

From PhD glut to redefined purpose: Rethinking the value and future of doctoral education

Junwen Bai¹, Arun S. Mujumdar², Hongwei Xiao^{3*}

(1. School of Food and Biological Engineering, Jiangsu University, Zhenjiang 212013, China;

2. Department of Bioresource Engineering, McGill University, Ste. Anne de Bellevue, Quebec, Canada;

3. College of Economics and Management, China Agricultural University, Beijing 100083, China)

Abstract: The global “PhD glut” has emerged as a critical issue with the rapid expansion of doctoral education. This oversupply has caused challenges such as intense competition for academic positions and a decline in the perceived value of doctoral degrees. To address these issues, a shift in the definition of the PhD is needed, moving towards a more versatile qualification that meets the evolving needs of society and the labor market. In the field of Agricultural and Biological Engineering (ABE), a “Solution-Driven PhD” model is proposed, integrating doctoral training with agricultural engineering enterprises and modern agricultural industry clusters. This paper explores the multifaceted challenges of the PhD glut, the need for redefining doctoral education, and the specific opportunities and strategies for transforming ABE doctoral programs to better align with global demands and future development needs.

Keywords: PhD glut, doctoral education, Solution-Driven PhD, Agricultural and Biological Engineering, PhD oversupply

DOI: [10.25165/j.ijabe.20251802.9744](https://doi.org/10.25165/j.ijabe.20251802.9744)

Citation: Bai J W, Mujumdar A S, Xiao H W. From PhD glut to redefined purpose: Rethinking the value and future of doctoral education. *Int J Agric & Biol Eng*, 2025; 18(2): 299–300.

As early as 2014, *Nature* discussed the issue of an oversupply of biology PhDs and whether the enrollment of biology graduate students should be reduced^[1]. Since then, the global “PhD glut” has become an increasingly prominent phenomenon. The rapid expansion of doctoral education has led to a saturation of highly educated individuals in many countries. In China, this trend is particularly evident. Over the past two decades, the number of doctoral graduates has grown from 18 800 in 2003 to 87 100 in 2023, reflecting the nation’s ambition to strengthen its scientific and technological capabilities^[2]. However, this growth has given rise to significant challenges: the academic job market has struggled to keep pace, forcing many PhD holders to compete for non-academic roles. For instance, some universities in China now require a doctoral degree even for positions such as student counselors, a stark indicator that the number of PhD graduates has surpassed the demand within traditional academic and research fields^[3]. This oversupply not only complicates the career prospects of individuals but also raises questions about the efficiency and sustainability of doctoral education systems worldwide.

The challenges are multifaceted. First, while some doctoral dissertations demonstrate remarkable innovation, there is a significant disparity in quality across institutions. Many dissertations are criticized for lacking originality, often focusing on synthesizing existing research rather than delivering meaningful breakthroughs. Second, the overproduction of doctoral graduates has intensified competition for a shrinking pool of academic

positions. Universities have struggled to expand their faculties at a pace that matches the growing number of PhD holders. Policies such as “up-or-out” exacerbate this instability, leaving many early-career researchers trapped in cycles of short-term contracts or facing significant difficulty in securing stable employment. Moreover, postdoctoral positions, originally intended as transitional roles on the academic career ladder, have increasingly become long-term research jobs. In some cases, they have even become de facto prerequisites for securing permanent academic positions^[4].

The growing imbalance between the supply and demand of doctoral graduates has given rise to what some call an “academic paradox”—a cycle of overqualification and limited career prospects. For many, earning a doctoral degree no longer ensures upward mobility but instead creates a persistent obstacle to professional advancement. This systemic issue is further exacerbated by enrollment pressures that drive universities to prioritize metrics such as publication counts and graduation rates over fostering bold and innovative research. As a result, doctoral training increasingly emphasizes credential accumulation over substantive intellectual growth, stifling creativity and reducing the process to a high-stakes pursuit with diminishing returns.

This issue is not unique to any single region but reflects broader systemic issues across different cultural and economic contexts. For example, in Japan, a longstanding cultural bias means that holding a doctoral degree can reduce one’s chances of being hired, discouraging students from pursuing advanced studies^[5]. Similarly, in China, where graduate education has rapidly expanded in recent years, the number of applicants for the postgraduate entrance examination dropped to 4.38 million in 2024—a decrease of 360 000 from the previous year. This marked the first decline in registrations since 2015, signaling a growing disillusionment with the perceived value of advanced degrees in an increasingly competitive job market^[6].

Bridging the gap between doctoral education and the labor market is essential. A key strategy involves diversifying the

Received date: 2025-02-15 **Accepted date:** 2025-03-20

Biographies: Junwen Bai, Associate Professor, research interest: food engineering, Email: baijunwen@hotmail.com; Arun S. Mujumdar, Professor, research interest: drying fundamental research and applications, Email: arunmujumdar123@gmail.com.

***Corresponding author:** Hongwei Xiao, Professor, research interest: agricultural products processing technology and equipment. College of Engineering, China Agricultural University, No.17, Qinghua East Road, Beijing 100083, China, Tel: +86-10-62736900, Email: xhwcaugxy@163.com.

objectives of doctoral training to encompass not only academic research but also practical, industry-oriented expertise. While academic doctoral programs emphasize intellectual exploration and fundamental research, there is an increasing need to expand the proportion of professional doctoral programs, which focus on technical problem-solving and application-driven skills. Such programs can better prepare graduates to meet the demands of emerging industries. Collaborative initiatives between universities and industries—such as joint research projects, internships, and co-designed curricula—could further align doctoral training with real-world economic needs.

Reframing the PhD requires a fundamental shift in its definition, moving away from traditional notions that tie the degree primarily to academic careers. Instead, the PhD should be reimagined as a versatile qualification that aligns with the evolving needs of individuals, society, and national development. This shift in perspective emphasizes the need to view doctoral education not only as a pathway to academia but also as a means to cultivate leadership and expertise across diverse sectors.

Doctoral education in Agricultural and Biological Engineering (ABE) faces unique opportunities and challenges. As a highly interdisciplinary field, ABE focuses on enabling the safe, efficient, and environmentally sensitive production, processing, and management of agricultural, biological, food, and natural resources^[7]. With global demand for sustainable agricultural solutions on the rise, projections indicate that total food demand will increase by 35% to 56% between 2010 and 2050^[8]. However, it remains uncertain whether existing ABE doctoral programs and educational models can effectively address this challenge.

Currently, interdisciplinary research, biotechnological innovations, and advancements in data science and information technology are reshaping the landscape of global agricultural technological innovation. The traditional ABE doctoral training

model, with its focus on discipline-specific knowledge, faces significant limitations in addressing the increasing demand for interdisciplinary and innovative talent. Consequently, there is an urgent need to transform ABE doctoral education into a “Solution-Driven PhD” model. This approach deeply integrates doctoral training with agricultural engineering enterprises and modern agricultural industry clusters, establishing a comprehensive training ecosystem that spans “Fundamental research – Technology development – Industrial application.” This practice-oriented, industry-academia integration not only ensures seamless alignment between academic research and industrial needs but, more importantly, equips doctoral students with the skills to systematically develop innovative solutions in food security, smart agriculture, and sustainable development by addressing real-world industry challenges.

[References]

- [1] Woolston C. How not to deal with the PhD glut. *Nature*, 2014. doi: [10.1038/nature.2014.16182](https://doi.org/10.1038/nature.2014.16182).
- [2] Ministry of Education of the People's Republic of China. <http://www.moe.gov.cn>. (in Chinese) Accessed on [2025-02-10]
- [3] Cingta. com. <https://mp.weixin.qq.com/s/1zGuHj6ltKcL7tMfh-yqHA>. (in Chinese) Accessed on [2025-02-10]
- [4] Sarrico C S. The expansion of doctoral education and the changing nature and purpose of the doctorate. *Higher Education*, 2022; 84: 1299–1315.
- [5] Hornyak T. Japan moves to halt long-term postgraduate decline by tripling number of PhD graduates. *Nature*, 2024. doi: [10.1038/d41586-024-02718-6](https://doi.org/10.1038/d41586-024-02718-6).
- [6] 2024 National Graduate Enrollment Survey Report. <https://www.eol.cn/ky/zt/report/2024/abstract.html>. Accessed on [2025-02-10]
- [7] Agricultural and Biological Engineering within ASABE – Definition. Available: <https://www.asabe.org/About-Us/About-the-Profession>. Accessed on [2025-02-10]
- [8] Dijk V M, Morley T, Rau M L, Saghai Y. A meta-analysis of projected global food demand and population at risk of hunger for the period 2010–2050. *Nature Food*, 2021; 2: 494–501.