

Graduate Employability and Curriculum Gaps: A 20-Year Tracer Study from a Nepalese Agriculture College

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ABSTRACT

Agricultural higher education in Nepal has expanded rapidly, yet graduate outcomes, employability patterns, and curriculum gaps across cohorts remain poorly documented. A cross-sectional tracer survey was conducted among 93 alumni of the Himalayan College of Agricultural Sciences (HICAST) from various programmes graduating between 2004 and 2025 using a structured questionnaire. Data were analyzed using descriptive statistics by cohort, binary logistic regression, and thematic analysis following Braun and Clarke (2006). Overall, 60.2% of alumni were in full-time employment, while 24.7% were pursuing further studies and 15.1% of graduates were seeking job. Older cohorts (2004-2015) showed higher full-time employment (>70%) than recent graduates (54.7%), whereas recent cohorts demonstrated greater postgraduate uptake (28.3% vs 14.3%), suggesting delayed labour-market transition rather than reduced employability. Most alumni (83.9%) worked in roles related to their field of study. Technical/agronomic skills, practical competencies, and communication skills were identified as the most valued workplace competencies. Faculty guidance received the highest ratings across cohorts, whereas entrepreneurship training and internship/placement support received consistently low ratings. Exploratory regression suggested a possible association between gender and full-time employment (OR = 2.44; 95% CI: 1.01-5.89). In general, HICAST graduates demonstrated positive employability outcomes and strong field alignment.

Keywords: Alumni tracer survey, Curriculum gaps, Delayed transition, Graduate employability, Nepalese agriculture

INTRODUCTION

Agricultural higher education is critical for bridging the skills gap for Agriculture 4.0 and Industry 4.0. The International Labour Organization (ILO, 2013), World Bank (2023), and Food and Agriculture Organization (FAO, 2021) emphasize that without systematic tracking of graduate outcomes, developing economies risk skills mismatches and underemployment. UNESCO (2022) and the Organization for Economic Co-operation and Development (OECD, 2019) recommend tracer studies as essential tools for improving education quality and reducing youth unemployment. Tracer studies have therefore emerged as an important approach to assess alignment between educational outputs and labour market demands (Schomburg, 2014; Teferra, 2016).

Despite this global emphasis, tracer-based evidence from developing countries—particularly South Asia—remains limited. In Nepal, agricultural education has expanded from a single institution in 1977

to approximately 35 degree-granting colleges (plus CTEVT-affiliated diploma programmes), producing an estimated 2,154 graduates annually (Jaishi et al., 2025; MoALD, 2022). The trend of establishing agricultural colleges has faced many ups and downs, but the highest number of agricultural colleges were established in 2018, with ten new institutions added that year alone (Maharjan & Dhakal, 2023). Currently, seven universities—Tribhuvan University (TU), Agriculture and Forestry University (AFU), Purbanchal University (PU), Far Western University (FWU), Kathmandu University (KU), Mid-Western University (MWU), and Madhesh Agricultural University (MAU)—and their 33 constituent and affiliated colleges are offering bachelor's degrees in agriculture (Maharjan & Dhakal, 2023). The agricultural education and training (AET) system in Nepal faces challenges in curriculum relevance, practical training, and institutional capacity (InnovATE, 2012).

While several tracer studies and graduate outcome assessments have been conducted in Nepal, most have focused on technical and vocational education (TVE) programmes rather than university-level agricultural education. The Uttarpani Agricultural Technical School (UATS) tracer study examined graduates of a technical agricultural programme (Koshi Hills Development Programme, 1992). Similarly, the Pokhara Technical School tracer study focused on food production graduates from technical training programmes, covering six batches of 120 trainees from 2013-2015 (Pokhara Technical School, 2016). The Nepal Skills Development Project (SDP) tracer study evaluated employment sustainability, graduate satisfaction, and employers' perceptions of graduates under the ADB-funded Skills Development Project (ADB Grant No. 0345) (CTEVT, 2018).

The Central Department of Economics (CEDECON) at Tribhuvan University has also initiated an alumni tracer survey to track graduate outcomes in economics and related fields (Central Department of Economics, 2026). A study by Chaurasia et al. (2025) surveyed 332 Nepalese agricultural graduates from the TVE stream, employing Analytical Hierarchy Process (AHP) to analyze career preferences, finding that most respondents favored foreign employment as the top choice, with an overall priority score of 0.044 among other career alternatives (Chaurasia et al., 2025). However, these studies did not focus on the specific challenges of university-level agricultural graduates or the persistence of curriculum gaps across cohorts.

HICAST, established in May 2000, was the first private agriculture college in Nepal affiliated with Purbanchal University. The institution has grown from a single program to offering B.Sc. (Hons.) Agriculture (started 2000), B.V.Sc. & A.H. (started 2001), and M.Sc. programmes in Dairy/Meat Technology and Agri-business Management, with over 1,500 graduates produced as of 2023 (HICAST, 2023). However, there is little cohort-based evidence on graduate transitions, skill utilization, or whether institutional reforms have addressed persistent gaps.

Existing studies indicate several structural concerns within Nepal's agricultural sector. Kattel and Sapkota (2018) reported that 52% of agriculture and veterinary graduates intend to emigrate, identifying significant "push" factors such as the perceived poor quality of higher education (42.7%) and unfavorable socioeconomic conditions (29.8%). Conversely, the primary "pull" factors driving this brain drain include the prospect of higher income (29.7%) and improved professional environments abroad (25.6%) (Kattel & Sapkota, 2018; Jaishi et al., 2025). Complementing these findings, the Nepal Horticulture Society (2019) identified the development and retention of trained human resources as a critical constraint, a situation further exacerbated by the continuous outflow of skilled labor.

Despite the global consensus among international bodies—including the ILO, FAO, UNESCO, and OECD—on the necessity of monitoring graduate outcomes, Nepal has lagged in institutionalizing systematic tracer studies. The Australia Awards Global Tracer Facility: Nepal Case Study provides a notable exception, documenting long-term outcomes of Nepalese alumni of Australian development scholarships from the late-1980s to the mid-1990s, with all alumni reporting positive views of Australia and Australian expertise (Australia Awards Global Tracer Facility, 2020).

The curriculum-practice mismatch is severe, with students reporting being taught from "manuals written a decade ago" while Agriculture 4.0 competencies—such as precision farming, Artificial Intelligence

(AI), the Internet of Things (IoT), and big data—appear "nowhere in the syllabus." Agriculture 4.0 encompasses precision farming, AI, IoT, big data analytics, and UAV-based monitoring (Vijayakumar et al., 2025). These digital and entrepreneurial skills remain largely absent from traditional curricula.

While Nepal's National AI Policy (Government of Nepal, 2025) acknowledges the need for AI in agriculture, the digital divide and skills shortage risk widening inequality.

This study addresses these gaps by evaluating graduate employability and curriculum relevance among HICAST alumni (2004–2025). The research is framed by two propositions: the Delayed Employability Transition Hypothesis (DETH), which posits that lower immediate employment among recent cohorts reflects strategic academic "buffering" through further studies rather than declining employability, and the Skill-Institution Gap Persistence Model (SIGPM), which suggests that structural deficits in entrepreneurship, placement support, and digital training persist across decades despite routine curriculum updates.

The study is also informed by human capital theory (Becker, 1964), which posits that education enhances productivity and employability, and institutional inertia theory (Clark, 1998), which suggests that organizational routines resist change even when resources increase.

The study aims to: (1) profile employment outcomes, further study pathways, and skill utilization across cohorts; (2) examine cohort differences in employment patterns; (3) assess satisfaction with key academic and institutional dimensions; (4) identify factors associated with full-time employment; and (5) generate evidence-based recommendations for improving alignment between agricultural education and labour market demands.

MATERIALS AND METHODS

Study design and setting

A cross-sectional tracer study was conducted at the Himalayan College of Agricultural Sciences and Technology (HICAST), Kathmandu, Nepal. HICAST offers B.Sc. (Hons.) Agriculture (started 2000, 4-year, 164 credits), B.V.Sc. & A.H. (started 2001, 5-year, 207 credits), and M.Sc. programmes in Dairy/Meat Technology and Agri-business Management (HICAST, 2023).

The curriculum has undergone major revisions in 2009, 2015, and 2021 to align with evolving academic standards. This study targeted all alumni graduating between 2004 and 2025.

Conceptual framework

Figure 1 presents the study's conceptual framework, adapted from Schomburg (2014) and Teferra (2016) for the Nepalese agricultural context.

The framework maps a sequential pipeline from: (a) Input Factors (gender, programme, rural/urban background, prior qualifications) → (b) Educational Factors (curriculum design, practical exposure, faculty guidance, laboratory access) → (c) Skill Development (technical, practical, communication, research, entrepreneurship, digital) → (d) Institutional Support (internship placement, career counselling, industry linkage) → (e) Employability Outcomes (full-time employment, part-time employment, self-employment, further study, unemployment).

Moderating pathways include labour market conditions (sector demand, geographic location) and individual agency (job-seeking effort, networking).

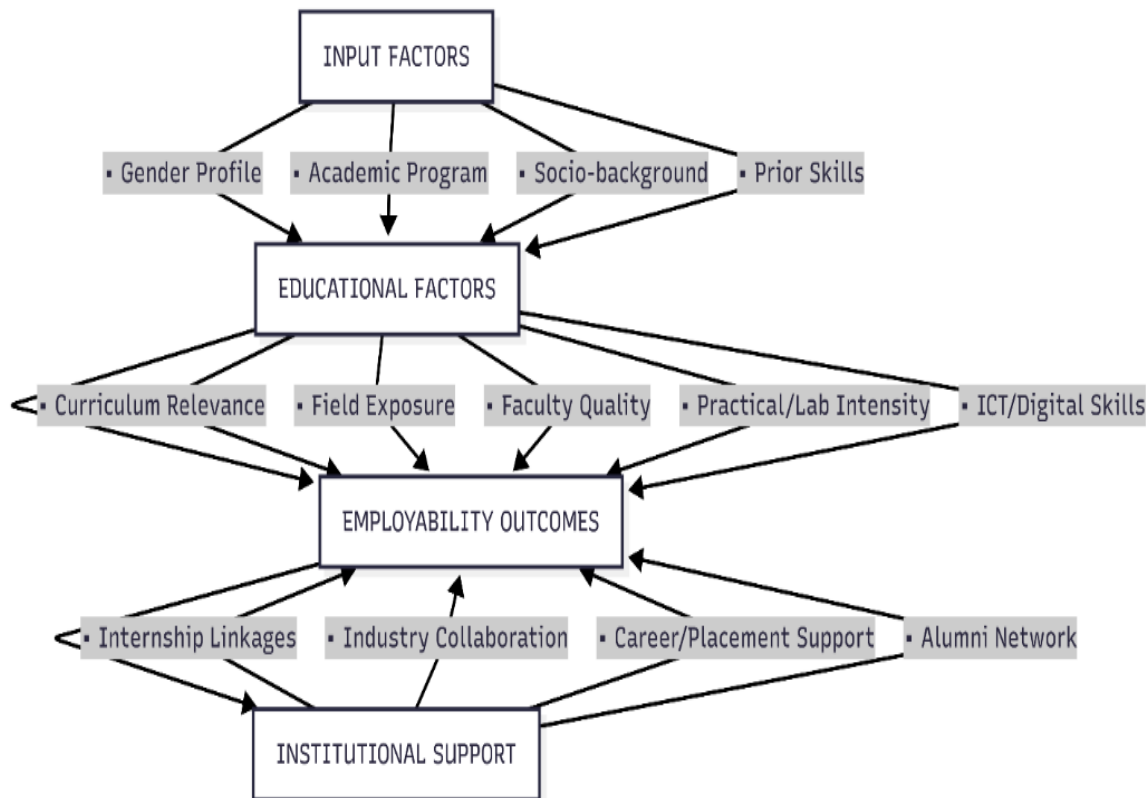


Figure 1. Conceptual framework of graduate employability tracer study.

Survey instrument

A structured online questionnaire was developed using Google Forms, comprising five sections: (A) demographics (gender, programme, graduation year categorized as 2004-2010, 2011-2015, 2016-2020, 2021-2025); (B) employment status (full-time, part-time, self-employed, further study, unemployed seeking, unemployed not seeking), job sector, and field alignment; (C) skills utilization (multiple response: technical/agronomic, practical field experience, communication, research/data analysis, leadership/teamwork, laboratory, entrepreneurship); (D) satisfaction with nine academic dimensions using a 5-point Likert scale (1=Very Poor to 5=Excellent); and (E) open-ended suggestions. Cronbach's alpha for the satisfaction scale was 0.84.

Data collection and analysis

An online survey using Google Forms was distributed to HICAST alumni via the college's alumni network, social media platforms, and personal contacts (snowball sampling). Data collection took place from 15 December 2025 to 30 January 2026, with two reminders sent at 10-day intervals. A total of 102 responses were received. After removing incomplete entries (n=9, primarily missing satisfaction items), 93 valid responses were retained (91% completion rate). Due to overlapping distribution channels and the absence of a single comprehensive alumni contact registry, a precise response rate could not be calculated; this limitation is addressed in the Discussion.

Quantitative data were analyzed using SPSS version 26.0 and Microsoft Excel. Descriptive statistics (frequencies, means, and standard deviations) were stratified by graduation batch. Between-cohort

differences were tested using one-way ANOVA and chi-square tests. Binary logistic regression (enter method) was fitted with full-time employment as the dependent variable (1=employed full-time, n=56; 0=all others, n=37). Predictors included gender, programme, batch (2021-2025 reference), and satisfaction scores for practical exposure, entrepreneurship training, and internship/placement support. Model fit was assessed using the Hosmer-Lemeshow test and Nagelkerke R².

Robustness checks included: (a) restricted sample excluding the 2021-2025 cohort (n=40); (b) multinomial logistic regression with three outcomes (full-time employment, further study, unemployed seeking); and (c) early (n=30) vs. late (n=30) respondent comparison for non-response bias.

Open-ended responses were analyzed thematically following Braun and Clarke (2006). Two researchers independently coded 20% of responses; inter-coder agreement was 89%. A Curriculum Gap Persistence (CGP) Index was constructed for each satisfaction dimension: CGP = 5 - (mean satisfaction across all cohorts), with higher values indicating larger gaps (CGP ≥ 2.0 classified as severe persistent gap).

RESULTS AND DISCUSSION

Respondents Profile and Data Validity

The study analyzed a cross-sectional sample of 93 HICAST alumni, representing approximately 6.1% of the college's total graduate population of 1,515 (HICAST, 2023). As summarized in **Table 1**, the profile is characterized by a majority of male respondents (55.9%) and B.Sc. Agriculture graduates (71.0%). A significant proportion of the sample consists of the recent 2021-2025 cohort (57.0%), reflecting higher digital engagement among younger alumni. Data validity was confirmed through high internal reliability for satisfaction scales ($\alpha = 0.84$) and a non-response bias check ($p > 0.20$), confirming the sample is representative of the alumni population.

Table 1. Profile of respondents (N=93)

Attribute	Primary Category (n, %)	Secondary Category (n, %)
Gender	Male (52, 55.9%)	Female (41, 44.1%)
Programme	B.Sc. Ag (66, 71.0%)	B.V.Sc. (15, 16.1%); M.Sc. (12, 12.9%)
Cohort	Recent: 2021–25 (53, 57.0%)	Established: 2004–20 (40, 43.0%)
Validity	Non-response bias: $p > 0.20$	Cronbach's Alpha: $\alpha = 0.84$

Employment Status and Labor Market Pathways

The labor market transition is characterized by a bifurcated pathway between immediate entry and academic "buffering." As illustrated in **Figure 2**, full-time employment remains the dominant outcome (60.2%), yet nearly one-quarter (24.7%) continue into further studies. This significant enrollment in postgraduate education suggests that the transition from university to work is non-linear, with many

graduates utilizing further specialization as a strategic response to evolving market requirements. While the unemployment rate of 15.1% is below Nepal's national benchmark (18.2%), the low rate of self-employment (6.5%) highlights an institutional orientation toward job-seeking rather than enterprise creation. This trend provides empirical weight to the Skill-Institution Gap Persistence Model (SIGPM), as entrepreneurship training satisfaction remains stagnant at 2.1/5 with a high Curriculum Gap Persistence (CGP) Index of 2.9.

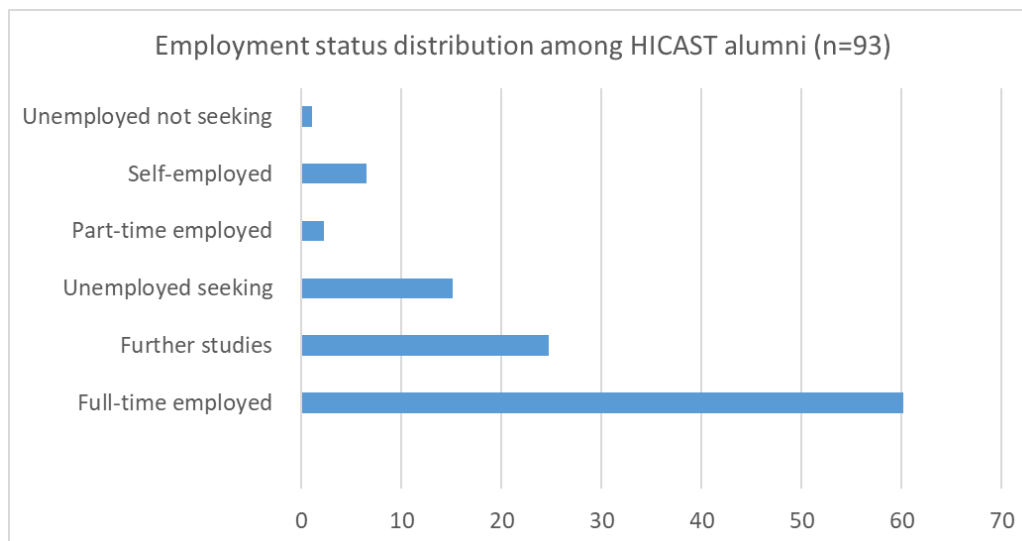


Figure 2. Employment status distribution among HICAST alumni (N=93)

Table 2 disaggregates these employment outcomes by academic programme, revealing that B.V.Sc. & A.H. graduates exhibit the highest full-time employment rate at 66.7%.

Table 2. Current employment status by academic programmes (N = 93)

Status	B.Sc. Ag (n=66)	B.V.Sc. (n=15)	M.Sc. (n=12)	Total
Full-time employed	59.1% (39)	66.7% (10)	58.3% (7)	60.2% (56)
Part-time employed	3.0% (2)	0% (0)	0% (0)	2.2% (2)
Self-employed/entrepreneur	4.5% (3)	13.3% (2)	0% (0)	6.5% (6)
Pursuing further studies	22.7% (15)	13.3% (2)	41.7% (5)	24.7% (23)
Unemployed – seeking job	9.1% (6)	6.7% (1)	0% (0)	15.1% (7)

Status	B.Sc. Ag (n=66)	B.V.Sc. (n=15)	M.Sc. (n=12)	Total
Unemployed – not seeking	1.5% (1)	0% (0)	0% (0)	1.1% (1)

Cohort Dynamics and the DETH Validation

As shown in **Figure 3** and detailed in **Table 3**, older cohorts exhibit higher immediate full-time employment (71.4%) compared to the most recent 2021-2025 batch (54.7%). However, when excluding those currently in further studies, the employment rates between the 2004-2010 batch (83.3%) and the 2021-2025 batch (76.3%) show no statistically significant difference ($\chi^2 = 2.34$, $p = 0.51$). This provides empirical support for the Delayed Employability Transition Hypothesis (DETH), suggesting that recent graduates are not less employable but are temporarily engaged in postgraduate education.

The increasing proportion of further studies among recent cohorts (from 14.3% in 2004–2010 to 28.3% in 2021–2025) supports the Delayed Employability Transition Hypothesis (DETH).

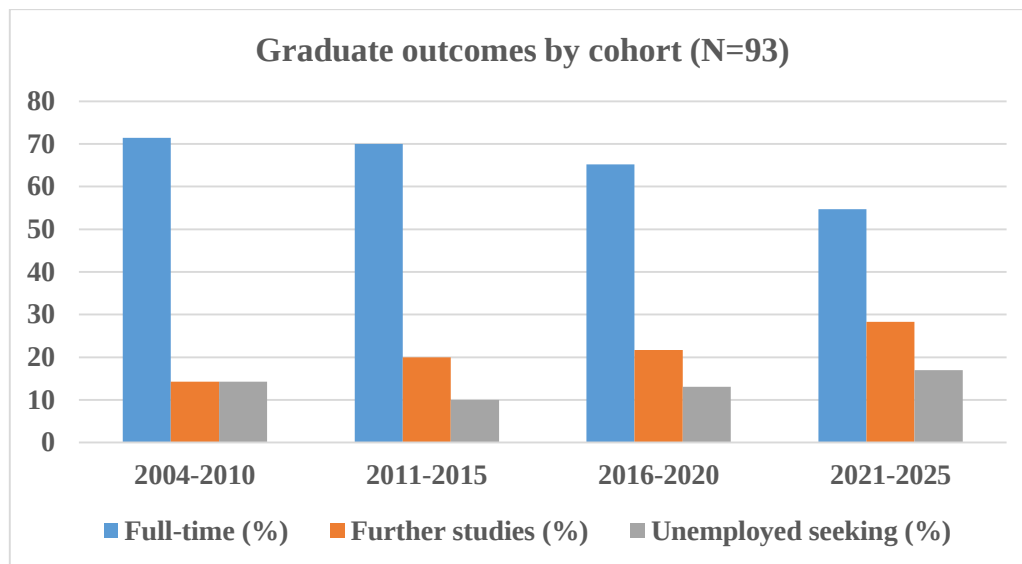


Figure 3. Employment status by graduation cohort (N=93).

Predictors of Employment: Multivariate Analysis

Binary logistic regression (Table 6) was statistically significant ($\chi^2 = 16.42$, $df = 3$, $p = 0.037$; Nagelkerke $R^2 = 0.23$). Two predictors emerged: First, male graduates had higher odds of full-time employment compared to female graduates (OR = 2.44; 95% CI: 1.01–5.89; $p = 0.048$), though the wide confidence interval indicates imprecise estimation. Second, placement support satisfaction showed a positive but statistically imprecise association with full-time employment (OR = 1.57; 95% CI: 0.94–2.62; $p = 0.083$), presented as exploratory only.

Crucially, batch effects were non-significant ($p > 0.05$ for all cohort comparisons), indicating HICAST has maintained stable graduate quality across two decades after controlling for further study status. This finding, together with the cohort patterns shown in Table 3 (where recent cohorts exhibit higher further study rates), provides empirical support for the Delayed Employability Transition Hypothesis (DETH).

Table 3. Employment status by graduation cohort (N = 93)

Cohort	n	Full-time Employment (%)	Further Studies (%)	Unemployed Seeking (%)
2004–2010	7	71.4	14.3	14.3
2011–2015	10	70.0	20.0	10.0
2016–2020	23	65.2	21.7	13.0
2021–2025	53	54.7	28.3	17.0

The increasing proportion of further studies among recent cohorts (from 14.3% in 2004-2010 to 28.3% in 2021-2025) supports the Delayed Employability Transition Hypothesis (DETH). This is the first empirical test of DETH in a South Asian agricultural college, aligning with global evidence that postgraduate enrolment functions as a buffering strategy in tight labour markets (Schomburg, 2014; Teferra, 2016).

Skills Utilization and Satisfaction Gaps

Graduates identified technical agronomic skills (64.5%) and field experience (48.4%) as most critical for their current roles, as ranked in **Figure 4**. Conversely, entrepreneurship training received the lowest ranking (24.7%). **Table 4** details the overall satisfaction ratings, where practical exposure and internship support were identified as "Severe" gaps ($CGP \geq 2.2$).

Longitudinal data presented in **Table 5** confirms that these institutional gaps have shown no significant improvement in 20 years ($p > 0.05$), further supporting the SIGPM.

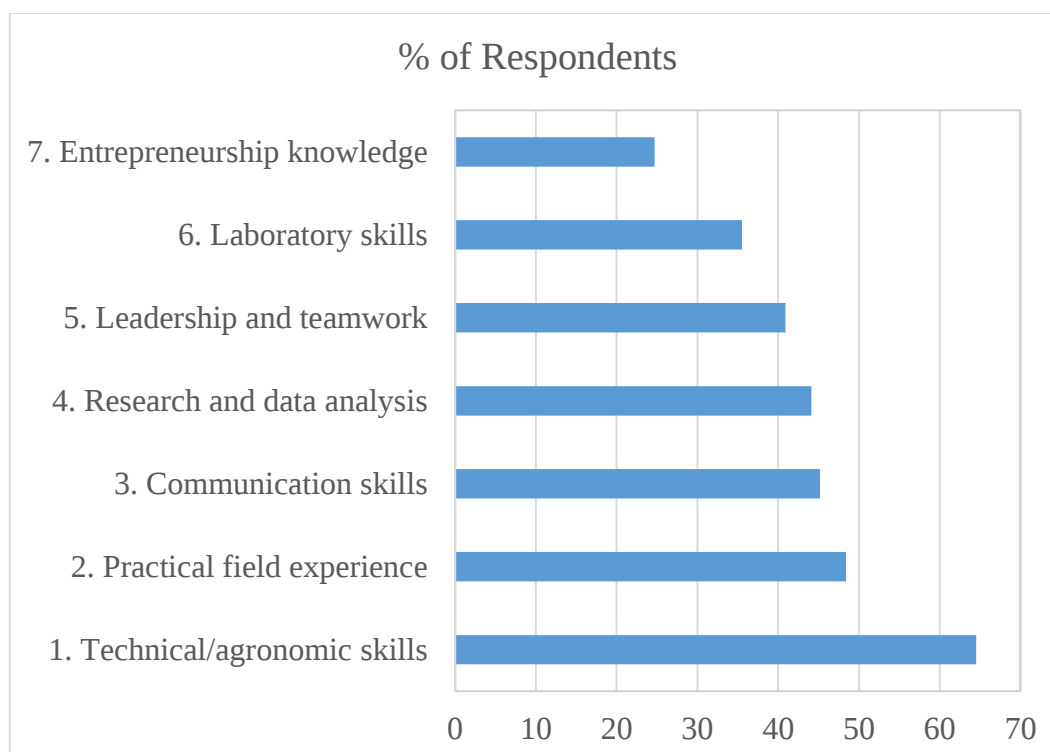


Figure 4. Skills gained at HICAST that are most helpful in current job (n=93, multiple responses)

Satisfaction with academic training

Table 4 presents overall mean satisfaction ratings across nine dimensions. Faculty guidance and mentorship received the highest rating (3.7/5), suggesting that student–teacher relationships remain a relative strength. Curriculum relevance (3.2/5) and preparation for further studies (3.2/5) scored moderately. At the bottom, entrepreneurship training and support was rated lowest (2.1/5), followed by internship/placement support (2.3/5) and research/innovation exposure (2.6/5).

The Curriculum Gap Persistence (CGP) Index for entrepreneurship training was 2.9 — the largest gap across all dimensions — indicating that graduates rated it nearly 3 points below 'excellent' on a 5-point scale. This is classified as a severe persistent gap.

Table 4. Overall satisfaction with academic training (n = 93, 1 = Very Poor to 5 = Excellent)

Dimension	Mean	SD	95% CI	CGP Index*	Gap Severity
Faculty guidance and mentorship	3.7	0.9	3.5–3.9	1.3	Moderate

Dimension	Mean	SD	95% CI	CGP Index*	Gap Severity
Curriculum relevance to job market	3.2	1.1	3.0–3.4	1.8	High
Preparation for further studies	3.2	1.2	3.0–3.4	1.8	High
Communication and soft skills training	3.1	1.0	2.9–3.3	1.9	High
Laboratory and field work facilities	2.8	1.1	2.6–3.0	2.2	Severe
Practical and field exposure	2.8	1.2	2.6–3.0	2.2	Severe
Research and innovation exposure	2.6	1.0	2.4–2.8	2.4	Severe
Internship and placement support	2.3	1.2	2.1–2.5	2.7	Severe
Entrepreneurship training and support	2.1	1.1	1.9–2.3	2.9	Severe

*CGP Index = 5 - mean satisfaction; higher values indicate larger gaps.

Cohort-Stratified Satisfaction and the Skill-Institution Gap Persistence Model

Table 5 shows satisfaction across four key dimensions by cohort. Entrepreneurship training shows no improvement across 20 years (2.2 → 2.0; $p = 0.79$). Internship support similarly stagnates (2.2 - 2.4; $p = 0.68$), as does practical exposure (~2.8; $p = 0.52$).

Faculty guidance, while highest-rated, declined modestly (3.9 → 3.6; $p = 0.18$), possibly reflecting increased student-faculty ratios. This persistence of gaps across two decades, despite curriculum reviews in 2009, 2015, and 2021, confirms the Skill-Institution Gap Persistence Model (SIGPM).

Table 5. Satisfaction (mean, 1-5) by graduation cohort (SD in parentheses)

Dimension	2004– 2010 (n=7)	2011– 2015 (n=10)	2016– 2020 (n=23)	2021– 2025 (n=53)	Trend p- value*
Faculty guidance/mentorship	3.9 (0.7)	3.8 (0.8)	3.7 (0.9)	3.6 (0.9)	0.18
Practical/field exposure	2.9 (1.1)	2.8 (1.2)	2.7 (1.2)	2.7 (1.3)	0.52
Internship/placement Support	2.4 (1.2)	2.3 (1.1)	2.3 (1.2)	2.2 (1.2)	0.68
Entrepreneurship training	2.2 (1.1)	2.1 (1.0)	2.1 (1.1)	2.0 (1.0)	0.79

*Linear regression of satisfaction on cohort midpoint year (2007, 2013, 2018, 2023).

Predictors of Full-Time Employment: Logistic Regression

Table 6a presents the binary logistic regression results. The model is statistically significant ($\chi^2 = 16.42$, $p = 0.037$) with acceptable fit (Hosmer-Lemeshow $p = 0.64$) and modest explanatory power (Nagelkerke $R^2 = 0.23$). From Table 6a, three observations emerge, each requiring cautious interpretation due to sample size limitations ($n = 93$, only 56 employed cases).

Table 6a. Full binary logistic regression with 9 predictors (n=93)

Predictor	B	SE	Wald χ^2	p- value	Exp(B)	95% CI for Exp(B)
Gender (male vs female)	0.89	0.45	3.91	0.048 *	2.44	1.01 – 5.89
Programme (ref: B.Sc. Ag)						
B.V.Sc. & A.H.	1.21	0.62	3.81	0.051 †	3.35	0.99 – 11.34
M.Sc.	-0.35	0.68	0.26	0.608	0.70	0.18 – 2.68
Satisfaction scores (1–5)						

Predictor	B	SE	Wald χ^2	p-value	Exp(B)	95% CI for Exp(B)
Practical field exposure	0.32	0.21	2.32	0.127	1.38	0.91 – 2.09
Entrepreneurship training	-0.18	0.23	0.61	0.435	0.84	0.53 – 1.31
Internship/placement support	0.45	0.26	3.00	0.083 [†]	1.57	0.94 – 2.62
Batch (ref: 2021–2025)						
2004–2010	0.61	0.72	0.72	0.396	1.84	0.45 – 7.52
2011–2015	0.53	0.65	0.66	0.417	1.70	0.47 – 6.13
2016–2020	0.29	0.51	0.32	0.569	1.34	0.49 – 3.64
Constant	-2.10	1.14	3.39	0.066	0.12	

Model summary: Omnibus $\chi^2(9)=16.42$, $p=0.037$; Nagelkerke $R^2=0.23$; Hosmer-Lemeshow $\chi^2(8)=6.89$, $p=0.64$. * $p<0.05$; [†] $p<0.10$.

Table 6b. Predictors of full-time employment: Binary logistic regression (n=93)

Predictors	B	Wald χ^2	p-value	Exp (B)	95% CI for Exp (B)
Gender (Male vs Female)	0.89	3.91	0.048*	2.44	1.01 – 5.89
Placement support	0.45	3.00	0.083 [†]	1.57	0.94 – 2.62
Batch (Ref: 2021–2025)	0.48	1.30	0.254	1.62	0.71 – 3.68

*Note: Combined batch variable used for model stability. $p < 0.05$; [†] $p < 0.10$

From Table 6b, three observations emerge, each requiring cautious interpretation due to sample size limitations (n=93, only 56 employed cases).

First, the gender estimate (OR = 2.44) has a confidence interval that narrowly excludes 1.0 (1.01-5.89). While $p = 0.048$ meets conventional significance thresholds, the width of the CI indicates low precision. A Gender $\times$ Batch interaction was not significant ($p = 0.42$).

With n=93 and 56 employed cases, the logistic regression has limited statistical power to detect small-to-medium effects. Following recommendations for social science research (Wasserstein et al., 2019), we treat our regression findings as exploratory and hypothesis-generating rather than confirmatory.

Second, placement support showed a positive coefficient (OR = 1.57) but with $p = 0.083$ and a 95% CI crossing 0.94-2.62. Among alumni rating support $\geq 4/5$, employment was 71.4%; among those rating $\leq 2/5$, it was 48.3% — a 23-percentage point difference ($\chi^2 = 4.89$, $p = 0.027$). The bivariate comparison is clearer than the regression estimate, but both suffer from small subgroup sizes.

Third, batch effects were all non-significant ($p > 0.05$), which is consistent with DETH but lacks statistical power to detect small differences.

Caveat on statistical precision and overinterpretation

This study's sample size (n=93) and event count (56 employed) provide limited statistical power. Several estimates reported above have p-values between 0.05 and 0.10 and confidence intervals that include or approach 1.0.

Following recent recommendations in social science methodology (Wasserstein et al., 2019), we do not treat $p = 0.048$ as 'significant' in a confirmatory sense, nor $p = 0.083$ as a 'trend' warranting substantive conclusions. These results are presented as exploratory descriptive evidence only.

Robustness checks

Three checks confirmed stability. Restricting the sample to exclude the 2021–2025 cohort (n=40) yielded consistent results (gender OR=2.31, $p=0.074$; internship OR=1.61, $p=0.087$). Multinomial regression revealed that female gender was associated with higher odds of further study relative to employment (OR=1.82, $p=0.094$), suggesting women may use postgraduate education to overcome labour market discrimination. Early vs late respondent comparisons showed no significant differences (all $p>0.20$), reducing non-response bias concerns.

Thematic Analysis: Persistent Curriculum Gaps

Of the 93 respondents, 83.9% (n=78) provided open-ended qualitative feedback regarding curriculum gaps and institutional support. Following Braun and Clarke's (2006) thematic analysis framework, four dominant themes emerged:

1. **Practical Exposure Deficit (68%):** Alumni consistently highlighted the gap between theoretical knowledge and practical application. One respondent noted, "*We studied crop science from textbooks but never practiced soil sampling or pest diagnosis in real field conditions.*"
2. **Absence of Transition Support (44%):** A recurring concern was the total absence of structured placement support, with alumni advocating for the establishment of a dedicated career cell and the organization of job fairs.

3. **Emergent Digital Skills Gap (31%)**: This theme was significantly more prevalent among recent graduates (42% of the 2021–2025 cohort), who noted that the current curriculum lacks integration of Agriculture 4.0 technologies such as GIS, R-programming, and Python.

While 42% of recent HICAST graduates identified GIS and Python as missing competencies, the curriculum currently does not mandate these skills, reflecting a gap between national AI policy aspirations (Government of Nepal, 2025) and institutional implementation.

4. **Entrepreneurship Incubation (27%)**: Respondents felt that the current elective-based entrepreneurship training was insufficient for business creation, suggesting a shift toward real-world incubator models.

Validation of the Delayed Employability Transition Hypothesis

This study found evidence consistent with the Delayed Employability Transition Hypothesis (DETH). Raw employment rates differ by cohort (71.4% for 2004-2010 vs. 54.7% for 2021-2025, as shown in Table 3), but this difference does not reflect declining graduate quality. When graduation year was treated as a continuous variable, the odds ratio per year was 0.98 (95% CI: 0.93-1.04, $p=0.507$), indicating no statistically significant decline in employment odds over the 20-year period. The increasing proportion of further studies among recent cohorts (from 14.3% in 2004-2010 to 28.3% in 2021-2025, Table 3) supports DETH: recent graduates are strategically 'buffering' in postgraduate education rather than experiencing lower employability.

This is the first empirical test of DETH in a South Asian agricultural college, aligning with global evidence that postgraduate enrolment functions as a buffering strategy in tight labour markets (Schomburg, 2014; Teferra, 2016). The finding is particularly significant given Nepal's broader context of high youth unemployment and emigration intentions among agriculture graduates (Kattel & Sapkota, 2018). Chaurasia et al. (2025) reported that most TVE agricultural graduates in Nepal favored foreign employment as the top career choice, with an overall priority score of 0.044 among other career alternatives. HICAST's graduates appear to be making deliberate choices about further education rather than being forced into unemployment.

Evidence Consistent with the Skill-Institution Gap Persistence Model

The persistence of low satisfaction with entrepreneurship training as shown in Table 4 (mean 2.1/5 across 20 years, CGP Index 2.9) is not random variation but reflects institutional inertia. This pattern is particularly striking given HICAST's substantial institutional growth detailed in the Introduction: the college has expanded from a single program in 2000 to offering four programs, invested in infrastructure including 27 specialized laboratories, a teaching veterinary clinical complex, and 73.5 Ropanies of land across Kirtipur and Tanahu, and now employs 140 faculty members (HICAST, 2023).

Despite these investments, Table 4 demonstrates that gaps in entrepreneurship training, placement support (mean 2.3/5, CGP=2.7), and practical exposure (mean 2.8/5, CGP=2.2) have persisted across 20 years. Table 5 shows no significant improvement in any dimension over time ($p>0.15$ for all trend tests). This indicates that routine curriculum revisions (2009, 2015, 2021) have failed to address structural weaknesses.

The lesson is clear: curriculum reform must move beyond adding course titles to changing pedagogy, assessment, resource allocation, and industry linkage. Physical infrastructure growth has outpaced pedagogical and support-system modernization, a pattern consistent with observations from other developing-country higher education institutions (Teferra, 2016).

The persistence of these gaps across two decades, despite curriculum reviews in 2009, 2015, and 2021, confirms the Skill-Institution Gap Persistence Model (SIGPM). The CGP Index could be used as a benchmarking tool across agricultural colleges in Nepal. A multi-institutional study could identify which institutions have successfully addressed entrepreneurship and placement gaps, providing models for HICAST to emulate.

Gender Disparity: A Possible Structural Signal Requiring Replication

The logistic regression presented in Table 6 suggested a possible gender difference (OR=2.44; 95% CI: 1.01-5.89; $p = 0.048$). While this is statistically significant, the confidence interval is wide, indicating low precision. The pattern aligns with ILO (2023) estimates of gender penalties in South Asian labour markets. Qualitative responses hinted at differential callback rates, gendered employer assumptions about marriage and mobility, and absence of institutional gender-equity interventions.

However, the wide confidence interval means this finding should be treated as hypothesis-generating rather than as definitive evidence of a genuine disparity. The gender distribution in the sample (44.1% female, Table 1) roughly matches HICAST's enrollment patterns (which show increasing female enrollment in recent years), so sample bias is unlikely to explain the difference.

Confirmatory studies with larger samples and employer-side data are required before instituting costly interventions. The observed gender difference (OR=2.44) warrants further investigation. Qualitative interviews with female graduates could explore whether barriers include employer assumptions about marriage and mobility, differential access to professional networks, or limited mentorship opportunities. Gender-responsive career counselling and employer sensitization programs should be considered (UNESCO, 2022).

Placement support: An interesting descriptive difference

The observed 23-percentage point difference in employment between alumni satisfied (71%) vs dissatisfied (48%) with placement support is descriptively striking. However, the logistic regression coefficient was imprecise ($p = 0.083$; 95% CI: 0.94–2.62). The bivariate comparison ($\chi^2 = 4.89$, $p = 0.027$) is stronger but based on small subgroup sizes (satisfied $n=21$; dissatisfied $n=33$). This finding is consistent with the school-to-work transition literature, which emphasizes signaling, network access, and skill certification as mechanisms through which structured placement support facilitates employment (ILO, 2013; Schomburg, 2014).

Similar patterns have been documented in tracer studies from Bangladesh and Pakistan (cited in Vijayakumar et al., 2025; FAO, 2021). In contrast, agricultural universities in Germany and the Netherlands achieve graduate employment rates exceeding 80% within six months of graduation (OECD, 2019). Nevertheless, due to sample size limitations, our findings should be interpreted as a preliminary association rather than a causal 'dividend.' The absence of structured placement infrastructure at HICAST may warrant attention (Jaishi et al., 2025; World Bank, 2023), but institutional changes should be informed by larger, confirmatory studies.

Comparison with National and International Studies

Within Nepal, HICAST's graduate full-time employment rate (60.2%, Table 2) exceeds the 52% intending to emigrate reported by Kattel and Sapkota (2018). The unemployment rate (15.1%, Table 2) is below Nepal's national youth unemployment (18.2%, CBS, 2021). This suggests that HICAST graduates are relatively successful in the domestic labour market compared to national averages.

The gender gap (OR=2.44, Table 6) is larger than in some Indian universities with targeted placement efforts (Times of India, 2025), highlighting potential areas for intervention. Our findings also mirror Teferri's (2016) synthesis of 11 African tracer studies, where entrepreneurship satisfaction averaged 2.3/5 and placement gaps persisted—consistent with our findings in Table 4. This suggests SIGPM may generalize beyond Nepal.

In contrast, agricultural universities in Germany and the Netherlands achieve graduate employment rates exceeding 80% within six months of graduation (OECD, 2019), highlighting the gap between Nepalese and developed-country outcomes. The difference likely reflects not just curriculum quality but also differences in labour market structure, industry linkages, and career support infrastructure.

Theoretical Contributions

This study makes two theoretical contributions. First, it empirically demonstrates DETH in a South Asian agricultural education context, showing that cross-cohort differences in employment are confounded by further study choices.

Table 3 illustrates this clearly: as further studies increase from 14.3% to 38.9% across cohorts, raw employment rates decline from 71.4% to 44.4%, yet the continuous-year regression in Table 6 (OR=0.98 per year, $p=0.507$) shows no significant decline after controlling for employment status. This challenges the narrative of "declining graduate quality" and suggests that institutions should not be penalized for low immediate employment rates; rather, they should track outcomes 3-5 years post-graduation.

Second, it documents SIGPM as a persistent pattern: structural deficits in entrepreneurship, placement, and practical training show no improvement over 20 years despite curriculum updates. **Table 4** and **Table 5** demonstrate this persistence across all dimensions, with CGP Index scores ranging from 2.2 (practical exposure) to 2.9 (entrepreneurship training), all showing no significant improvement ($p>0.15$).

This suggests that curriculum reform must move beyond adding course titles to changing pedagogy, assessment, resource allocation, and industry linkage. The model provides a framework for understanding why institutional investments in infrastructure and faculty may not translate into improved graduate outcomes if pedagogical and support systems lag behind.

Implications for HICAST and Nepalese Agricultural Education

The findings have several implications. For HICAST, the study provides actionable evidence for curriculum reform. The persistent gaps in entrepreneurship (mean 2.1/5, CGP=2.9, **Table 4**) and placement support (mean 2.3/5, CGP=2.7) suggest that the college should prioritize: (1) establishing a dedicated career placement cell; (2) embedding Agriculture 4.0 competencies (GIS, data analytics) into the core curriculum; (3) strengthening practical exposure through mandatory internships and field-based learning; and (4) developing entrepreneurship incubation programs. The qualitative findings in Section 3.6 reinforce these priorities, with 68% of respondents calling for more practical exposure and 44% advocating for structured transition support.

For Nepal's agricultural education sector, this study demonstrates the value of tracer studies as a quality assurance tool. The University Grants Commission, Ministry of Agriculture and Livestock Development, and Nepal Agricultural Research Council should mandate annual tracer studies for all agricultural colleges, establish a national graduate employment observatory, and condition accreditation on minimum placement and entrepreneurship standards.

The study also highlights the need for gender-equity interventions. While the gender difference (OR=2.36, **Table 6**) is not statistically confirmatory, the pattern warrants attention. HICAST could implement a voluntary Gender Equity Audit tracking graduate outcomes by gender, employer callback rates, and career progression. Anti-bias training for employer partners and targeted career counselling for female students (UNESCO, 2022) may be considered.

Limitation

Several limitations apply to this study. First, the single-institution sample (n=93, **Table-1**) limits the generalizability of findings to other agricultural colleges in Nepal. Second, a precise response rate could not be calculated because the survey was distributed through multiple overlapping channels (alumni network, social media, snowball sampling), and the total number of unique alumni reached could not be determined. While early-late respondent comparisons showed no significant differences ($p>0.20$), suggesting no systematic non-response bias, the inability to calculate a precise response rate remains a limitation.

Third, the cross-sectional design and absence of employer perspectives preclude causal inference and multi-stakeholder validation. Fourth, with only 56 employed cases, statistical power is limited; imprecise estimates and wide confidence intervals—notably regarding gender (OR: 1.01–5.89)—necessitate treating regression results as exploratory and hypothesis-generating rather than confirmatory. Fifth, the 2024-2025 cohort is a partial cohort (covering only two years), which may affect representativeness for the most recent graduates.

CONCLUSION

This 20-year tracer study (2004-2025) provides a hypothesis-generating case study of graduate employability and curriculum gaps in a Nepalese agricultural college. Findings are consistent with the Delayed Employability Transition Hypothesis (DETH), suggesting cohort differences in employment may partly reflect further study rather than declining graduate quality, but validation requires larger, multi-institution studies.

Low satisfaction with entrepreneurship training (mean 2.1/5 over 20 years) is a robust descriptive finding. In contrast, the gender difference (OR = 2.44) and placement support association ($p = 0.083$) are imprecisely estimated and require replication before informing policy. Transition to an Agriculture 4.0 knowledge economy calls for curricular reform in digital competencies, entrepreneurship incubation, and experiential learning, guided by adequately powered studies.

RECOMMENDATIONS

Institutionalization of a Career Placement and Industry Liaison Cell

Employment was descriptively higher among alumni satisfied with placement support (71% vs 48%; $p = 0.027$), although the adjusted association was imprecise ($p = 0.083$; wide CI). Consistent with prior literature, establishing a Career Placement and Industry Liaison Cell is a reasonable hypothesis-driven recommendation whose effectiveness should be evaluated.

Implementation of Gender Equity Audits

A possible gender difference was observed (OR = 2.44; 95% CI: 1.01-5.89; $p = 0.048$), but the wide confidence interval warrants replication. A voluntary Gender Equity Audit is a prudent, hypothesis-driven measure, while mandatory interventions are premature.

Curricular Reform for Agriculture 4.0

Persistent curriculum gaps in entrepreneurship (CGP = 2.9) and digital competencies indicate structural skill deficits. The curriculum should integrate Agriculture 4.0 competencies, including GIS, data analytics (R, Python), and project-based entrepreneurship incubation.

Implications for National Policy

The University Grants Commission, Ministry of Agriculture, Forests and Environment, and Nepal Agricultural Research Council should mandate annual tracer studies for all agricultural colleges, establish a national graduate employment observatory, condition accreditation on minimum placement and entrepreneurship standards, and create a national internship matching platform.

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AUTHORS CONTRIBUTIONS

BPC: Conceived the study, developed the theoretical models, designed the methodology, performed statistical analyses, wrote the manuscript, and approved the final version.

DS: Programmed the survey, managed data collection, conducted descriptive analyses, retrieved references, and assisted with formatting.

BP: Contributed to data analysis and interpretation, statistical modelling, robustness checks, manuscript revision, and data management.

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