops have been completely destroyed," he said. Italy produces 52 percent of all the rice in Europe, more than any other country, and almost all of that is grown in Piedmont and Lombardy.

The drought could not have come at a worse time for farmers. The prices of electricity, gasoline and fertilizer have nearly all doubled this year, Mr. Guerrini said, and there is little financial relief in sight.

The government last week allocated 36.5 million euros in emergency aid, but that is unlikely to provide much help: It will be split among five regions, be divided among local institutions and could take years to be distributed.

Crop insurance will not provide a solution, either. It covers extreme weather events, like hail and the heavy but short downpours that have been increasingly common in Italy, but not drought.

And while the situation was critical in the north, there were signs that "the drought is spreading to central and southern Italy" as a result of temperatures that are consistently higher than average, said Ramona Magno, of Drought Climate Services, a research center.

Experts say that huge investments and new thinking are necessary to offset the effects of climate change, with measures that includes the construction of lakes and reservoirs, surveillance of fields by satellite, and something as simple as improved water infrastructure. Ms. Magno said the country loses more than 40 percent of its drinking water because of dilapidated pipes.

"We have to change our approach to the problem, change our mentality to deal with it face on," Ms. Magno said.

Mr. Berselli of the river basin authority said he had other concerns. In the Po Delta, the fertile plain next to the Adriatic, saltwater incursion is transforming the river and its estuaries and seeping into groundwater, putting the fertility of the farmland at risk.

"Water is life," he said. "We can't afford to waste it."

Mr. Guerrini received a momentary respite one day last week when a summer storm scattered about an inch of rain, filling the canals. "But that only lasted a day," he said.

The summer has barely begun, and he said that a 10-day stretch without water would be enough to put his crops at serious risk.

The next several weeks, when his rice paddies must be watered regularly, will feel like "an eternity for agriculture," Mr. Guerrini said. "We're not out of danger yet."