Employee Training and Firm Productivity in MENA Economies: Evidence from Propensity Score Matching

Youssra JOUHARI[1*], *Mohamed Saad KHOLTI*[1], and *Mariem LIOUAEDDINE*[1]

[1] Faculty of Economics and Management, Ibn Tofaïl University Kénitra, Morocco

Abstract. Improving firm productivity remains a critical challenge for developing economies, particularly within the Middle East and North Africa (MENA) region. This paper evaluates the causal impact of employee training programs on firm productivity, utilizing data from the World Bank Enterprise Surveys (2020) for five MENA countries: Morocco, Egypt, Lebanon, Tunisia, and Jordan. To account for potential self-selection bias, the study employs Propensity Score Matching (PSM). The empirical findings indicate that training exerts a substantial positive influence on productivity in Morocco (33.1%), Egypt (24.0%), Lebanon (26.2%), and Tunisia (26.2%). In contrast, while the estimated effect in Jordan is positive (16.4%), it lacks statistical significance, suggesting that training effectiveness is subject to heterogeneity across diverse institutional and sectoral landscapes. These results underscore that investment in human capital is a pivotal driver of firm-level competitiveness in developing markets. Furthermore, the findings highlight the necessity of context-specific factors in shaping the returns on training. From a policy perspective, the research advocates for the design of industry-specific and sector-sensitive training frameworks, particularly for small and medium-sized enterprises (SMEs). Promoting lifelong skill acquisition and implementing systematic appraisal mechanisms for training interventions will be essential for MENA countries to enhance firm performance, operational flexibility, and long-term economic sustainability in an increasingly competitive global environment.
Keywords: Training Programs, Productivity, MENA Region, Organizational Performance, Propensity Score Matching.

1 Introduction

Human capital investment, especially professional training is well known as a key factor of firm productivity and economic performance. Although this relationship is established in the literature, the majority of empirical evidence is provided by advanced economies [5]. In emerging economies, particularly the Middle East and North Africa (MENA), one of the strategic objectives of competitiveness and sustainable development is the enhancement of productivity [10].

* Corresponding author: youssra.jouhari@uit.ac.ma

Nevertheless, there is limited rigorous causal data on the productivity implications of training in the emerging markets. The rapid change in technology has heightened the need to continuously develop skills to make the workforce relevant and flexible [11]. The increasing rate of innovation has minimized the long-term usefulness of early education, which is why firm-based training has become vital in maintaining productivity and organizational endurance. On top of personal skill development, training promotes the use of technology, the spread of knowledge, and enhancements in the performance of firms [24].

Although these advantages have been identified, micro-level empirical analysis of the MENA region has received comparatively scanty attention. Available literature is mostly concerned with institutional limitations or financial availability, which provides scant information on the causal implications of training on firm productivity [22]. This gap is particularly important given the persistent productivity stagnation and skills mismatches observed across many MENA economies.

This paper fills this gap by offering causal support on the effect of employee training on firm productivity operating in five MENA countries namely Morocco, Egypt, Jordan, Lebanon, and Tunisia. The study is based on data of the World Bank Enterprise Surveys (2020) on firms and uses propensity score matching to determine the productivity impact of training and evaluate cross-country heterogeneity related to institutional and labor market factors.

There are three hypotheses that are tested in the study. First, attendance in employee training programs leads to a high level of productivity within the firm. Second, the institutional and economic differences of MENA countries lead to the fact that the level of productivity improvement varies. Third, companies that undergo continuous training have greater and more sustained productivity gains.

Academically, the primary contribution of the research towards the literature on human capital is the provision of strong causal evidence in an area that is still underdeveloped in research. The results can be used in policy formulation to conduct specific training programs that can enhance the competitiveness of firms, diversify the economy, and foster sustainable growth.

2 Literature review

The human capital theory provides the fundamental model of examining how training contributes to productivity and the performance of the firm. Based on Becker [8], training investments improve the human capital of the workers, where productivity and wages are increased. Mincer [12] further formalized this connection by highlighting the fact that there are economic returns to training that can be measured. Expanding the basis of this idea, more recent papers point to the fact that training is more than an operational process and a strategic factor that determines the survival and competitiveness of firms [1, 23]. Training helps workers to have flexible skills which are necessary in fast-paced economic conditions when planned as a systematic and organized undertaking. With the environment of globalization and the rapid change in technology, continuous training is required to remain competitive, especially in the economy where the problem of obsolescence of the skills is common [19, 15].

Empirical evidence consistently demonstrates a positive correlation between training and productivity, although the magnitude of this effect varies depending on methodology and context. In the United States, cross-sectional studies suggest a positive relationship between training and productivity, but the effect diminishes when controlling for unobserved firm heterogeneity [25]. In Europe, Zwick [26] reported a strong positive effect in German firms, whereas Ballot et al. [7] found heterogeneous outcomes, which were positive in France but not statistically significant in Sweden.

Methodological refinements have provided clearer insights into the training–productivity link. Carneiro and Almeida [20] measured the effects of additional training in Portuguese companies and found that an extra 10 hours per worker per year increased productivity by 0.6%. Dearden et al. [13] improved this analysis by combining micro-level and sector data, showing that a one-percentage-point increase in training was estimated to have a 0.6-percentage-point increase in productivity, about twice as large as had been seen for wages. These results emphasize the fact that productivity returns may be higher than wage returns and that it is important to consider the problem of endogeneity and selection bias to get plausible causal estimates.

Training effects seem to be contextual in the emerging economies. According to Thang et al. [18], manufacturing firms in Vietnam exhibited high returns in productivity and sales, while non-manufacturing sectors did not experience similar gains. Zwick [27] also emphasized that failing to control selectivity and omitted variables can bias results and that fixed-effects models provide more accurate estimates of training intensity effects.

Despite strong evidence from developed and some emerging economies, empirical research in the Middle East and North Africa (MENA) remains limited. One of the few rigorous micro-econometric studies in the region found that training generally enhances firm performance, though effects vary by context and methodology. Evidence from developed economies is mixed, and causal studies in the MENA region remain scarce. This paper addresses this gap using propensity score matching on World Bank Enterprise Survey data from Morocco, Egypt, Jordan, Lebanon, and Tunisia, providing causal evidence on the training–productivity link across countries and sectors.

3 Data and variables

The data used in this study come from the World Bank Enterprise Surveys (firm-level data, 2019 and 2020).The sample includes companies in Egypt, Morocco, Tunisia, Jordan, and Lebanon, and the West Bank and Gaza are not observed because of their unique economic and institutional environment. This choice guarantees higher comparability among countries that have quite similar economic setups and labor forces.

The last sample is 3,049 firms in Egypt, 898 in Morocco, 514 in Tunisia, 216 in Jordan and 514 in Lebanon. It is analyzed country-by-country to consider the national economic and institutional heterogeneity, to allow drawing cross-country comparisons, and makes it easier to formulate policy recommendations that are specific to the context.

The outcome variable is firm productivity and its measure is a logarithm of sales per employee, which is a common measure in the literature, making cross-firm comparisons possible, and eliminates the effects of outliers [25]. The treatment variable represents the existence of employee training programs in the firm and assumes the value of one where the firm has employee training programs and zero otherwise.

The empirical analysis is based on a set of variables commonly used in the literature. Firm productivity, the main variable of interest, is measured as log (Sales / Number of Employees). The treatment variable captures the presence of employee training programs within the firm (0 = No, 1 = Yes). Control variables include legal status (1 = Shareholding firm; 2 = Sole proprietorship; 3 = Partnership; 4 = Limited partnership; 5 = Other) and firm size (1 = Small firm: 5–19 employees; 2 = Medium firm: 20–99 employees; 3 = Large firm: ≥100 employees). Firm age is calculated as the difference between the survey year and the year of establishment. The sector of activity is coded as 1 for manufacturing, 2 for retail, and 3 for other services. Several business constraints are introduced as ordinal variables: unskilled labor, work regulations, corruption, access to finance, and political instability, each coded as 1 = No obstacle, 2 = Minor obstacle, and 3 = Major obstacle. Training program objectives are coded as 1 for technical skills development and 2 for non-technical skills development. All variables are derived from the Enterprise Survey data.

4 Methodology and discussion of results

4.1 Method used

The effects of training programs on firm productivity are analyzed using propensity score matching (PSM), which minimizes selection bias by comparing similar firms, whether or not they received training [21]. This method generates strong causal estimates by matching treated and untreated firms based on observable variables [14]. Propensity scores (PS) estimate the probability that a firm has a training program, defined as PS = P(T=1|X), where T is the treatment variable and X represents observed characteristics. Firms are then paired based on these scores, and the impact of training is evaluated by comparing average productivity between treated and control firms, yielding the average treatment effect on the treated (ATT):

$$ATT = E(Y^T - Y^C|T = 1) = E(Y^T|T = 1) - E(Y^C|T = 1)\#(1)$$

where Y^T is the potential outcome for firms with skills training programs and Y^C for those without such programs.

Propensity score matching (PSM) is well-suited for estimating the impact of training programs as it reduces selection bias by matching firms with similar observable characteristics and constructing a credible counterfactual, thereby improving the reliability of impact estimates. However, its effectiveness depends on the quality and relevance of the covariates used for matching and may be limited in the presence of small samples or substantial heterogeneity across firms. For PSM to yield valid results, several key assumptions must be satisfied, including sufficient common support between treated and control firms, formally expressed as $0 < P(T = 1 \mid X) < 1$ for all X, as well as the conditional independence assumption, which requires that, conditional on observed covariates, participation in training is independent of potential productivity outcomes [9]. In addition, achieving covariate balance after matching is essential to ensure that observed productivity differences can be attributed to training rather than pre-existing firm characteristics [16].

4.2 Discussion of results

To determine how training programs impact the productivity of firms, we must compare firm productivity with and without training. The matching method begins with estimating a Probit model to assess the likelihood of a firm having a training program based on observable characteristics, such as size, industry, age, and legal status. This model captures the correlation between these variables and the probability of being a beneficiary firm. The Probit model is expressed in the following equation:

$$\begin{aligned} P(Training) = {} & \beta_0 + \beta_1 Size_i + \beta_2\, Age_i + \beta_3 Status_i + \beta_4 Sector\ of\ activity_i \\ & + \beta_5 Unskilled\ labor_i + \beta_6 Program\ objectives_i + \beta_7 Work\ regulations_i \#(2) \\ & + \beta_8 Financing_i + \beta_9 Corruption_i + \beta_{10} Political\ instability_i + \varepsilon i \end{aligned}$$

The matching method begins with creating a propensity score model, which assigns each firm a probability of having a training program. Marginal effects from the Probit model (Table 1) show how each variable contributes to this probability. Using these effects, propensity scores are computed for all firms, enabling analysis of the factors influencing training adoption while accounting for the model's structure and explanatory variables [16].

Table 1. Propensity Score Estimation

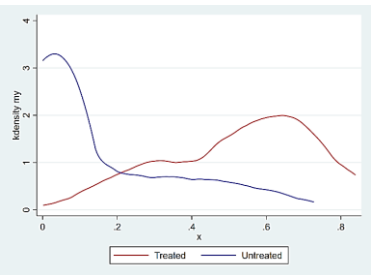
Treatment variable = 1	Egypt		Lebanon		Tunisia		Jordan		Morocco	
	Coef	P>|z|	Coefficient	P>|z|	Coef	P>|z|	Coef	P>|z|	Coef	P>|z|
Firm size	.0420953	0.000***	.1412061	0.000***	.0850673	0.000***	.0239657	0.414	.0901641	0.000***
Firm Age	.0001209	0.674	.0001701	0.840	-.0042229	0.000***	.0007501	0.746	.0010627	0.349
Legal status	-.0131051	0.009***	-.0118861	0.398	-.0054211	0.811	-.0313161	0.355	.0158308	0.381

Sector of activity	.0267489	0.000***	.0520946	0.018**	-.0461651	0.030**	.0882508	0.003***	.0632959	0.001***
Unskilled labor as an obstacle	-.0151038	0.020**	.0741806	0.000***	.0373819	0.122	.2375679	0.000***	.0720637	0.016**
Training program objectives	-.0081864	0.666	.1139513	0.120	.4539157	0.000***	-.0218271	0.905	-.0349202	0.301
Work regulations as an obstacle	-.0055	0.465	-.0286002	0.254	-.0507133	0.030**	-.0363492	0.406	-.0288052	0.297
Access to financing as an obstacle	-.0105845	0.090*	-.0266476	0.183	-.0823844	0.000***	.0205551	0.500	-.005059	0.854
Corruption as an obstacle	.0083534	0.149	-.0120401	0.708	.0075011	0.746	-.0462796	0.262	.0313404	0.334
Political instability as an obstacle	.0007882	0.891	.0084812	0.827	-.0483354	0.039**	.0828936	0.022**	-.0130358	0.659

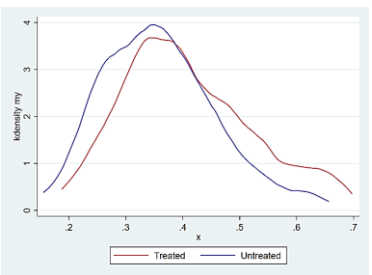
Source: Author's calculation. *, **, ***Statistical significance at 10%, 5%, and 1%, respectively

Table 2 presents probit estimates of the probability that firms provide employee training programs in the MENA region. Firm size increases training adoption in Egypt, Lebanon, Tunisia, and Morocco, but not in Jordan. Firm age is mostly insignificant, except in Tunisia, where younger firms are less likely to train. Legal status has a significant negative effect only in Egypt. Sector affects training adoption in all countries: positively in Egypt, Lebanon, Jordan, and Morocco, and negatively in Tunisia. Workforce mismatch increases adoption in Lebanon, Jordan, and Morocco, but reduces it in Egypt and is insignificant in Tunisia. Training objectives positively affect adoption only in Tunisia. Labor regulations reduce training likelihood in Tunisia, while access to finance negatively affects Egypt and Tunisia. Corruption is insignificant across all countries. Political instability increases adoption in Jordan but reduces it in Tunisia, with no significant effect elsewhere. Before estimating the productivity effects, the common support condition was verified to ensure comparability between treated and control firms. Figure 1 shows sufficient overlap in propensity score distributions, confirming the validity of the matching procedure.

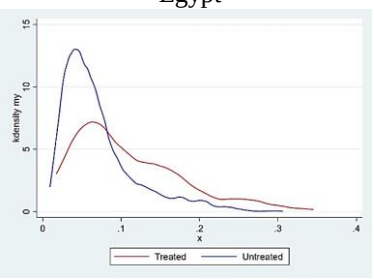
Jordan



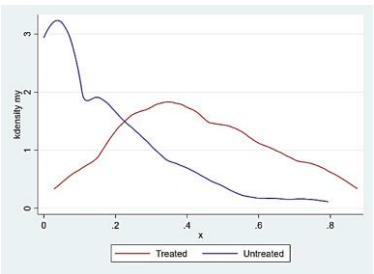
Morocco



Egypt



Tunisia



Lebanon

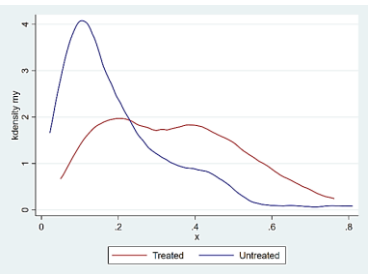


Figure 1. Common Support Representation

In each country studied, the overlap in propensity score distributions ensures that treated and untreated firms are comparable, supporting reliable estimates of training program effects on productivity. The common support zones are: Jordan [.0017, .8392], Morocco [.1873, .6975], Egypt [.0171, .3452], Tunisia [.0285, .8755], and Lebanon [.0496, .7621], indicating sufficient similarity between groups. Using nearest neighbor matching within these zones, each treated firm was paired with the most similar untreated firm, restricting the analysis to comparable observations and strengthening the validity of the results. The estimated impacts of training programs on productivity obtained through this method are represented in Table 2:

Table 2. Average Treatment Effect on the Outcome Variable

	ATT	Std. Err.	T
Morocco	0.331	0.082	4.012***
Egypt	0.240	0.066	3.622***
Jordan	0.164	0.127	1.283
Lebanon	0.262	0.070	3.759***
Tunisia	0.262	0.099	2.648**

Source: Author's calculation.

The results of training in MENA countries have varied impacts on the productivity of firms with high positive impact on Morocco (+33.1%), Egypt (+24%), Lebanon (+26.2%), and Tunisia (+26.2%). This effect is especially strong in Morocco, which validates the hypothesis that effective training programs can significantly improve the performance of firms, as it is consistent with Kumar et al. [28] and Dumas and Hanchane [6]. The 24% productivity increase in Egypt is in line with the positive contribution of training in enhancing employee performance and competitiveness by Elsafty and Oraby [2]. Similarly, the results of both Lebanon and Tunisia show that training is a much more effective way to enhance productivity, which aligns with El-Kassar and Singh [3] in Lebanon and Ben Jemaa Cherif [17] in Tunisia. However, Jordan has a smaller and non-significant productivity impact (+16.4%), which indicates sectoral heterogeneity and effects dependent on context similarly emphasized by Dang et al. [4]. In general, these findings confirm the idea of human capital theory because they demonstrate that investments in training do bring about productivity benefits, whereas the cross-country contrasts provide a reminder of how much institutional setting, policy formulation, and quality of implementation matter.

5 Conclusion

The comparative study of the training programs in five countries of MENA reveals that investment in human capital is an extensive strategic factor that leads to productivity and competitiveness rather than a functional instrument. In Morocco, Egypt, Lebanon, and Tunisia, the effects are strong, whereas the results in Jordan are more limited and heterogeneous, which implies that the results of training should not be generalized and should be interpreted in the context of the institutional framework within a country, the development of the labor market, and the specifics of the sector. The findings also form part of the human capital theory literature by demonstrating that the returns to training are complemented by other factors such as favorable government policies, absorptive capacity of firms, and the flexibility of training to meet the market demands.

The findings indicate that the policies would require flexible, sector-sensitive training approaches that actively involve the small and medium-sized enterprises to mitigate the skill mismatches, enhance innovation and economic resiliency in the MENA region. To companies, the results emphasize the need to incorporate training in long term management

of human resource practices since it not only brings immediate gains in productivity but also enhances flexibility and competitiveness in the long term. The research also identifies the importance of future research studies based on larger country samples, longitudinal data, and associations with other firm-level variables including technology adoption and management practices in order to establish more about the long term role of training in sustainable development.

This research did not receive any specific grants from funding agencies in the public, commercial, or nonprofit sectors. The study did not involve direct interaction with or participation of human subjects. It used publicly available, anonymized data from the World Bank Enterprise Surveys (firm-level data, 2019 and 2020), ensuring compliance with ethical standards for secondary data analysis. The authors declare that they have no affiliations with or involvement in any organization or entity with financial interests in the subject matter or materials discussed in this manuscript. All authors contributed equally to this study.

References

1. A. Belaidi, and N. Nabila. "Le capital organisationnel et la création de valeur Valorisation du NCA ROUIBA selon le référentiel «Thésaurus Bercy V1»." *Revue des reformes Economique et intégration dans l'économie mondiale* 12.25 (2018): 91-111. https://asjp.cerist.dz/en/article/55602
2. A. Elsafty, M. Oraby. (2022). "The impact of training on employee retention: An empirical research on the private sector in Egypt." *International Journal of Business and Management* 17.5 (2022): 58-74. http://dx.doi.org/10.5539/ijbm.v17n5p58
3. A.N. El-Kassar, S.K. Singh. "Green innovation and organizational performance: The influence of big data and the moderating role of management commitment and HR practices." Technological forecasting and social change 144 (2019): 483-498. https://doi.org/10.1016/j.techfore.2017.12.016
4. C.Dang, Z.F. Li, and C. Yang. "Measuring firm size in empirical corporate finance." Journal of banking & finance 86 (2018): 159-176. https://doi.org/10.1016/j.jbankfin.2017.09.006
5. D. Acemoglu, J.S. Pischke. "Beyond Becker: Training in imperfect labour markets." *The economic journal* 109.453 (1999): 112-142. http://www.jstor.org/stable/2565588.
6. Dumas, A., & Hanchane, S. (2010). How does job-training increase firm performance? The case of Morocco. International Journal of Manpower, 31(5), 585-602. http://dx.doi.org/10.1108/01437721011066371
7. G. Ballot, F. Fakhfakh, and E. Taymaz. *Who benefits from training and R&D: The firm or the workers? A study on panels of French and Swedish firms*. No. 0201. ERC-Economic Research Center, Middle East Technical University, 2002. https://doi.org/10.1111/j.1467-8543.2006.00509.x
8. G. Becker. "Investment in human capital: A theoretical analysis." Journal of political economy 70.5, Part 2 (1962): 9-49. http://dx.doi.org/10.1086/258724
9. J. A. Smith, P. E. Todd. Does matching overcome LaLonde's critique of nonexperimental estimators?. Journal of econometrics 125.1-2 (2005): 305-353. https://doi.org/10.1016/j.jeconom.2004.04.011
10. J. Blanke, C. Browne, M.D. Hanouz, T. Geiger, I. Mia, & X. Sala-i-Martin. The Global Competitiveness Report. World Economic Forum (2009). https://estaticos.expansion.com/estaticas/documentos/2009/09/productividad8.pdf
11. J. Konings, S. Vanormelingen. "The impact of training on productivity and wages: firm-level evidence." *Review of Economics and Statistics* 97.2 (2015): 485-497.http://dx.doi.org/10.2139/ssrn.1487468
12. J.A. Mincer. The human capital earnings function." Schooling, experience, and earnings. NBER, (1974). 83-96. NBER. https://docs.iza.org/dp3181.pdf

13. L. Dearden, H.Reed, J. Van Reenen. "The impact of training on productivity and wages: Evidence from British panel data." Oxford bulletin of economics and statistics 68.4 (2006): 397-421. https://doi.org/10.1111/j.1468-0084.2006.00170.x
14. L. Donato, M. C. Migliore, S. Poy. "Employment effects of vocational training: An evaluation using propensity score matching." Politica economica 34.3 (2018): 273-296. https://doi.org/10.1429/92121
15. M. Asad, J. Mahfod. "Training and development and its impact on the employee's performance: A study of agility company-Kingdom of Bahrain." International Review of Management and Business Research 4.3 (2015): 700.https://irmbrjournal.com/paper_details.php?id=457
16. M. Caliendo, S. Kopeinig. "Some practical guidance for the implementation of propensity score matching." Journal of economic surveys 22.1 (2008): 31-72.https://doi.org/10.1111/j.1467- 6419.2007.00527.x
17. N. Ben Jemaa Cherif. "The impact of training on productivity and wages in Tunisia." International Journal of Manpower 43.4 (2022): 950-961. http://dx.doi.org/10.1108/IJM-12-2019-0527
18. N. N. Thang, N.V. Thu, D. Buyens. The impact of training on firm performance: Case of Vietnam. Faculteit Economie en Bedrijfskunde, Univ. Gent, (2008). https://wps-feb.ugent.be/Papers/wp_08_538.pdf
19. Ö. DEMİRAL. "Effects of training on employee job satisfaction and achievement:'train to gain'evidence from manufacturing businesses in turkey." Business & Management Studies: An International Journal 5.3 (2017): 765-785. https://doi.org/10.15295/bmij.v5i3.157
20. P. Carneiro, R. Almeida. "The return to firm investment in human capital." (2006). https://ssrn.com/abstract=922977
21. P. R. Rosenbaum, D. B. Rubin. The central role of the propensity score in observational studies for causal effects. Biometrika 70.1 (1983): 41-55. https://doi.org/10.1093/biomet/70.1.41
22. R. Blundell, J. Cribb, S. McNally R. Warwick, X. Xu. "Inequalities in education, skills, and incomes in the UK: The implications of the COVID-19 pandemic." *Institute for Fiscal Studies* (2021): 1-42.https://dx.doi.org/10.1920/bn.ifs.2021.bn0321
23. S. A. Nadir. Évaluation et formation du capital humain: Quel impact sur l'innovation et la compétitivité des entreprises? Cas de l'Algérie, (2012). https://asjp.cerist.dz/en/article/56290
24. S. Bauernschuster, O. Falck, and S. Heblich. "Training and innovation." *Journal of Human Capital* 3.4 (2009): 323-353. http://dx.doi.org/10.1086/653713
25. S.E. Black, L.M. Lynch. "How to compete: the impact of workplace practices and information technology on productivity." Review of Economics and statistics 83.3 (2001): 434-445. http://dx.doi.org/10.1162/00346530152480081
26. T. Zwick. "Continuing vocational training forms and establishment productivity in Germany." German Economic Review 6.2 (2005): 155-184. https://doi.org/10.1111/j.1465-6485.2005.00125.x
27. T. Zwick. "The impact of training intensity on establishment productivity." Industrial relations: a journal of economy and society 45.1 (2006): 26-46. https://doi.org/10.1111/j.1468-232X.2006.00412.x.
28. T.S. Kumar, S.K. Rao, H. Chakravarty, N. Thyagaraju, S. M. Soman. "Examining the effect of training and development programs on employee productivity and organizational success." Journal of Survey in Fisheries Sciences 10.1 (2023): 6255-6267.