ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR

CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW

Vol.03 No.04 (2025)

ANALYSIS OF PRE-ADMISSION FACTORS AFFECTING ACADEMIC ACHIEVEMENT OF AGRICULTURE GRADUATES IN PAKISTAN

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Abstract
The determination of pre-admission factors affecting agriculture graduate students' better academic performance measured through cumulative grade point average (CGPA) is the aim of this research. The statistical population consists of 185 first year agricultural graduates enrolled during 2023-24 at the University of Agriculture Faisalabad, Pakistan. The study applies binary logistic regression model on the information collected from the sample respondents. Results reveal that female students are found to be highly successful in achieving CGPA higher than 3 compared to their male fellows. Similarly, entry test held for admission onto agriculture degree program is positively and highly significant predictor of favorable academic achievement. Those students who after graduation have wide preferences for the job also have more chances of achieving better academic performance. The way they select the agriculture degree for study has insignificant effect on specified academic achievement. It is emphatically suggested to continue entry test procedure as a pre-requisite for student's admission onto higher studies in order to give better graduates to the labor market. Lastly, the government should ensure more jobs in partnership with private sector to absorb future leaders especially females from agriculture sector.
Keywords: *Binary Logit, Pre-admission Factors, Academic Achievement, Agricultural Students, Cumulative Grade Point Average (CGPA), Pakistan.*

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INTRODUCTION

Students as an important asset of any academic institute give recognition to the institution to which they belong. According to Ali et al. (2009), social and economic development of any country also relies on its academically trained manpower as the best quality students will become future great leaders, thus, putting country on the path of prosperity. Successful and best quality students of agriculture are main assets of the agriculture universities or colleges as well as the economies dependent on agriculture as they earn a good fame for universities and play an important role in the socio-economic development of agrarian economies. Academic performance in the words of Bell (2018) is how the students fulfill standards set out by the local government and the institution itself. It is gauged through various parameters like cumulative grade point average (CGPA), grade point average (GPA), and the marks obtained in a particular subject or previous year results (Hijazi & Naqvi, 2006). But the academic achievement is affected by many factors mainly categorized namely school-related factors, home-background-related variables and individual student-oriented factors. UNESCO (1992) defines the relationships and casual effects of various factors on students' academic success into school-related, situational factors and culture, teacher and student characteristics and home-related variables. Similarly, Crosnoe, Johnson & Elder (2004) discussed 32 factors that could affect academic performance of students in general by classifying factors mainly under social, economic, environmental, personal and academic factor categories.

However, these factors vary from entity to entity (person to person and country to country) depending upon diversity of local living conditions, environments, cultures etc. Under such circumstances, new practical studies are conducted to investigate factors affecting academic performance of school, college or university level students because educational institutions are always struggling hard to improve their outlook based on their assets. From last couple of decades, enhancement of literacy rate and education programs are on priority agenda of political government of Pakistan to produce well educated and skilled labor force for dynamic market demands. Moreover, the number of enrollment of female students at higher institutions is increasing in Pakistan (Maqsood & Maqsood, 2017). These are the reasons before the researcher to plan study on pre-university factors that may affect agriculture graduates students better achievement, especially selecting one of the top-ranked agriculture sector Asian university located in Faisalabad, Pakistan which is home to many national and international scholars.

SIGNIFICANCE OF RESEARCH

In previous studies, the academic achievement is measured after degree completion based on factors like gender differences, socio-economic factors and students' family backgrounds in Pakistan. Present research particularly guesses the students' future academic achievement based on pre-university (pre-admission) factors like desire of students to join public or private sectors after graduation, selection of degree program either by the family or students themselves and the entry test held for admission onto agriculture degree program. As a results, it is considered that these newer factors have positive and significant relationship with acquired cumulative grade point average (CGPA) at the university level studies as the majority of the researchers are using GPA and CGPA as a measure of the performance of university students around the globe (Mushtaq & Khan, 2012 and Olusola et al., 2016). The study may be helpful for both the university policy makers and parents of the students as it will help university higher-ups in academic program planning and implementing policies for improving the students' academic achievement and the quality of education by improving the attitude of students and teaching procedures. Parents can solve the students' problems especially by guiding them towards better future prospects in

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agriculture. The study may be helpful in arousing awareness particularly among female students about their roles and responsibilities to become future leaders in private and public sectors. The study may be helpful for competing higher education universities as well as corporations to attract best quality human resource as their labor force. This will also enhance the ability of students and parents to evaluate/select the degree program most suitable to their future career.

RELATED LITERATURE AND THEORETICAL FRAMEWORK

University of Agriculture Faisalabad (UAF) holds 284th best Asian University ranking in overall categories (World Global University Rankings, 2020). Nationally, in the province of Punjab, it is number one university and fourth in the country, based on 13 quality indicators. Student diversity is depicted on account of blend of rural to urban, poor to rich, students from nuclear families to joint family systems, as well as having different personal characteristics. Each of these variables could in a way, have relationship with a students' academic achievement. Academic achievement is measured in number of ways but most common is Grade Point Average/Cumulative Grade Point Average (Mushtaq & Khan, 2012 and Olusola et al., 2016). According to Abiodun & Issaiah (2015), while conducting multinomial logistic regression found that academic performance of undergraduates is significantly linked with gender of students and mode of admission. In a study on determining factors affecting students' academic success, Mushtaq & Khan (2012) by using simple statistical tools of mean, standard deviation, correlation and regression methods, discussed that there is close association between learning facilities, communication methods, proper guidance and family stress on students' academic performance in Pakistan. The results of study by Asampana et al. (2017) indicated that performance in any subject is largely dependent on gender of students, age of students, mother's employment, parents' religion, number of children in household and supply of allied materials. Family income, scholastic aptitude, social background of the students, employment prospects have been regarded as important determinants in the study of academic performance in the University of Granada (Jimenez & Velasco, 2000).

Similarly, Sharker & Rahman (2015) identified through multinomial logistic regression that the student's present grade significantly depends on the students' first term grades. According to Okolie et al. (2014) educational success depends to a great extent on the socio-economic status of students' parents Similarly, organized examinations determining the broad knowledge in a students' educational development have been extensively applied to assess students' performance in formal school settings (Tobih, 2012). However, in on-going research, cumulative grade point average is studied with respect to pre-university independent variables like sex of the students, literacy of the father, desire of students to join public or private sectors after graduation, selection of degree program either by the family or students themselves and the entry test held for admission onto agriculture degree program. Logistic regression technique is very common in numerous fields like medical and social sciences as well as education (Sule & Saporu, 2015) and higher predictive power than linear regression technique (Ayan & Garcia, 2008). Sirin & Sahin (2020) also applied this technique while studying factors affecting the achievement of university students in the school of physical education and Sport Example. At school level study, Rashid (2011) used simultaneous equation model to determine the evidences of association between performances of primary school students' achievement scores and socio-economic status of the household in Pakistan. Keeping in view the comparatively the wide application of logistic regression model at higher education level, present research relies on this model.

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PURPOSE AND OBJECTIVES

The main purpose of the research is to study the pre-university (pre-admission) factors and conditions affecting the chances of achieving CGPA higher than 3 out of 4 CGPA at the University of Agriculture, Faisalabad (UAF). The study tries to probe into the nature of various variables/factors included in the model and then determine the relationship between students' academic achievement and pre-university factors like gender, background of student, choice of the degree by the student or parents, education of the father, intention to join the public/or private/or any sector after graduation, hours spent in home study and entry test score as potential contributor to cumulative grade point average (CGPA).

MATERIALS AND METHODS

Study area, sampling and data collection: The primary institution and hence, population for this research work is first year students of Faculty of Agriculture at University of Agriculture Faisalabad admitted during session 2023-24. Generally, first generation university students provide unique experiences as to which characteristics can helpful in describing students' academic achievement (Robinson, 2018). Primary data is collected through random sampling of 195 students through well designed questionnaire. The sample size is determined on the basis of following formula:

$$S = n /1 + n (e)^2$$

Where, n= Number of students, e = 10 percent level of precision which is + 10 percent.

On the basis of almost 1000 new admissions in Faculty of Agriculture, sample size becomes 92 students but total questionnaires distributed randomly among students are 195. After dropping questionnaires containing incomplete information, valid sample size is 185 students (representing 94 percent of total questionnaire distributed) giving almost equal representation to both males (95) and females (90) in final sample. Sample size of 94 percent is sufficient for the research study based on the assertion of Moser and Kalton (1999) who considered survey as biased and insignificant if the filled questionnaires rate of return is lower than 20-30 percent.

Selection of variables and the analytical econometric technique: The criteria of selecting a high achievement (obtaining a CGPA higher than 3) versus low achievement (not obtaining CGPA higher than 3), informs that the dependent variable is a dichotomous variable where low academic achievement is a baseline/reference category. The dichotomization is normally done based on statistical (using median as a cutting point) or theoretical (defining some value as a cutting point) rules (Ayan & Garcia, 2008). Present research follows the later rule for dichotomization. The selection of cutting point (achieving CGPA>3) is also justified on the basis of standardized criteria of UAF marks system wherein CGPA greater than 3 is considered as equal to first division. Moreover, this cut-off score (first division) is one of the most demanded eligibility criterion for finding job in the public sector of Pakistan. Dichotomous nature of the outcome variable guides us to apply binary logistic regression which according to Cramer (1991) is a special case of utility maximization model. Logistic regression is also an extension to the techniques of multiple regression; therefore, its mathematical form in accordance with Karkacier and Goktolga (2011) is given as:

$$Prob_i=\beta_o+ \beta_1 sex+ \beta_2 test+ \beta_3 degr+ \beta_4 back+ \beta_5 eduf+ \beta_6 jobgD+ \beta_7 jobpD$$

Where gender is denoted by "sex", UAF entry test denoted by "test", selector of degree program by "degr", background of student by "back", education of the father by "eduf", plan to choose government sector by "jobgD" and plan to join private sector is denoted by "jobpD". Here, except UAF entry test, all other independent variables are represented with their respective

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categories/dummies. The data management, statistical analysis and logistic regression were performed in statistical STATA software (version 12).

RESULTS AND DISCUSSION

Descriptive Statistics

Preliminary results on description of variables as outlined in Table 1 show that total number of observations of every variable are 185 which imply that data set does not contain any missing values. Moreover, all variables except variable of UAF entry test are categorical in nature. It is further evident that students' average marks in UAF entry test are almost 62 with a range of 40 to 87 marks.

Table 1. Description of the variables

Descriptive	Mean	S.D	Number	Min	Max
Dependent variable is CGPA: (code of getting CGPA>3=1, otherwise=0)			185	0	1
Gender (with code of Male=1 otherwise=0)			185	0	1
UAF test marks	61.94	9.983	185	40	87
Degree selector (Self=1 otherwise=0)			185	0	1
Background of students (Urban=1 otherwise=0)			185	0	1
Literacy of the father (Literate=1 otherwise=0)			185	0	1
Job preference (Government=1, otherwise=0)			185	0	1
Job preference (Private=1, otherwise=0)			185	0	1
Job preference (Anywhere=1, otherwise=0)			185	0	1

Source: Primary Data

Model fitting information

The study applies binary logit model to predict the determinants of student's academic achievement in terms of obtaining cumulative grade point average greater than three by the first year students of agriculture degree. The maximum likelihood approach is used to estimate the parameter coefficients of the logit model. Log likelihood value (-85.219311) is maximized at 4^{th} iteration (i.e., results are converged at 4^{th} iterative process as shown in Table 2). The total number of observations is 185. The overall fitness of the model is evident from the Chi-square statistic. The value of Chi-square of 25.27 and its corresponding p-value of 0.000 is less than 1 percent (see Table 2) which means that a highly significant relationship exists between the favorable outcome variable and the set of independent variables in the final binary logistic model. The value of pseudo R^2 is measured through different formulae/methods like Cox and Snell, Nagelkerte and McFadden but here value determined by maximum likelihood method is not very close to 1 implying weak correlations between the outcome variable and the set of independent variables.

The Logistic Regression Model

Here the logistic model compares the students' favorable academic achievement (CGPA>3) to unfavorable/low achievement (CGPA<3) in 4 years' bachelors of agriculture degree on the basis of some pre-admission factors. The results depict that sex of the student; UAF entry test, and option of joining for job anywhere are significant. Results further show that female students have more chances of obtaining CGPA>3 than male students with highly significant odd ratio of 0.28. In other words, a female student is approximately $1/4^{th}$ times more likely to secure good achievement (i.e., achieving CGPA>3) than a male student of agriculture degree. This result is in line with

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Hedjazi and Omidi (2007) who found that female students were performing better than males in academic achievement also measured through grade point average system at University of Tehran, Iran. Contrary to this, results of Asampana et al. (2017) elaborated that performance in mathematics is highly related with gender type with male students showing better performance at Zamse Senior High School, Bolgatanga. Whether male performs well or females, the reason behind this may be lack of incentives for study in comparison to one another.

Results of aptitude test (UAF entry test for admission onto degree program) also show a highly significant and positive association with obtaining favorable outcome with a highly significant odd ratio of 1.063. In other words, for one unit increase in UAF test score, the log odds of getting CGPA>3 in bachelor degree increases by the amount of coefficient (0.06). In further easy words, this does not mean that CGPA marks increase but log odds (ratio of probability of favorable to probability of non-favorable outcome) are increased by one unit increase in UAF test score.

Independent variables (study choice, hours of study, students' background and education of the father) have insignificant coefficient which means these don't affect the CGPA. However, on the basis of signs with respective coefficients, interestingly, the students whose fathers imposed the decision to take admission onto agriculture degree programs have more chances of getting CGPA>3 as compared to students who themselves decided to go for agriculture degree with insignificant odd ratio of 0.852. This finding although insignificant yet it is in line with results of Hedjazi & Omidi (2008) who noted an insignificant relationship between a students' achievement and his/her parents attitude towards guiding their children realistically towards selecting their major study. It is responsibility of the parents to decide for the degree as their children are not mature enough to make wide decisions. Moreover, the applied nature of agriculture discipline further justifies the decision of parents to choose agriculture degree where acquisition of skills is of high importance for finding jobs easily as compared to other sectors in agrarian Pakistan. The students belonging to rural areas (reference category) have more chances of getting better grade point average as compared to students coming from urban areas. Another interesting result is that the students whose fathers are illiterate (reference category) have more chances of getting better academic performance because of negative sign with coefficient of variable. But the students who have wide preferences for job in the market (reference category) are also having more probability of getting CGPA>3 as compared to other categories as evident from significant odd ratio of 0.252. In other words, students desirous of doing job anywhere (without being strict on preference for specific service sector) highly predicts their academic achievement of getting favorable outcome (CGPA>3) as compared to students who have limited preference either for government/or private sector. Wide choices for entry into service may motivate them for hard work and consequently leading to better academic scores. Wong (2002) also observed that any type of motivation and cognitive entry behavior have relationship with students' success.

Table 2. Summary statistics of binary logistic regression

CGPA > 3	Log of Odds	Z	P>z	Odds Ratio
Constant	-.1266651	-0.08	0.940	0.8810287
Gender	-1.241411	-2.97	*0.003	0.2889762
UAF test marks	0.0624983	3.02	*0.002	1.0644930
Study Choice (dummy)	-0.159232	-0.38	0.706	0.8527985

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Back Student (dummy)	-0.0306024	-0.08	0.940	0.9698611
Eduf_dum	-1.461925	-1.29	0.196	0.2317897
jobg_dum	-0.0037591	-0.01	0.993	0.9962479
Jobp_dum	-1.378180	-0.08	†0.040	0.2520369

Log likelihood	-85.219311
LR chi^2 (10)	25.27
Prob > chi^2	*0.0007
Pseudo R^2	0.1291
Number of observations	185

*Significant at the 1 percent and †5 percent levels of confidence

CONCLUSION AND SUGGESTIONS

Based on binary logistic regression model, female students' high academic achievement is more pronounced than male students at the University of Agriculture, Faisalabad. The aptitude test (UAF admission entry test) is highly significantly and positively effective on students' academic performance measured through cumulative grade point average. Those students who are motivated to join any type of job in the market are performing comparatively better than students having only sector specific job preferences. Rural or urban background of students, literacy of the father, and the way they select the degree program of agriculture has insignificant relationship with academic achievement. The administration of higher education institutions should ensure better facilities for students. Moreover, it is emphatically suggested to continue entry test procedure as a pre-requisite for student's admission onto higher studies. It is the time parents should also support their girls towards higher education by changing social attitudes. In the meanwhile, government should ensure more jobs in partnership with private sector to absorb future leaders particularly females from agriculture sector.

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