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India: Leveraging Rural Education to Strengthen Food Security

"Food is the moral right of all who are born into this world," championed Norman Borlaug during his Nobel Lecture in 1970. Still, for rural populations in India, this is a highly elusive privilege. Inadequate infrastructure, limited healthcare services, and low agricultural productivity are just a few of the many challenges that keep millions of the country's individuals to this day in dire poverty, with a severe lack of access to reliable food sources. The Krishi Vidya Uday (KVU) Initiative, a Hindi phrase translating to "the rise of agricultural knowledge," is a proposed solution that leverages three types of education (vocational agriculture training, business knowledge, and internet literacy). By equipping rural Indians with the knowledge to produce food, generate income, and access critical agricultural information, this education program can guide the nation toward a future less plagued by food insecurity.

Background

Located at the heart of South Asia, India is a country of extremes. Within its enormous population of 1.46 billion in 2025, approximately 65% of the country's individuals live in rural areas, while the other 35% reside in suburban and urban areas (World Bank, 2024). While India boasts a rapid economic growth of 7.6% in the fiscal year 2026, this largely favors the country's urban populations (India Development Update, 2026). Specifically, the World Inequality Report 2026 confirms that "[India's] top 10% of earners capture about 58% of national income, while the bottom 50% receive only 15%" (Chancel et al., 2025, p. 173). Knowing that rural poverty rates hover at 27.7% while urban poverty at a much lower 14.3%, as determined by the World Bank's Poverty & Equity Brief in October 2025, it follows that many of the "bottom 50%" of India's earners resides in these rural regions. Knowing this, it therefore comes as no shock that these populations are greatly challenged by a lack of jobs and low income per person, leaving them in a sustained cycle of poverty (Chung, 2026).

Concentrated primarily in the central and northern parts of the country, much of India's rural population relies heavily on agriculture for sustenance, with 47% of the population involved in the field on a day-to-day basis. Though agriculture is prevalent, India's unique climate poses pressing challenges. For one, the southwest and northeast monsoons indicate high precipitation during summer months but comparatively low rain during the fall and winter months. This, combined with the fact that 30% of India's area receives 0–750 mm of rainfall annually, while another 42% receives 750–1,150 mm, proves that water availability is highly variable in the country (FAO, Ch. 1, n.d.). Because access to water for crops is uncertain for farmers, consequent yields and income are unpredictable as well. Farms in India are also limited by size, with the average being 1.08 hectares, which is ~186 hectares less than the average farm size in the United States (Ministry of Agriculture & Farmers Welfare, 2020). Minimal farming area, in conjunction with the alternating droughts and floods brought on by the country's monsoon seasons, thus renders Indians dependent on farming for mere subsistence, rather than having agriculture as a means of ensuring financial stability.

Regarding family structure, India has historically been characterized by extended family life, though contemporary individuals find themselves increasingly tending toward a nuclear structure. To illuminate, the average family size in rural India is 4.5, a drop from the higher 4.9 in the 2011 Census of India (The Hindu Centre, 2020). Despite Indian families growing smaller over the years, "high levels of poverty, food insecurity and malnutrition persist," making it further evident that the nation's agricultural sector is not entirely self-sufficient (World Food Programme, n.d.). Thus, it tends to the possibility that educational materials could be the step needed to bring India's rural families out of fiscal and nutritional poverty.

In the context of malnutrition, the World Food Programme confirms that "35% of children under five are stunted, 19% are underweight, and anaemia affects 57% of women of reproductive age and 67% of children aged 6–59 months." Notably, farmers grow a variety of crops, including rice, wheat, maize, arhar (also known as pigeon peas), sugarcane, cotton, soybean, and onion. However, even though India has a successful grain market and is considered a food surplus nation, the disparity in wealth and food distribution across the country leaves rural populations lacking the nutrition they need to maintain their health. By extension, for the millions who lack the resources and insurance needed to support their own wellness, the healthcare process is taxing. The Elders, an independent group founded by Nelson Mandela, point out an important, related figure from the World Health Organization. The group, in an argument for universal health coverage in the nation, relates that the WHO estimates that "two-thirds of health expenditures in India are made in the form of out-of-pocket payments" and approximately "600 million people fail to access the healthcare they need" (Brundtland et al., 2018, p. 7). While healthcare accessibility is undeniably a major problem that India faces, the urgency of its necessity can largely be attributed to malnutrition, for inadequate food is a major trigger of many health issues (like anemia, which is characterized by low iron). The same logic applies in the converse, though: reliable, nutritious food supports bodily health (ex. with anemic patients, low iron levels can be controlled via consumption of iron-rich foods), showing how such food can address not only hunger but also some of the health burdens associated with malnutrition.

As a developing country, India's infrastructure is largely limited in scope compared to that of highly developed nations. Specifically, "India faces an estimated shortage of 35 million tonnes of storage capacity" ("Navigating Market Constraints and Linkages in Indian Agriculture," 2023). Because there are not enough facilities for storing foods that need to be kept cool, many farms cannot sell their goods and lose out on profits ("15-20% for fruits and vegetables and 4-6% for food grains") as a result. Further, many rural roads are not built to withstand inclement weather, which makes the monsoon season an instigator for poor market access ("Navigating Market Constraints and Linkages in Indian Agriculture," 2023). Economic struggles are also often a barrier to farmers' livelihoods. As 40% of Indian farmers utilize informal credit sources (that collect 24-60% in interest) and a subsequent desperation for cash requires them to sell their crops even when prices are low, many rural families struggle to financially sustain their primary employment.

Findings

While infrastructural and economic barriers affect the typical Indian farmer family, the education gap represents a critical and addressable barrier to food security. UNICEF India, an organization dedicated to protecting and improving the lives of the country's vulnerable youth, points out that "around 50 per cent of adolescents do not complete secondary education" and "approximately 20 million children [do not even attend] pre-school." Even in children who do attend school, "nearly 50 million" do not "achieve grade appropriate learning levels." Evidently, availability of quality education is currently unreliable in India, and its shortage is an endemic issue; such an issue is even more severe in rural regions, for the Ministry of Education confirms that rural schools experience ~29% less access to online educational resources compared to urban institutions (Sadashiv, 2024). On this same thread, it follows that Lakshita Singh, from the Impact and Policy Research Institute, conveys that there is a 15% difference in literacy between rural and urban regions of the country, which she follows by illuminating that only 5.7% of rural individuals have completed a graduate degree compared to 21.7% of city individuals who have achieved the same feat. While this has significantly improved from previous decades, with an 'increase from 24.48% in 1961 to 68.91% in 2011,' Singh confirms, it is still far from ideal. Food insecurity is a multifaceted, embedded issue within rural India; it is not one that can be solved quickly. However, given that disparities in access to education between rural and urban regions of India show a positive correlation with disparities in poverty rates, it becomes evident that working to close the education gap is a significant first step in lowering poverty rates and, consequently, increasing the nation's food security.

In Zhemgang, Bhutan, the Rural Development Training Centre (RDTC) provides youth with educational training in topics including commercial agriculture, livestock management, and food processing. It was established by the nation's Ministry of Agriculture and Forests and is a Technical and Vocational Education and Training (TVET) institution under the Department of Workforce Planning and Skill Development, Ministry of Education and Skill Development (RDTC, n.d.). Such an approach provides an outlet for practical farming education to individuals who have either dropped out of school altogether or completed it in an environment that did not prepare them to sustain themselves and their family with agriculture. The RDTC has been significantly successful since its founding in 2004. A 2023 course in food production educated "53 participants" on the subject in a single month (RDTC, n.d.). Further, a Bhutan Qualifications Framework (BQF) Level 3 Landscape Technician course from the organization graduated 15 specialists to "transform Bhutan's landscape" to one positioned for regular agricultural production (RDTC, 2026). As a testament to the program's immense success, the Asian Development Bank (ADB) has approved a $30 million loan for RDTC to "improve Bhutan's technical and vocational education and training (TVET) system and enhance the skills and employability of its youth" (ADB, 2023).

Solution

Bhutan demonstrates the potential of practical agricultural education, but India's scale requires a fundamentally different delivery model. Unlike Bhutan, which has a population of ~800,000 people, India is an extremely populous country, with ~1.47 billion people—nearly 1,900 times Bhutan's population (Worldometer, 2026). In Bhutan, the RDTC has been largely successful with courses designed for 15-50 students per cohort. However, small class sizes like this would hardly cause a dent in the food insecurity challenge for India. At the same time, though, India is highly congested in terms of space, with cities like Bengaluru "recording a 74.4 per cent congestion level" (REDIFF, 2026). Even in rural areas, which are significantly less crowded than cities, the high population density makes it nearly impossible to create enough physical training centers for the country's citizens without jeopardizing the limited space left in the country. Thus, the proposed Krishi Vidya Uday (KVU) Initiative can utilize a "Hub-and-Spoke" digital hybrid model. At the "hub" (center), the Skill Digital India Hub (SIDH), a mobile-first national piece of Digital Public Infrastructure (DPI), is an app that "ensures equitable access to resources related to skilling, education, apprenticeship, employment and entrepreneurship" (SIDH, n.d.). The "spokes" (extensions) of the model apply to the remote areas being discussed, where standalone facilities do not exist for digital education. Instead of building thousands of new training centers, KVU could use this existing digital infrastructure to extend these educational resources to rural populations. Because, according to the Ministry of Statistics & Programme Implementation in 2025, '96.8 percent of persons [in rural India] in the age group 15-29 years used mobile phones,' the NSDC eSkillIndia App (an initiative of the National Skill Development Corporation under the aegis of the Ministry of Skill Development and Entrepreneurship) can be downloaded by rural populations to gain agricultural training "in English, Hindi, and many regional languages" (Softonic, n.d.). Because the app already offers courses for free and at low cost, this language accessibility ensures that there are minimal barriers to food security for the "more than 2,000 ethnic groups" and over 121 spoken languages of people in India, making the proposed Krishi Vidya Uday (KVU) Initiative highly specific and culturally sensitive (Bureau of Public Affairs, 2017). Furthermore, courses provided by SIDH boast Aadhaar-enabled verification, biometric attendance, and digitally verifiable certificates, proving their credibility and transferability to the agricultural workforce in rural India. Of course, even digital programming is not free. The PM-SETU program, funded with ₹60,000 crore, finances the development of India's vocational training network. As an agricultural initiative within this network, KVU could receive financial support to implement the SIDH and NSDC eSkillIndia apps.

Due to the nature of agricultural education, it must be conceded that not all training can be done virtually. For example, education related to the actual farming process (like biological pest management) is best provided in person, where students can physically experiment with the content they are learning. For this,

the Farmer Field School (FFS) Model can be utilized. The FFS Model, developed by the Food and Agriculture Organization (FAO), "is an approach based on people-centred learning," where "local knowledge and outside scientific insights are tested, validated and integrated, in the context of local ecosystem and socio-economic settings" (FAO, n.d.). Essentially, groups of rural farmers in India would meet in each other's fields throughout a crop's biological cycle to experiment with various agricultural methods, such as "soil, crop and water management, seeds multiplication and varietal testing, IPM, agropastoralism" and more (FAO, n.d.). Not only is the FFS Model likely to be highly effective due to its prioritization of active, experimental learning over passive lecture-based learning, but its utilization of preexisting plots of land is also extremely valuable, given India's spatial limitations. Furthermore, Indian culture is characterized by values of respecting elders and viewing them as wise teachers with incredible life lessons to share (Mehta, 2017). This is built into the FFS Model, as it hinges on agricultural practices being taught by current farmers, for new, youth farmers. With veteran agriculturalists as teachers, Farmer Field Schools are also culturally appropriate for solving food insecurity within rural India, for the elders are adept in the language and knowledgeable about the cultural and religious practices of the given region, as well as inherently respected by their town's youth. Also, because rural Indians can learn how to best make real-time decisions on crop and soil management using the resources that already exist, the FFS Model is not only space-efficient but cost-effective as well for the KVU Initiative, as government and private spending do not need to be targeted toward creating facilities for the program. Instead,the nation's Ministry of Agriculture and Farmers Welfare alongside National Bank for Agriculture and Rural Development (NABARD), a body dedicated to agricultural and rural development, can dedicate funding toward hiring some Agricultural Extension Officers to teach alongside elders in the community (Singh et al., 2020).

Therefore, digital training (via SIDH) and in-person training (via the FFS Model), in conjunction, form the foundation of the proposed Krishi Vidya Uday (KVU) Initiative. Utilizing the former for market literacy courses & IT education and the latter for modern agricultural technology education, the KVU Initiative will work to solve India's food hunger crisis with a three-pronged method: Produce, Profit, Connect. By teaching India's rural youth how to cultivate crops effectively, market them to ensure adequate earnings, and stay-connected with updates in the agricultural sector in real time, the KVU Initiative will guide the nation's next generation toward lives of prosperity and food security. Below are the initiative's three programs, outlined in depth.

1) Produce: Modern Agrarian Technology Education

Currently, India largely relies on traditional yet less efficient farming methods. Thus, food insecurity in the country can, for one, be approached by government-subsidized programs for vocational training in modern agricultural technology. Coordinated by the Ministry of Skill Development and Entrepreneurship (MSDE), this will function as either a college course or a major for students who would otherwise move straight to farm work. Similar agricultural training initiatives have already been implemented through organizations such as Digital Green, which uses local educators and instructional videos to teach rural farmers modern farming techniques in villages across India. Through partnerships between local schools, community centers, and agricultural cooperatives, students in rural areas could enroll in these vocational courses without needing to relocate to major cities. Within the program itself, trained teachers will provide instruction on "precision agriculture, biotechnology, smart irrigation, automation, vertical farming, and artificial intelligence (AI)," for those technologies have, as confirmed by the NIH, "improve[d] [crop] yields by 20–30% and cut input waste by 40–60%" globally (Chen, 2025). Notably, finances are of concern in rural, often impoverished areas. To reduce the economic burden of taking such classes, the National Skill Development Agency (NSDA), a subsector of the MSDE, can provide need-based scholarships to students when necessary. Also, the National Scheduled Castes Finance and Development Corporation (NSFDC) can help manage the costs of agricultural technology training by providing financial support to students in historically underrepresented castes. Together, this will ensure

that all students across communities can learn the newest, groundbreaking agricultural techniques, which they can then apply in their daily lives to maximize food production.

2) Profit: Consumer (Economics, Psychology, Marketing) Education

While the aforementioned proposal has significant potential, technical training alone cannot ensure that increased food production translates into greater food security. To guarantee that agricultural production leads to sustainable profits for farmers, rural Indians must also develop an understanding of economics, psychology, and marketing. In an increasingly market-driven world, large-scale companies such as McDonald's and Domino's use recognizable branding and consumer-focused marketing to shape purchasing preferences, often making commercially marketed foods more appealing than locally grown, nutritious crops. Overcoming this challenge requires educating future farm owners about consumer behavior and how it applies to food markets. Thus, incorporating humanities courses (like economics, marketing, and sociology) into standard rural high school curricula would better prepare students whose futures may involve agriculture. This could be implemented in rural schools under the direction of the National Council of Educational Research and Training (NCERT), which is responsible for developing and overseeing educational policies. Similar school-based economic literacy and nutrition education programs have also been supported internationally by organizations like UNICEF and the World Food Programme, via incorporating financial and food education into school systems in developing regions. In rural India, these lessons could be integrated into existing secondary-school coursework and supplemented by free after-school workshops for students whose families depend on agriculture. By entering the agricultural industry with both farming expertise and an understanding of how to reach consumers, rural families would be better equipped to market their crops effectively, and consequently, drive up their profits. Such an increase in income could strengthen household financial stability and help families secure reliable access to nutritious food, thus supporting both their own food security and that of their communities.

3) Connect: Information and Communications Technology (ICT) Education

Finally, a significant education-based solution to food insecurity for the typical agriculture-supported family is the implementation of information and communications technology (ICT) education and resources. Among the nearly 1,234,788 rural schools, 553,894 have access to digital infrastructure, which amounts to less than 50% (Sadashiv, 2024). This leads to information asymmetry, which, according to "Navigating Market Constraints and Linkages in Indian Agriculture," is characterized by sellers' inability to bargain due to not receiving live updates as prices fluctuate throughout food markets, which hinders their income by a whopping 15%. To combat this, digital infrastructure should be added to India's schools and classes should be provided to educate students on how to leverage those tools while working. Because this will be a large-scale solution, the Ministry of Electronics and Information Technology (MeitY), in collaboration with the Ministry of Education (MoE), should work to bring devices like computers, laptops, tablets, and phones to students in rural schools. Programs such as Digital India and e-Choupal have already demonstrated that rural communities can successfully use digital platforms to access weather forecasts, crop pricing data, and agricultural advice. To ensure equal access, schools and local governments could establish shared computer labs and community internet kiosks for families who cannot afford personal devices. From there, the organizations can develop a curriculum to teach students in those lower-income areas how the electronics work as well as how to access credible news sites and government reports on food market prices. Consequently, individuals will be able to adjust their own prices accordingly and thus prevent themselves from losing out on customers due to disparate costs. Once again, this will ensure that farm owners can earn the necessary profits to be financially stable and, in turn, fiscally support their own food security.

Conclusion

India is a rapidly developing nation, but much of its pastoral population remains trapped in poverty. For these families, food insecurity is sustained not only by limited infrastructure and resources, but also by

inefficiencies in longstanding agricultural practices. Although these challenges cannot be eradicated overnight, expanding access to agricultural, economic, and technological education can equip rural Indians with the knowledge to adapt to their nation's changing landscape. Through the Produce, Profit, and Connect framework, the Krishi Vidya Uday Initiative can thus transform India's education into a pathway toward greater agricultural productivity, financial stability, and, ultimately, food security.

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