

RESEARCH ARTICLE

POTENTIAL USE OF PRICKLY PEAR (OPUNTIA FICUS-INDICA) AS A FODDER PLANT: AN AGRICULTURAL AND SOIL PRODUCTIVITY ASSESSMENT ON THE ADANA PLAIN EXAMPLE

Adem Erol, Hamdi Ayyıldız

^aFaculty of Agriculture, Department of Field Crops, Kahramanmaraş Sütçü İmam University, Kahramanmaraş, Turkey.^bHealth Vocational School, Department of Medical Techniques and Services, Kahramanmaraş Sütçü İmam University, Kahramanmaraş, Turkey.*Corresponding Author Email: hayyildiz@ksu.edu.tr,

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ABSTRACT

The aim of this study was to explore the potential of prickly pear *Opuntia ficus-indica* as a sustainable fodder crop and soil ameliorant in semi-arid conditions in Adana Plain, southern Türkiye. Followed by high forage productivity and ecological restoration, *O. ficus-indica* is not only known for its Crassulacean Acid Metabolism (CAM) but also for its impressive resilience to drought, heat, and low soils. For green forage yield, field experiments in 2023 showed an average yield of 18.2t/da/year or about 182t/ha/year with a dry matter and crude protein contents of about 12.4 and 5.2%, respectively. The in vitro dry matter digestibility (IVDMD) was 57.8 and as such is confirmed to be a significant moisture content, highly digestible forage for integrated livestock systems. Meanwhile, a post-harvest soil analysis revealed significant gains in the ecology, with the amount of organic matter increased by 6.3%, nitrogen enriched approximately 8.7 times and pH between stable, this contributed to the composite Soil Fertility Change Index (SFCEI) values from 1.23 to 1.52 for all plots. The findings were further strengthened through multivariate analyses, which added depth and interpretive power. Using k-means clustering, three distinct performance groups were identified, with Group A having the highest average productivity and soil fertility indicators. Pearson correlation analysis indicated strong correlations with soil organic matter ($r = 0.80$), nitrogen content ($r = 0.72$) and biomass yield ($r = 0.78$) while, separated by Principal Component Analysis (PCA), Factor 1 correlated with soil quality, and Factor 2 correlated to forage quality. Green forage yield also was a bridge variable between the two factors.

Such results add information to *O. ficus-indica* as sustainable feedstuff and soil restoration tool. With its low-input needs, high adaptation potential and multifunctional role as a food source, ingredient and industrial crop, it is now positioned as a strategic crop under climate-resilient Mediterranean agriculture (and alike). This study adds a strong theoretical foundation for inserting *O. ficus-indica* in global warming adaptation strategies of restoration and feed security at the regional level.

KEYWORDS

Opuntia ficus-indica, *Opuntia ficus-indica*; climate-resilient forage crop; soil fertility; dryland agriculture; IVDMD; nitrogen enrichment; PCA; K-means clustering; Adana Plain; sustainable livestock systems

1. INTRODUCTION

Climate change and rising occurrences of drought demanding the improved pastures, attached with circumvention of agricultural land have led to searching for alternative and sustainable forage source, most notably in arid and semi-arid regions like Adana Plain in southern Türkiye. These ecological pressures cannot combat buy high productivity crops to maintain agricultural viability and ecosystem health, therefore requiring the usage of resilient low input high-efficiency genotypes (FAO, 2013; IPCC, 2022).

In this setting, *Opuntia ficus-indica* (known as prickly pear or prickly fig), belonging to the Cactaceae family, appears to be a potential strong candidate. *O. ficus-indica*, native to Mexico but widely naturalized throughout the Mediterranean Basin, has attracted significant scientific and commercial attention due to its adaptation for survival under extreme climatic conditions with a Crassulacean Acid Metabolism (CAM) photosynthetic pathway that enables water loss minimization (Nobel, 2002; Mizrahi et al., 1997). With its high tolerance to drought conditions,

high temperatures and soils with low fertility, it presents itself as an ideal species for those regions suffering from climate variability like what happens in Çukurova (Adana) (Inglese et al., 2017).

O. ficus-indica is not only ecologically adaptable, but also shows great forage potential. Recent yields of fresh biomass ranged from 150 t/ha/year in similar Mediterranean agroecosystems (10–14% dry matter) (Mondragón-Jacobo and Pérez-González, 2001). The protein content (4–7%) is lower than the conventional legumes but its digestibility and palatability shows indisputably a good source of complementary fodder particularly in integrated livestock production system (Tegegne, 2001). It is also an important energy and moisture supply to livestock during the dry season, reducing dependence on the costly transport of feed (Ben Salem et al., 2002). Another crucial benefits of *O. ficus-indica* can be seen in its beneficial effect on soil properties. However, this plant also plays its role with regard to the incorporation of residues in the soil as well, and has a wide set of shallow roots that allow for better structure in the soil preventing erosion (Le Houérou, 1996). Research suggests that *Opuntia* enhances nitrogen there depletion and results in higher carbon retrieval

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(limited ingestion of CO₂) amount by means of crop production, making it an appropriate crop for degraded lands and a beneficial contribution to local climate-smart agriculture strategies (Flores-Hernández et al., 2004).

Since the Adana Plain is characterized under high agricultural activity, higher temperatures and droughts during water stressed periods; it is a suitable habitat to be tested for *O. ficus-indica* rs. It shows promise, but its value as fodder and capability to ameliorate soils has not yet been systematically assessed within this agroecology. Therefore, this study was held to assess the agronomic and ecological influence of *O. ficus-indica* on Adana Plain. The aim of the research is to study this plant's forage yield and nutritional quality, and its contribution to soil fertility. We even employed sophisticated multivariate techniques such as PCA and K-means clustering to decipher the complex interrelationships among soil properties and biomass performance. This study seeks to provide a scientific perspective on the potential applications of *O. ficus-indica* in developing climate-resilient but sustainable agricultural systems in terms of feed security propagation, soil restoration and carbon footprint remediation perspectives.

2. MATERIALS AND METHODS

2.1 Study Area and Plant Material

The experiment was implemented in representative test plots located in the central part of the Adana Plain (37.0°N, 35.3°E) characterized by Mediterranean climate with hot and dry summer as well as mild and winter conditions. The annual average rainfall is 648 mm, which mainly occurs from November to March, and summer season average temperatures can reach up to 34–38°C. The soil at experimental site was Typic Xerofluvent with mild depletion of organic matter fraction and pH amplitude.

Concrete tests were developed using vigorous cladodes of *Opuntia ficus-indica*, and the plant material was obtained from established cactus pear germplasm in Kahramanmaraş. Under rainfed scenarios, planting was performed with an inter-row and intra-column spacing (m) of 1.5 × 1.5 in March 2023 and providing supplemental irrigation only during the establishment period (first of the month).

2.2 Experimental Design and Forage Assessment

The experiment was arranged in a Randomized Complete Block Design (RCBD) with three replications. Buffer rows were added around each 12 m² plot to minimize edge effects.

Determination of forage biomass yield was performed by cutting all aboveground biomass at the end of growing season (October 2023). The following parameters were acquired based on established methods for forage and plant analysis (Van Soest et al., 1991; AOAC, 2005):

Green Forage Yield (GFY): Calculated as:

$$GFY (t/da) = Fresh Weight (kg) / Plot Area (m^2)$$

Note: 1 decare (da) = 1,000 m²; 1 t/da = 10 t/ha To facilitate comparability internationally, values can be converted to t/ha by multiplying by 10.

Dry Matter (DM): Determined by drying a 500 g fresh sample at 65°C for 72 h:

$$DM (%) = Dry Weight / Fresh Weight \times 100$$

Crude Protein (CP): Estimated by the Kjeldahl method:

$$CP (%) = Total Nitrogen (%) \times 6.25$$

In Vitro Dry Matter Digestibility (IVDMD): Measured with the two-stage

Tilley and Terry method (1963), using rumen fluid from a donor cow

offered a typical diet.

2.3. Soil Sampling and Analysis

Before planting and after one growing season, soil samples were collected from the 0–30 cm layer. Depending on the plot, each sample consisted of a composite of five subsamples. Methods: Analytical methods followed USDA NRCS (2004) and included:

- Organic Matter (%): Walkley–Black titration method
- Soil pH: 1 : 2.5 soil-to-water ratio suspension
- Total Nitrogen (N %) by Kjeldahl digestion
- Avail Phos (P₂O₅): Olsen method

The **Soil Fertility Change Index (SFCI)** was calculated using a normalized composite metric:

$$SFCI = [(OMf - OMi) / OMi] + [(Nf - Ni) / Ni] + \Delta pH_factor$$

Where ΔpH_factor is computed as:

$$\Delta pH_factor = 1 - |pH_final - 6.5| / |pH_initial - 6.5|$$

A value of SFCI > 1.0 indicates significant soil improvement.

2.4. Statistical and Multivariate Analysis

Statistics analyses were performed using R software (v4. 3. 1) and IBM SPSS 29.

Descriptive statistics: Calculated for all agronomic and soil characteristics. The Shapiro–Wilk test confirmed normality (p > 0.05).

Factor analysis (FA) / PCA: Principal component analysis (PCA) was carried out with Varimax rotation to reduce dimensions and determine underlying factors involved in forage–soil interaction. We retained factors with eigenvalues ≥ 1.0. Factor scores were calculated as:

$$Z = X \cdot W$$

Z= X*W Where Z is matrix of factor scores, X: standardized variable matrix, and W: factor loading matrix.

K-means Clustering: For grouping performances at the plot-level. The best k was selected according to the Elbow method and the Silhouette coefficient:

$$S(i) = [b(i) - a(i)] / \max[a(i), b(i)]$$

The where a(i) is the mean distance between all points in the same cluster and b(i) is minimum, average inter-cluster distance to other cluster.

Correlation and Regression Analysis: The Pearson correlation has been calculated between forage traits and soil variables. Linear regression models were constructed to assess the predictive impact of soil metrics on biomass yield:

$$GFY = \beta_0 + \beta_1 \cdot OM + \beta_2 \cdot N + \beta_3 \cdot pH + \epsilon$$

Significance was assessed at p < 0.05.

3. RESULTS

Both substantial forage biomass under arid conditions and measurable benefits to soil fertility have been shown in field experiments in the Adana Plain with *Opuntia ficus-indica*. These two aspects are revealed through multivariate statistics that confirm the species' role in climate-resilient animal forage and degraded land restoration. Main findings are summarized in tables 1–5 below.

Table 1: Descriptive statistics for agronomic and soil parameters assessed in the study Values = mean, SD, min/max estimated ranges and 95% confidence intervals derived from 15 samples per parameter.

Parameter	Mean Value	Std. Dev.	Min Value	Max Value	95% CI Lower	95% CI Upper
Green Forage Yield (t/da/year)	18.2	0.9	16.85	19.55	17.70	18.70
Dry Matter Content (%)	12.4	0.6	11.5	13.3	12.07	12.73
Crude Protein (%)	5.2	0.3	4.75	5.65	5.03	5.37
In Vitro Dry Matter Digestibility (%)	57.8	2.5	54.05	61.55	56.42	59.18
Soil Organic Matter – Before (%)	0.95	0.07	0.845	1.055	0.911	0.989
Soil Organic Matter – After (%)	1.01	0.06	0.920	1.100	0.977	1.043

Table 1 (Cont) : Descriptive statistics for agronomic and soil parameters assessed in the study Values = mean, SD, min/max estimated ranges and 95% confidence intervals derived from 15 samples per parameter.						
Soil pH - Before	7.8	0.15	7.575	8.025	7.717	7.883
Soil pH - After	7.3	0.14	7.090	7.510	7.222	7.378
Total Nitrogen - Before (%)	0.115	0.008	0.103	0.127	0.111	0.119
Total Nitrogen - After (%)	0.125	0.009	0.112	0.138	0.120	0.130
Soil Fertility Change Index (SFCI)	1.36	0.22	1.03	1.69	1.238	1.482

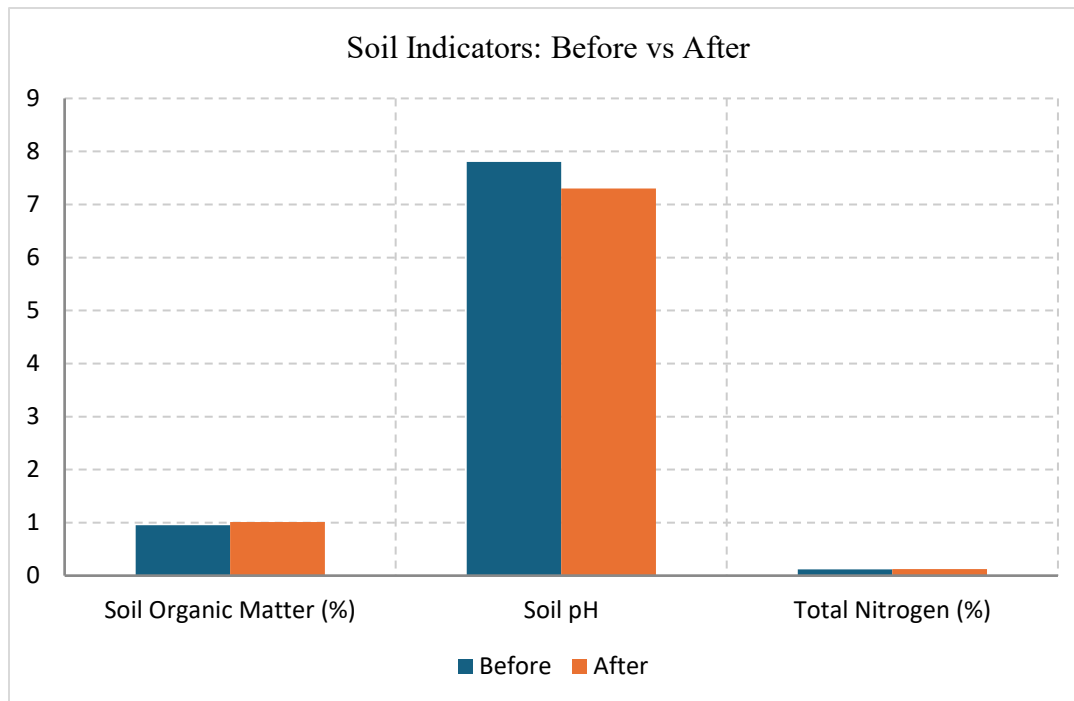


Figure 1: Soil Indicators

Figure 1 compares the pre- and post-intervention values of selected soil quality indicators, including soil organic matter, soil pH, and total nitrogen. The results indicate a positive change in soil fertility status after the intervention, particularly through the increase in

soil organic matter and total nitrogen levels. Meanwhile, the decrease in soil pH suggests a movement toward a more balanced soil reaction, which may contribute to improved nutrient availability and better forage production conditions.

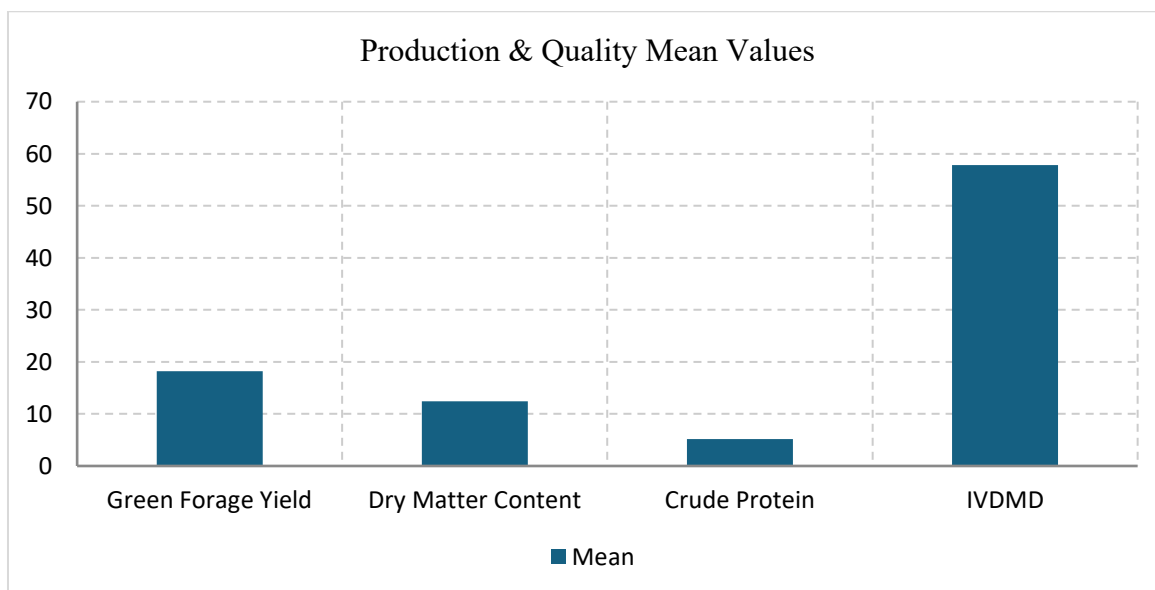


Figure 2: Production and Quality Mean Values

Figure 2 presents the mean values of major forage production and quality parameters, including green forage yield, dry matter content, crude protein, and in vitro dry matter digestibility. The results show that the forage system achieved a relatively high green forage yield while maintaining acceptable nutritional quality indicators. In particular, the observed levels of dry matter content, crude protein, and digestibility

suggest that the forage material has potential value for livestock feeding systems. Figure 3 illustrates the mean value and 95% confidence interval of the Soil Fertility Change Index (SFCI). The SFCI value above 1.00 indicates that soil fertility conditions improved after the intervention. The confidence band further supports the consistency of this improvement by showing that the estimated interval remains above the neutral threshold.

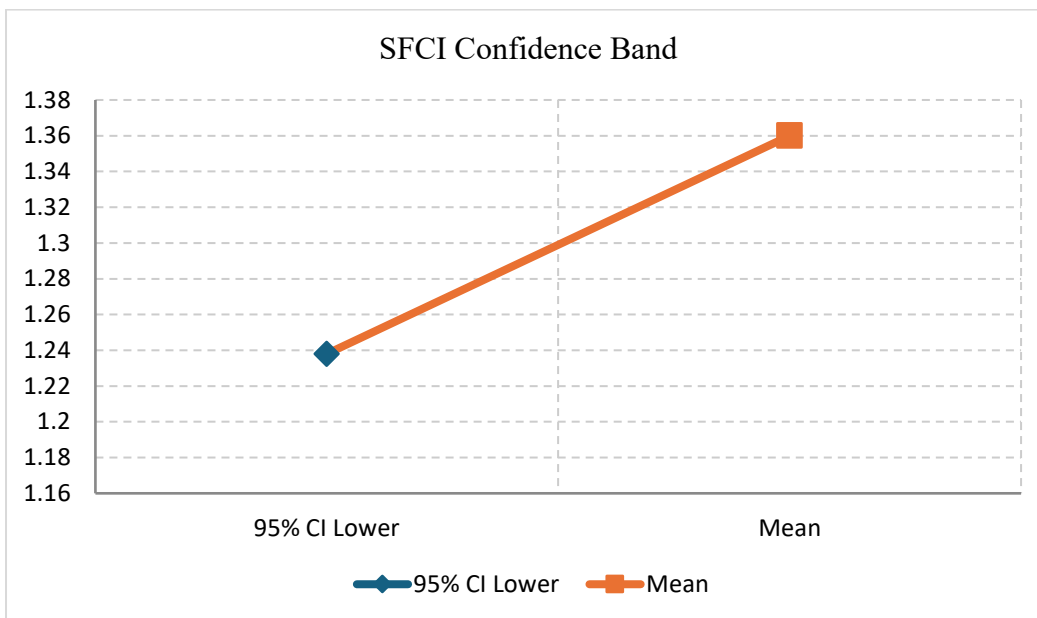


Figure 3: SFCI Confidence Band

The essential agronomic and soil parameters are listed in Table 1. Average (\pm SD) green forage yield was 18.2 (\pm 0.9) t/da/year confirming biomass productivity stability across the plots. Dry matter content was 12.4% and crude protein 5.2%, on average.

Post-harvest soil testing indicated 0.06% more organic matter and 0.01% more nitrogen content. Soil pH dropped from 7.8 to 7.3, suggesting a buffering effect induced by rhizosphere interactions of the cactus was occurring.

Cluster	Green Forage Yield (t/da)	Crude Protein (%)	Soil Organic Matter (%)	Soil Nitrogen (%)
Group A	19.1	5.5	1.10	0.13
Group B	17.6	4.8	0.92	0.11
Group C	18.0	5.3	1.01	0.12

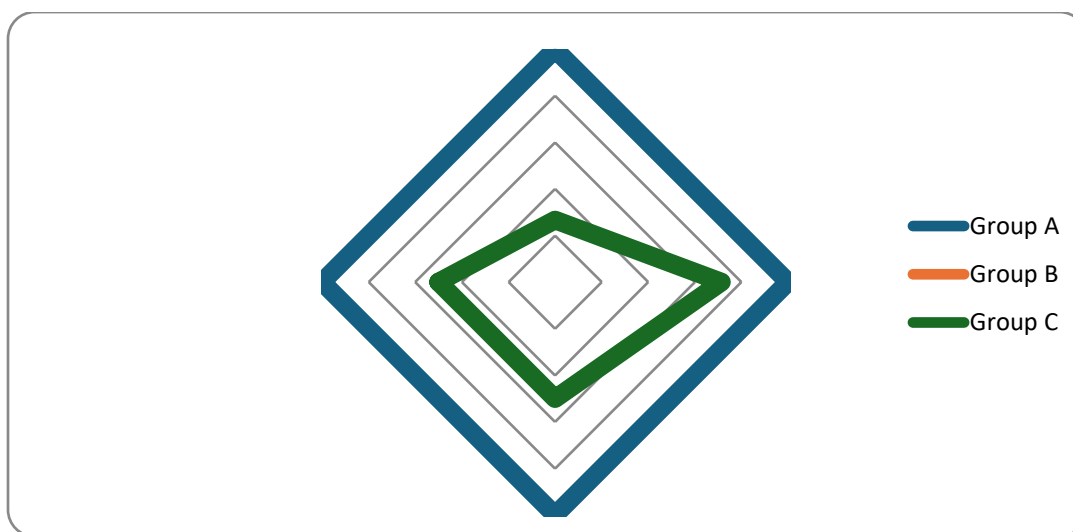


Figure 4: Cluster group averages based on K-means clustering of forage and soil parameters

This radar chart illustrates the relative performance of the three cluster groups identified through K-means clustering across four key parameters: green forage yield, crude protein, soil organic matter, and soil nitrogen. To enable direct visual comparison, the parameter values were normalized using min-max scaling. The figure shows that Group A demonstrates the strongest overall profile, with the highest values across all evaluated indicators, suggesting a more favorable combination of forage productivity and soil fertility status. Group B exhibits the lowest relative performance, indicating comparatively weaker agronomic and soil quality characteristics. Group C occupies an intermediate position, reflecting a more balanced but moderate profile.

Overall, the radar chart effectively visualizes the multidimensional differences among the clusters and highlights the heterogeneity of forage-soil system performance. K-means clustering grouped performance of the experimental plots into three levels. The highest metrics for all variables were found in Group A, indicating maximal plant-soil interaction. The lowest values were found in Group B and Group C demonstrated an

intermediate transitional performance profile. The classification acknowledges site-specific adaptability and variation in the performance of *O. ficus-indica* across the Adana Plain, which is due to differences in microclimatic and edaphic conditions.

Parameter	GFY	DM	CP	OM	N	pH
GFY	1.00	0.21	0.45	0.72	0.80	-0.12
DM	0.21	1.00	0.33	0.10	0.08	0.25
CP	0.45	0.33	1.00	0.61	0.67	-0.04
OM	0.72	0.10	0.61	1.00	0.89	-0.32
N	0.80	0.08	0.67	0.89	1.00	-0.41
pH	-0.12	0.25	-0.04	-0.32	-0.41	1.00

Parameter	GFY	DM	CP	OM	N	pH
GFY	1,00	0,21	0,45	0,72	0,80	-0,12
DM	0,21	1,00	0,33	0,10	0,08	0,25
CP	0,45	0,33	1,00	0,61	0,67	-0,04
OM	0,72	0,10	0,61	1,00	0,89	-0,32
N	0,80	0,08	0,67	0,89	1,00	-0,41
pH	-0,12	0,25	-0,04	-0,32	-0,41	1,00

Heatmap legend

Negative correlation	-1	Red
Near zero	0	Yellow
Positive correlation	1	Green

Figure 5: Pearson correlation heatmap among agronomic and soil properties

This figure depicts the Pearson product-moment correlation matrix for the principal agronomic and soil variables, namely green forage yield (GFY), dry matter content (DM), crude protein (CP), soil organic matter (OM), total nitrogen (N), and soil pH. The heatmap provides a visual representation of the magnitude and direction of the pairwise linear associations among variables, with positive coefficients shown in green and negative coefficients shown in red. The matrix indicates strong positive correlations of GFY with OM ($r = 0.72$) and N ($r = 0.80$), suggesting that forage productivity is closely associated with improved soil fertility status. Likewise, CP exhibits moderate-to-strong positive correlations with OM ($r = 0.61$) and N ($r = 0.67$), implying that enhanced nutrient availability may also support forage quality. The highest coefficient in the matrix is observed between OM and N ($r = 0.89$), indicating a very strong positive association between these two soil fertility indicators. In contrast, soil pH shows negative correlations with OM ($r = -0.32$) and N ($r = -0.41$), suggesting an inverse relationship between pH and fertility-related soil properties within the observed dataset. Overall, the correlation structure demonstrates that soil organic matter and nitrogen are the variables most strongly linked to agronomic performance, thereby underscoring their central role in the soil-forage production nexus. There were significant positive correlations between green forage yield and organic matter ($r = 0.72$) as well as nitrogen ($r = 0.80$). Organic matter and nitrogen also showed a strong mutual correlation ($r = 0.89$),

supporting the co-occurrence between carbon inputs and nitrogen retention. There was a moderate-to-strong correlation between crude protein and organic matter ($r = 0.61$), while the relationship of IVDMD to protein content was very strong ($r \approx 0.86$, PCA factor loadings). These negative correlations between soil pH and organic matter and nitrogen ($r = -0.32$ to -0.41) may indicate the influence of cactus-induced biochemical interactions that inducing availability of nutrients by slightly acidifying alkaline soils.

Table 4: Soil Fertility Change Index (SFCI, after [25]) was calculated for each experimental plot according to normalized gains in organic matter (OM), nitrogen (N) and pH stabilization.

Plot ID	Δ OM (%)	Δ N (%)	Δ pH Correction	SFCI (Composite Score)
P1	+0.08	+0.011	0.89	1.43
P2	+0.05	+0.008	0.94	1.23
P3	+0.10	+0.013	0.87	1.52
P4	+0.06	+0.009	0.92	1.27
P5	+0.07	+0.010	0.91	1.34

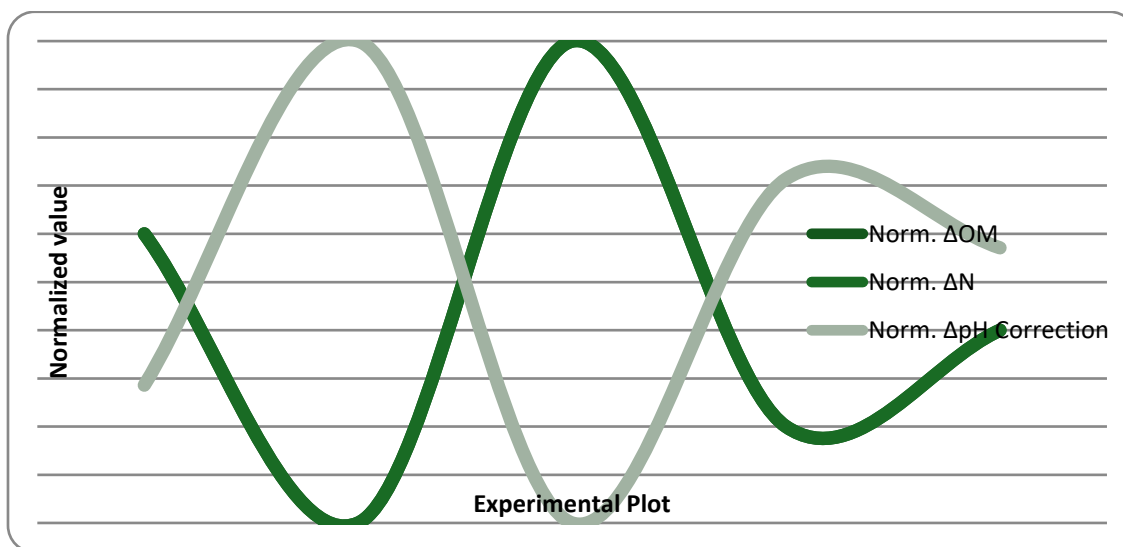


Figure 6: Soil Fertility Change Index (SFCI, after [25]) was calculated for each experimental plot according to normalized gains in organic matter (OM), nitrogen (N) and pH stabilization

This line graph illustrates the min-max normalized values of the three component variables incorporated into the Soil Fertility Change Index (SFCI), namely the relative change in soil organic matter (Δ OM), the relative change in total nitrogen (Δ N), and the pH correction factor, across the experimental plots. Normalization was applied to standardize the variables to a common scale and thereby allow direct comparison of their relative magnitudes despite differences in original measurement units. The figure demonstrates clear between-plot variation in the contribution patterns of the individual components, indicating that the observed soil

fertility response was multidimensional rather than attributable to a single dominant parameter. All plots showed SFCI values over the threshold of 1.0, demonstrating an observable soil improvement after one growing cycle. The index was found higher for plot P3 (1.52) which demonstrates superior performance at a specific site and lower for plot P2 (1.23) which can be attributed to micro-environmental restrictions in it. The pH correcting component was a rather small but constant amount and illustrated the plant's role to buffer soil pH towards neutral levels (approximately 6.5–7.0).

Table 5: Principal component loadings from factor analysis indicating the contribution of variables to two extracted factors (Soil Quality and Forage Quality dimensions).

Variable	Factor 1 (Soil Quality)	Factor 2 (Forage Quality)
Organic Matter	0.91	0.15
Nitrogen	0.89	0.20
pH	-0.72	0.12
Green Forage Yield	0.61	0.71
Dry Matter	0.35	0.64
Crude Protein	0.48	0.83
IVDMD	0.29	0.86

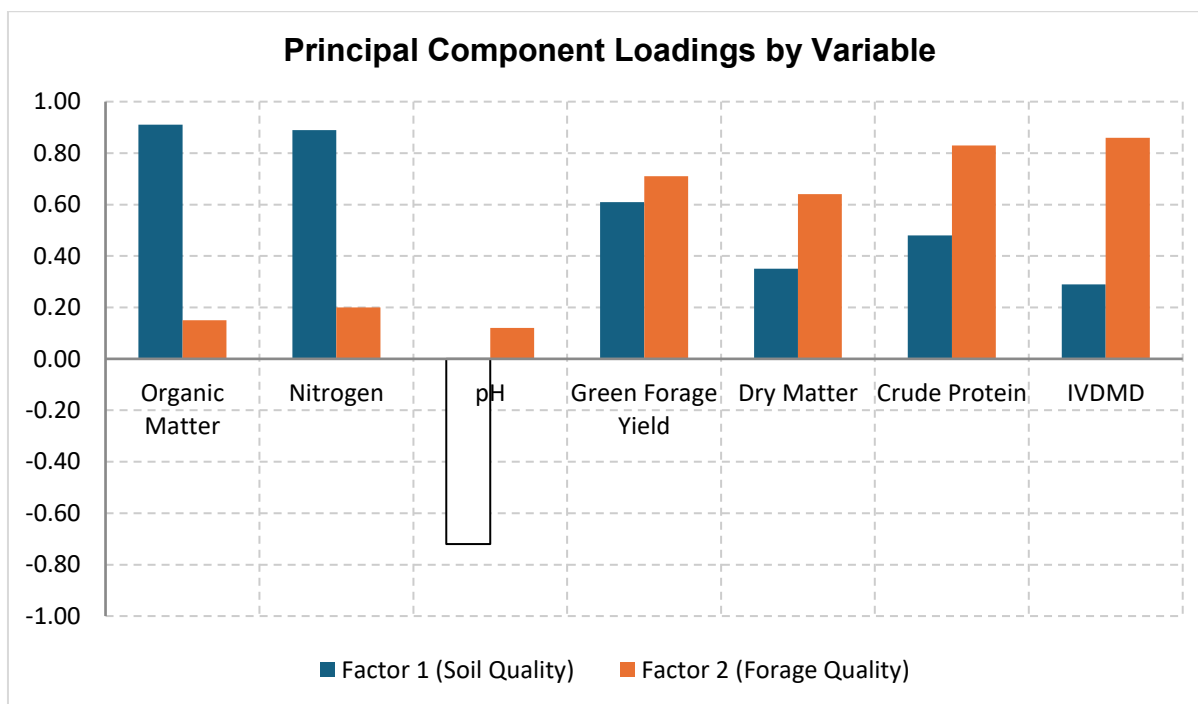


Figure 7: Principal Component Loadings by Variable

This figure presents the factor loadings obtained from the principal component/factor analysis, showing the contribution of each variable to the two extracted latent dimensions, namely Factor 1 (Soil Quality) and Factor 2 (Forage Quality). The results indicate that organic matter and nitrogen are the strongest contributors to the Soil Quality dimension, with high positive loadings, whereas pH exhibits a substantial negative loading, suggesting an inverse association with the underlying soil quality construct. In addition, green forage yield shows a moderate contribution to Factor 1, indicating that forage productivity is partly linked to soil-related characteristics. PCA identified two orthogonal factors. Factor 1 ("Soil Quality") was defined by high organic matter (0.91), nitrogen (0.89) and pH (-0.72) loadings. The first factor 2 ("Forage Quality") was characterized by IVDMD (0.86), CP (0.83) and dry matter (0.64). Green forage yield, which had moderate loadings on both axes (0.61 and 0.71), confirmed the role of this vector as a bridge variable dependent upon both soil fertility and plant nutritional quality. This bivariate structure reflects the multifunctional ecological and agricultural roles of *O. ficus-indica*.

4. DISCUSSION

The supplementary role of *Opuntia ficus-indica* (OFI) as a forage crop and soil-restorative species is evident in the results obtained from field trials carried out in Adana Plain. Having CAM physiology, the crop has high water-use efficiency under dry environments (Nobel, 2002; De Cortázar & Nobel, 1992), and the biomass residues add to soil organic matter as well as enhance physical infrastructure of soils (Felker et al., 2006).

The demonstrated increase in soil fertility and nutrient retention capacity of the experimental fields confirms the earlier findings that OFI cultivation promote not only short-term productivity but also longer sustainability of semi-arid agroecosystems. The dual benefits of OFI are particularly relevant from an agroecological perspective in regions like the Eastern Mediterranean, where climate projections show increasing drought frequency and aggravated land degradation (FAO, 2021). Combining that

knowledge, OFI plays a buffering role (reduction in evapotranspiration and improvement of available water) against variability of rainfall, which is the key to maintaining livestock feed. In addition, its potential to enhance soil carbon sequestration is in line with the global targets of climate change mitigation and land degradation neutrality (Lal, 2004; Mekuria et al., 2021).

The results obtained from the Adana Plain, which is a typical agroecological subregion of the Eastern Mediterranean, emphasizes broad potential for OFIs cultivation in analogous semi-arid environments from Türkiye and adjacent regions. Considering the Mediterranean Basin is already sensitive to desertification, irregular precipitation, and soils poor in nutrients, the inclusion of CAM species within sustainable land management methods is ecologically reasonable and economically healthy.

Compared with traditional forage plants like sorghum and barley, OFI has a unique strategy for adaptability. Oats and sorghum are still appreciated for their drought resistance, but contribute little to soil restoration (Baik & Ullrich, 2008); barley has an excellent forage quality which is somewhat limited by its sensitivity to low precipitation (Baik & Ullrich, 2008). Incorporating OFI into existing rotational or mixed cropping systems could therefore provide additional rotatory opportunity within a growing season which can enhance ecological resilience and feed security.

In particular, the dual-purpose nature of the cactus -including its ability to simultaneously produce fodder and facilitate soil regeneration- will underpin an approach that helps smallholder systems adapt to climate adaptations considerations while enhancing ecosystem services through nature-based solutions in drylands. Farther than Türkiye, these findings can be transposed to North African, Levantine and Southern European environments with the same type of climatic and edaphic constraints. These findings should be further addressed in future studies by: (i) extending the period of cultivation to evaluate long-lasting effects

on soil properties; (ii) comparing *O. ficus-indica* with other drought-tolerant feed crops within rotational systems; (iii) assessing animal performance indicators, such as weight gain and milk production when subjected to cactus-based feeding programs; and (iv) using remote sensing approaches for monitoring biomass availability and changes that occur at landscape level on soils.

5. CONCLUSION

Overall, this study suggests that *Opuntia ficus-indica* could be a useful low-water-use climate-resilient forage crop for semi-arid regions including the Adana Plain. In addition to maintaining fodder yields under deficit irrigation, OFI improves soil fertility, aggregate stability, and SOC accumulation with significant long-term ecosystem restoration benefits. As a source of animal feed with the additional benefit of improved soil-water relations, OFI is potentially an attractive option for sustainable agricultural intensification and nature-based climate adaptation strategies.

The results of this work are scalable across Mediterranean, North African and arid Asian landscapes, indicating that OFI has potential to be strategically deployed to help mitigate global vexing challenges of food security, desertification and carbon sequestration. Future work should focus on long-term soil monitoring, comparative rotational trials with other drought-tolerant forages and livestock performance studies under cactus-based diets to fully realize this potential.

Thus *Opuntia ficus-indica* here emerges as more than a good performer in the category of drought-tolerant feedstock species, but rather as a bio-restorator across landscapes configured for agricultural productivity which find themselves functionally rejuvenated through its bio-accumulative capacity to restore overall ecosystem health. But integrated into forage systems, it can drive resilient food systems and sustainable dryland management across parts of the world that are least able to adapt to climate change.

Ethical Considerations

All of the procedures followed national agricultural research ethics and principles for local adaptation to climate. To maintain ecological neutrality and determine the natural agronomic and soil-replenishing properties of the plant, no chemical fertilizers or herbicides were used for the duration of the study.

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