

NRRI Mission:

Deliver research solutions to balance our economy, resources and environment for resilient communities.

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From the Editor:

As we put 2020 in the rear view mirror, NRRI is anticipating an exciting and productive 2021.

To prepare, we've rewritten our mission, sharpened our vision and renewed our core values. We've hired new top talent, upgraded labs with state-of-the-art technologies and improved our work flow.

The results can be seen in our fiscal year 2020 (June 2019 - July 2020) Annual Report Highlights, published last month.

We took a new approach to highlighting our activities -- projects are aligned with our core values of collaboration, innovation, partnership, safety, quality and integrity.

It's an impressive report, especially against the backdrop of a challenging 2020. I hope you'll take a few moments to look through the report.

June Breneman

Marketing & Communications



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Collaborative project expands use of wood species to new markets

Is there anything new to discover in using wood for building construction? There's evidence that people have been building wood structures for [some 10,000 years](#). Has it all been done? Nope. Washington State University and NRRI submitted a provisional patent application this year for developing thermally modified cross-laminated strand-veneer timber building materials. With [Mass Timber construction](#) on the rise because of its sustainability benefits over competing materials, this innovation addresses some of the problems with wood.

Wood strand-based timber products aren't new. Think oriented strand board (OSB). Wood strands are layered across each other and bonded together to make a board that's strong, while using lower-value, less-desirable timber. But as everyone knows, moisture can damage wood. Thermal modification – basically cooking the wood in an oxygen-free kiln using a precisely controlled process– improves the moisture resistance of the wood and makes it more dimensionally stable. The wood also becomes more resistant to fungal decay.

With promising results at the bench-scale, NRRI and Washington State University are working with a company in Montana, Therma Wood Technologies, to scale up the process in commercial size kilns. Aro was able to visit the plant in October and bring in the WSU team via a live Zoom meeting.

"This is a really big step toward commercialization," said NRRI Scientist Matt Aro. "We talked about how to thermally modify the wood strands, get even heating and the properties we need in the strands to make mass timber panels."

The commercialization scale-up testing is being funded by a National Science Foundation grant. One of the key performance properties yet to be



Matt Aro inspects thermally modified wood strands before shipping to the University of Washington where it will be made into strand veneer lumber for testing. 2019 archive photo.

verified is the product's fire performance – something all builders ask about. WSU received funding from the U.S. Forest Service to contract with an external lab to do large scale fire testing. NRRI optimized the thermal modification process and processed thin wood strands at its kiln in Duluth to ship to Washington for fabrication into panels for testing.

"WSU has a nationally known wood composites research program and we've been working with a grad student, Ruben Jerves, who has done a great job making and testing the panels," said Aro. "And we've applied for another U.S. Department of Agriculture grant to extend the research."

The Forest Service is especially

interested in the team's focus on using underutilized trees that tend to grow very densely and can create forest fire danger. 2020 was an unprecedented fire season according to the National Interagency Fire Center. About 8.6 million acres burned, compared with 4.6 million acres in 2019. Climate change predictions show this trend continuing to rise, so forest management practices that remove some of the tinder is a top priority.

"Developing markets – especially high value and environmentally useful markets – for underutilized resources is something that I find critically valuable," said Aro.

Meet the Researcher: Saleh Mamun

Value of natural resources are mapped in shared post doc position

In Economics 101 students learn that this field of study is all about production, consumption and the transfer of wealth. But there's another economics field that is less known: natural resources economics. Its focus is on how to operate an economy within the ecological constraints of earth's natural resources. And the big question: What are the connections and interdependence between human economies and natural ecosystems?

Saleh Mamun is NRRI's natural resource economist specializing in ecosystem services. He came to NRRI in 2019 to fill a joint position at NRRI and the University of Minnesota's College of Food, Agricultural and Natural Resources Sciences, in the Applied Economics Department. The duo role, split 50/50, makes Mamun a bridge and a conduit between NRRI and the Twin Cities campus.

And to the world.

One of his current projects is a global analysis that will provide national-scale indicators on the efficiency of natural and capital management to inform policy and strategic decisions. This Natural Capital Index is a collaborative project between the University of Minnesota and Stanford University researchers, funded by the World Bank Group.

But what, exactly, is "natural capital?" It's all of the world's natural assets – geology, soil, air, water and all living things. Human life depends on a wide range of benefits, often called ecosystem services, from this natural capital.

"The Natural Capital Index is a measure of the efficiency of sustainable use and management of natural capital in a country," Mamun explained. "It measures the contribution of the ecosystem services, using a variety of metrics, relative to the services that could be achieved given a country's natural



Saleh Mamun sends a selfie from his home office.

capital endowment."

Collaboration

Given the duo-role, Mamun has a foothold in the greater University of Minnesota system, of course, but he also regularly collaborates with scientists and engineers at Stanford, Boston and Bowdoin Universities.

He's also working with a multi-disciplined NRRI team to develop a Forest Optimization Tool. Mamun's role is to evaluate biophysical ecosystem services and convert them into monetary value, considering the trade-off among ecosystem services. He's also analyzing the life cycle of forest harvest production.

"This will be a valuable tool for forestry sector policymakers to decide best forest management practices," said Mamun.

Strumming at home

The 2020 pandemic stay-at-home orders have given Mamun time to finally start guitar lessons. "I'm learning via video tutorials," he said. "Right now I'm just practicing my chords, but my goal is to play ['Nothing else matters' by Metallica](#)."