PART 5

SUSTAINABLE INTENSIVE SYSTEMS

The previous chapters in this volume have presented examples of the accumulation of knowledge about the components of our agricultural systems. This knowledge, combined with the powerful new tools at our disposal, permits us to explore how agriculture interacts with the broader biophysical environment. This lays the foundation for creating sustainable intensive systems at national, regional or perhaps global scale. Developing such frameworks pre-supposes an ability to query the environment at scales much larger than individual fields or farms, extending to areas covering hundreds or thousands of square kilometres.

Chapter 19 introduces us to a range of remote sensing technologies that have been coming widely available over the last couple of decades. Detailed images that were previously in the exclusive domain of government military and intelligence agencies are now publicly available, as many remote sensing satellites have been launched that provide images at a resolution of a few square metres, can use wavelengths that are biologically useful and can penetrate cloud cover and capture images at night. It is now possible to obtain near real-time estimates of cropping area, timing of crop establishment and have a reasonable appreciation for how production may be impacted by weather-related incidents such as drought and severe storms. Like the genomic analyses described in Chapters 4 and 12, application of remote sensing to agriculture depends on our capacity to capture and manage enormous sets of data. This also implies broad access to and a free flow of data at a reasonable cost.

Satellites have been launched by many nations, have a wide range of resolution and a rapidly growing array of sensors that allow increasingly sophisticated measurements. The technology is rapidly evolving such that the size and costs of putting satellites in orbit is dropping to a level that private companies and smaller countries can begin to contemplate launching task-specific, almost disposable, remote sensing instruments. These applications begin to merge with what inexpensive drones can accomplish at the field level.

Although capture of this amount and complexity of data is exciting, converting the information into useful knowledge depends on being able to very accurately align the

measurements with fixed Earth points, calibrate the remote measurements with actual field conditions and meaningfully interpret the results. Ubiquitous satellite-based global positioning systems, sometimes supplemented by ground stations refined for extremely precise locations, are widely and publicly available. Crop growth models are essential to develop predictions of crop performance need continual refinement. Finally, having trained and properly remunerated human staff on the ground to generate high-quality data for image calibration may be the greatest bottleneck to remote sensing expressing its full potential. Whether governments, or companies for that matter, see the value in supporting these teams and other enabling technologies remains to be seen.

It is clear that our global agriculture is a mix of private and public interests. Farmers may be considered to be the basic unit of the private sector, while consumers are the unit of the public sector. Chapter 21 looks at public–private partnerships and dissects the different spheres of interest and accountability of public and private sectors to examine how public goods generated by the public sector can be fairly taken up by private interests. It provides a brief critique of past partnerships and proposes a comprehensive framework for effective and sustainable partnerships.

Despite the very favourable returns on investment in agriculture Chapter 21 points out that, relative to its importance, public investment in agriculture is low and is trending lower. It proposes that the private sector take up the slack and presents two examples of financing instruments to accomplish this. Although not explicitly saying so, this proposal can be taken as tackling concerns over the tendency to socialise the costs and risks around agricultural innovation and advances, while privatising the gains.

Consolidating the wide array of accumulated knowledge around best production practices, environmental safeguards, natural resources and the like would appear to be a logical step. The Sustainable Rice Platform (SRP), led by the United Nations Environmental Program (UNEP) and the International Rice Research Institute, was just such an initiative. Chapter 20 describes the process of bringing interested private and public parties together to create a means for farmers to know what sets of practices are sustainable. The process of trying to align very different priorities and philosophies, not to mention the accumulation of decades of mistrust among some sectors was enlightening, if not disheartening at times. Although what constitutes a sustainable practice is reasonably well known for individual steps in rice production, assembling them into an internally consistent package is another matter entirely. Designing tools for farmers (who may be barely literate) by committees of highly educated scientists and business people does present a unique challenge. Far greater, though, is finding a way to compensate farmers for the additional costs they incur by not only adopting sustainable practices, but collecting verifiable data to support their claims of having produced their crop sustainably.