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Rice & the Private Sector: Asia's Food-Energy-Water Nexus

By Stella Liu

Synopsis

With global food demand and energy needs increasing amid a potential shortfall in water, the interdependencies between these resources – defined as the water-food-energy nexus – have become the resource scarcity challenge of the 21st century. The pressures are especially acute as Asia rapidly develops. The private sector needs to step in.

Commentary

AS ASIA develops, global food and energy needs are projected to rise dramatically in the upcoming decades. While these two sectors have normally dealt with their challenges in their individual silos, the shared requirement of water, an increasingly scarce resource, to support their growth has inextricably linked them together.

The food sector requires water for agriculture and fossil fuel production, a dominant part of the global energy mix, is highly water-intensive. According to the United Nations, the world is anticipated to face a 40% shortfall in water by 2030. As water becomes more scarce, any action in one sector will have an impact in one or both of the sectors.

Rapid Urbanisation's Impact on Water

Asia's needs for energy, food and water are especially acute as the region rapidly urbanises. Current energy consumption trends suggest that projected energy demand and supply in Asia can almost double by 2030. To feed the projected additional one billion more people in Asia, food production must make gains in productivity.

For water, an MIT research on economic and population growth and climate change

for the next 35 years projected that more than one billion people in Asia may become water-stressed compared to today.

Efficiency gains in the 'food' link of the nexus can influence the outcome of this challenge. Currently, 90% of the world's total production and consumption of rice is located in Asia. Developing more water and energy efficient agricultural techniques for rice is a key entry point to address the nexus challenge.

Advances in biotechnology and water-conservation agricultural techniques are promising because they use considerably less energy and water resources required by traditional agriculture.

However, public sector investment and research in the agricultural sector have been waning in the past few decades and prioritised below development. As the food-energy-water nexus becomes the forefront of the resource scarcity debate, the agriculture sector can no longer be ignored.

Water for Agriculture

Rice is the world's largest irrigated cereal, covering 29% of the total irrigated crop area and almost half of the irrigated cereals area. Research into making rice production more water-efficient yet productive has yielded promising results. IRRI, the International Rice Research Institute, has conducted research into more water conservative agricultural techniques with rice paddies.

One example is the Alternative Wetting and Drying (AWD) method; Irrigation water is applied a few days after the disappearance of water so the field gets routinely flooded and non-flooded rather than continuously flooded.

The University of California Davis this year analysed 56 studies on AWD. It discovered that overall, the farms who implemented AWD experienced a small yield reduction of 5.4% with a water usage reduction of 23.4%. The findings highlighted the potential of AWD to reduce water inputs with rice without jeopardising yields.

Energy for Agriculture

The energy needs for food production are expected to rise to meet growing food demand in Asia. As agriculture becomes more productive and industrialised, the input needs for fossil fuels increase along the value chain.

Developing countries use less than half of the energy input for agriculture compared to industrialised countries. To meet growing food demand around the world, agriculture needs to become more 'energy-smart' in developing countries, while still making significant gains in productivity.

Impact assessment studies on biotechnology crops by Brookes and Barfoot demonstrate the potential for these technologies to increase productivity while using minimal energy. Its tracking of different biotech crops from 1996-2014 found that the adoption of biotechnology allowed farmers to increase their yields while using no-till and/or reduced till farming and less herbicides and insecticides use.

As tractor fuel usage for tilling is reduced, soil quality is enhanced and more carbon remains in the soil. Based on savings arising from the rapid adoption of reduced tillage and no tillage bio-technology crop farming systems in North and South America, an extra 6707 million kg of soil carbon is estimated to have been saved in 2012. This is equivalent to taking 10.9 million cars off the road for one year.

Way Forward for Asia

In ASEAN, there have been diminished investments in public sector agricultural research and development over the years as development in other areas took priority. There has been, however, recognition that technological change can no longer be advanced by the public sector alone. Currently half of the agricultural R&D comes from the government in ASEAN and for some countries like Malaysia and Myanmar it's all of it.

Figures from the International Food Policy Research Institute (IFPRI) and the Asia Pacific Association of Agricultural Research Institutions (APAARI) demonstrate that agricultural R&D spending has been either stagnating or dropping from 1996 to 2008. Incentivising private sector investment can fill that gap.

Given the scale and urgency of these challenges, a mix of traditional and innovative private sector incentives is needed. The Asian Development Bank (ADB) 2013 Report on food security provided a few traditional recommendations. Intellectual property rights, trade and foreign investment liberalisation, advance purchase rewards and rewards are a few mechanisms that the public sector can use.

G20 Recommendation

For a more innovative approach, the G20 summit in 2010 launched the idea of “pull mechanisms.” Rather than “push” mechanisms that strengthen the supply of research, this type strengthens demand by fostering markets for innovations to “pull” or draw private investors. Since then, AgResults, a US\$110 million multilateral initiative, has launched a few pilots and initial results are promising. For instance, in Kenya, post-harvest grain losses in the developing world led to lowered food insecurity rates for smallholder farmers.

AgResults addressed this by creating a competition to provide economic incentives for companies to design and sell on-farm storage devices for smallholder farmers. Companies that sold the greatest amount of storage capacity received the largest proportion of the prize. In the first year, the companies sold 113,000 on-farm storage devices.

The competition encouraged companies to compete and create a new market that did not exist before and provided smallholders with a wider range of options. The key to address the nexus challenge in Asia is to focus on future innovative “pull mechanisms” and traditional private sector incentives on more energy and water efficient agri-technologies for rice.

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