



**Precision Development (PxD)** vision is to end information poverty by delivering personalized information to households via mobile phones. By providing actionable information to the right people, in the right way and at the right time, PxD enables poor people in low- and middle-income countries (LMICs) to make more informed decisions to enhance their welfare. A majority of PxD's services deliver customized digital agricultural advice to smallholder farmers, but we are expanding into new informational fields including education, nutrition, financial services, and environmental sustainability. PxD implements this model in collaboration with partners to maximize scale, and we continuously experiment, iterate, and gather evidence on impact to improve our services and demonstrate value. At the end of 2021, PxD's total reach was 5.7 million users across ten countries in Africa, Asia, and Latin America. PxD is rapidly expanding as governments and organizations look for innovative ways to utilize technology to deliver information to people who need it.



**Harnessing technology, data science, and behavioral economics to empower people living in poverty to improve their lives.**

## The issues

### Information poverty

Information poverty exists when “individuals and communities... do not have the requisite skills, abilities or material means to obtain efficient access to information, interpret it and apply it appropriately” (Britz, J.J.). Information poverty is widespread in poorly resourced settings and interacts with income poverty in a vicious circle, as both a symptom and a cause of poverty traps. Today, infrastructure for mass information dissemination is rapidly expanding, with access to mobile phones now outpacing access to clean drinking water. But access to information is not always enough. To improve people’s lives, information must be easy to understand, actionable, relevant to the needs of each individual, and received at the right time to improve decision-making.

### Smallholder farmers

PxD’s initial focus was in the agriculture sector, which supports more than two-thirds of the world’s poor. Households engaged in smallholder farming collectively account for more than two billion people - almost a third of humanity. An immediate and direct cause of their poverty is what is known as the yield gap: the difference between potential and actual on-farm production. Smallholder

farmers typically harvest only 30 to 50 percent of what their land can produce. Whether it is due to a misapplication of inputs such as fertilizer and pesticides, use of low-quality seeds, or the use of too much or too little water—the potential yield of these farms is not reached. In many instances, smallholder productivity and income can also be boosted through crop diversification, the adoption of new drought or flood-resistant crop varieties, or knowledge about how to combat pests and infestation. Climate change presents an additional, confounding challenge and risk, particularly for smallholders who rely on rainfed cultivation. Studies suggest that small changes in agricultural practices can substantially improve smallholder productivity and profitability, reduce the incidence of extreme poverty, and help insulate livelihoods from climate-related risks. Traditional agricultural extension confronts many challenges: in-person information sharing is expensive relative to its effects, contact with farmers is irregular, and advice is difficult to customize and deliver on time. Despite significant resources supporting the work of over one million agricultural extension workers, most farmers continue to lack the advice they need to close the yield gap and maximize their incomes.

### Students and teachers

Many LMICs have made tremendous progress in promoting school enrolment. Most LMICs now enroll primary school-age children at rates almost equivalent to high-income countries. However, evidence demonstrates that enrollment in



school does not guarantee learning. Many children continue to learn below their grade level, and millions of children fail to master basic reading and mathematics skills even after completing primary education. Without adequate education during these formative years, disadvantaged children may permanently lag behind their peers, with constrained economic opportunities throughout their lives. At the same time, many teachers struggle to manage the wide skills gap among students and lack the capacity to customize teaching to all levels in the classroom.

***We are optimistic.*** Today, the globe is more connected than ever before. Most people, including people living in extreme poverty, use mobile phones and can access information at their fingertips. Mobile ownership in LMICs ranges between 50 to 70 percent, while access to a mobile phone through a household member is even higher - often rising above 90 percent. For the first time in history, a majority of the world's poor are in a position to use digital information services delivered to the palm of their hand. PxD leverages this opportunity to empower smallholder farmers with relevant and customized information, delivered at low cost, to improve on-farm practices, input utilization, pest and

disease management, climate and weather resilience, environmental sustainability, and access to markets. Primary school students, regardless of circumstance, are better positioned to access customized, adaptive learning exercises to strengthen the weak areas in their learning journey, while their teachers can more precisely focus their time and energy on teaching to the needs of individual students.

## Our approach

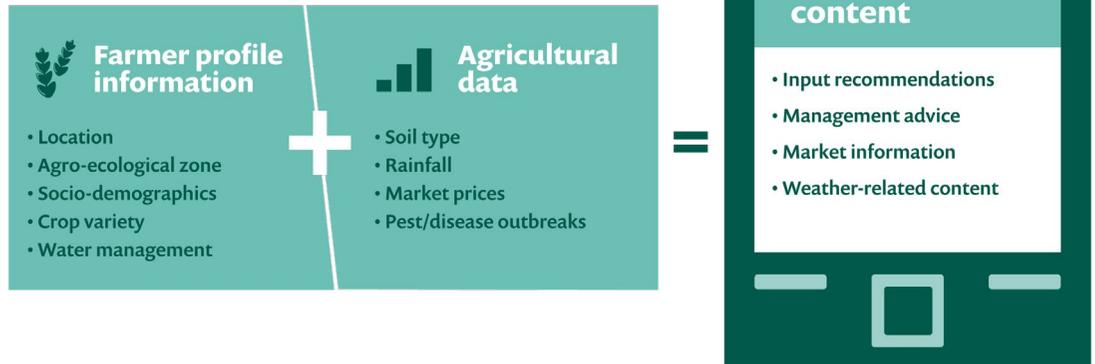
PxD's approach harnesses innovations in technology and research to improve the lives of smallholder farmers. We provide a two-way flow of information that delivers customized advice to farmers through their mobile phones. PxD's unique approach to digital development consists of four components:

1. We deliver **simple** and **effective** messages that users can understand and act upon. We draw on behavioral economics to inform messaging that more effectively influences farmer behavior and social learning

theory that facilitates more widespread diffusion of information across farmer networks.

2. Our systems allow us to **customize** our messaging to users to ensure that the information we provide is useful, timely, and actionable. Big data and machine learning techniques make it possible for us to tailor information at scale to conditions revealed in existing and new sources of data. These recommendations can be tailored to optimize inputs (seeds, water, fertilizers, pesticides) and management practices conditional on geographic and temporal-specific conditions (soil types, weather, agro-ecological zone,

### What we do: Provide Quality Agricultural Advice



etc.), market conditions (input and output prices and availability, etc.), and user-specific information (education, experience, risk tolerance, demographics, etc.). Our goal is to develop intelligent platforms that provide users with context-relevant and personalized agricultural recommendations through their mobile phones to improve productivity, profitability, and advance environmental sustainability.

## Key Elements Differentiating PxD's Model

1 Using behavioral science and human-centered design to design actionable and customized messages and services

2 Using experiments and data science to test, iterate, and improve

3 Scale rapidly through partnerships with governments, NGOs, and private companies, while remaining free to the user

Share data and learnings transparently as public goods

3. Our interventions are **evidence-led**. We develop systems that are continuously monitored and constantly improving. PxD's interventions draw on the power of new research methods to improve agricultural extension. A/B testing – comparing two or more service design options to assess which is preferred or more effective – allows for near-instantaneous upgrading of content and service delivery to concurrently improve user experience and deliver more appropriate information. The use of rigorous assessment tools such as randomized controlled trials (RCTs) provide opportunities to systematically understand impact and we feed this information back into our model to refine it over time. Mobile phones allow for the collection of large datasets from users which PxD uses for rapid experimentation and analysis to iteratively improve user experience and user-centered design.

4. **Working through partners** who are already providing services to users at scale – including governments, NGOs, and for-profit agribusinesses – allows PxD to rapidly reach scale, with extremely low customer acquisition costs and rapidly falling marginal costs per farmer per year.

## Our work

PxD's work is premised on rigorous research on the impact of digital information interventions in multiple contexts. In agriculture, this research demonstrates that digital extension can increase the adoption of appropriate farm management practices, improve yields by, on average, 4 percent, and improve farmer incomes. These results suggest that digital extension is extremely cost-effective, with point estimates suggesting a benefit-cost ratio between 6:1 and 10:1 - very high relative to other development interventions. At scale, these improvements represent millions of dollars of benefits that can bolster the livelihoods and resilience of food-insecure households.

Platforms built and supported by PxD serve users in ten countries in Africa, Asia, and Latin America (Ethiopia, Kenya, Nigeria, Rwanda, Uganda, Zambia, India, Pakistan, Bangladesh, and Colombia). We are pleased to support the work of government partners in India (Odisha, West Bengal, and the Coffee Board of India), Pakistan (Punjab), Ethiopia (the Agricultural Transformation Agency), Kenya, and Zambia to design, build, evaluate, and improve mobile phone-based advisory systems. We also support efforts to design and evaluate services in partnership with agri-



businesses and NGOs such as One Acre Fund and Root Capital. In 2020 we commenced a partnership with IFAD to deliver productivity supporting advisory and to mitigate the effects of COVID-19 for 1.9 million smallholder farmers in Kenya, Nigeria, and Pakistan.

Our emerging work in education is showing promise. Our flagship digital education tool, [ElimuLeo](#), has reached almost 10,000 Kenyan students via simple mobile phones, and 550,000 math exercises have been completed on the platform. This innovative, two-way SMS tool, inspired by Teaching at the Right Level (TARL), allows students to solve math exercises while dynamically adapting the difficulty of problems in response to the performance of the individual student. We are preparing to expand this approach to engage with teachers through a partnership with the Kenyan Ministry of Education, using digital technology to boost the effectiveness of in-class teaching and ease the burden on teachers and education systems.

## Our team

PxD's senior [leadership team](#) draws on years of experience working in and studying agriculture in sub-Saharan Africa and South Asia, business, development economics and behavioral economics, technology, data science, and monitoring and evaluation.

PxD's [board members](#) are 2019 Nobel Laureate for Economic Sciences Michael Kremer (University of Chicago), Shawn Cole (Harvard Business School), Amrita Ahuja (Douglas B. Marshall Jr. Foundation), and Heiner Baumann (PxD). PxD is led by Chief Executive Officer Owen Barder who brings to the organization more than three decades of experience as a development practitioner, scholar, and advocate.

