

Assessing the Influence of Olive Production Units on Household Assets through a Sustainable Livelihood Approach: A Case Study in Rudbar County

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ABSTRACT

Olive is a vital medicinal product known for its numerous health benefits and therapeutic properties. This study aimed to assess how olive production units affect the assets of working households through a sustainable livelihood approach. The research combined library research and field methods, utilizing a questionnaire as its primary tool. A panel of experts validated the questionnaire for content and face validity post-revision, with a Cronbach's alpha estimate of 0.97 for general reliability. The study was carried out in Rudbar County. The statistical population comprised 5053 olive orchard owners, with a sample size of 604 individuals determined using Bartlett's table. The data were analyzed using the SPSS and LISREL software packages. The main findings, as determined by LISREL, were as follows: P-VALUE = 0.000001, AGFI = 0.9, GFI = 0.91, NNFI = 0.95, CFI = 0.95, RMSEA = 0.038, IFI = 0.95, and $\chi^2/df = 1.88$. These findings suggest that the measurement model fits well and is deemed acceptable. The study demonstrated that olive production units have enhanced the livelihoods of participants across various dimensions, including natural, financial, physical, human, and social aspects. Also, a positive and significant correlation was identified between the five livelihood capitals and the livelihood levels of the households. A comprehensive and holistic approach is essential to enhance and maintain the well-being of the target community, considering the interconnected nature of livelihood capitals and livelihood levels. This aligns with the importance of addressing multifaceted aspects of livelihoods to achieve sustainable development and positive outcomes for communities.

Keywords: Capital assets, Livelihood, Olive, Sustainable

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INTRODUCTION

Livelihood is a fundamental aspect of human existence that extends beyond financial considerations, impacting household stability and well-being profoundly through its sustainability. (Azami *et al.*, 2018). Poverty and livelihood are intricately connected, with poverty alleviation being a crucial prerequisite for fostering sustainable rural development. By addressing poverty through sustainable livelihood strategies, communities can enhance their well-being and resilience, ultimately contributing to long-term development efforts (Nouri, 2019). The sustainable livelihood approach highlights the importance of diversifying economic activities in rural areas to enhance the assets of the local population (Veisi and Nikkhah, 2018). The evolving social, economic, and environmental landscape in recent years has had a significant impact on farmers' livelihood strategies, subsequently influencing the agricultural sector at large. This dynamic interplay underscores the need for adaptive and resilient approaches to address the changing demands and challenges faced by agricultural communities (Savari

et al., 2020; Shokati Amghani *et al.*, 2022; Zhu *et al.*, 2022; Baghernejad *et al.*, 2023).

Livelihood is commonly analyzed at the household level and can be described as a blend of diverse assets and engagements that contribute to the income of residents (Su *et al.*, 2019; Ellis, 2000). In developing regions, individuals construct their livelihoods based on a combination of assets. Therefore, grasping this framework is essential for comprehending their ways of life and sustaining their livelihoods effectively (Azami and Shanazi, 2017; Guillotrea *et al.*, 2012). Sustainable livelihoods are characterized by their ability to endure challenges and uncertainties, preserve resources and capacities for current and future needs, and yield positive outcomes that benefit the well-being of individuals at both national and local scales over the short and long term. This multifaceted approach underscores the importance of building resilient and inclusive livelihood systems (Department for International Development, 2008). The livelihood approach posits that livelihood capital (comprising physical, natural, human, financial, and social assets) underpins the ability and agency of rural villagers

to engage in shaping their social and personal trajectories. This framework influences their outlook, aspirations, and actions within rural environments, shaping their interactions and opportunities (Brimani *et al.*, 2016). The enhancement of natural, social, and human assets in rural areas remains inadequately bolstered by prevailing political structures and power dynamics, limiting its potential benefits. Moreover, these endeavors are susceptible to the influences of globalization and face challenges in anticipating and adapting to future changes in rural livelihoods (Yasinto *et al.*, 2023).

This approach, centered on individuals, holistic perspectives, adaptability, resilience, sustainability, and interconnections at micro- and macro-levels, views the eradication of deprivation and poverty as the initial stride towards development. (Badko *et al.*, 2019). Hence, an examination of the agricultural sector's recent trajectory across multiple dimensions demonstrates an escalating struggle with a range of challenges that impede its productivity and overall performance. (Shokati Amghani *et al.*, 2018; Yazdanpanah *et al.*, 2021). The agricultural development initiatives in Iran prioritize enhancing crop production and processing, alongside securing the livelihoods of rural households. (Savari *et al.*, 2018). However, relying heavily on resources like water and soil has contributed to livelihood challenges and environmental instability in rural regions. To foster sustainable livelihoods in these areas, alterations in production techniques and rural livelihood strategies are imperative. (Chambers and Conway, 1992).

Olive production plays a crucial role in agriculture, industry, commerce, and services, contributing to employment and income generation across multiple sectors (Soleimani *et al.*, 2018; Gholami *et al.*, 2023; Gholami *et al.*, 2024). Regions with a comparative edge in olive cultivation not only generate employment during production but also offer income-generating possibilities in post-harvest phases, such as processing. Given the necessity of processing olives before market distribution, it is deemed a lucrative industrial crop with enhanced worth. Beyond on-farm cultivation, every facet of the marketing process—from harvesting and transportation to oil extraction, sales, and financial services—enhances the crop's overall value (Chegini *et al.*, 2015; Khabiri, 2007; Golmohammadie *et al.*, 2022). According to Rossi (2016), Spain stands as the top olive producer globally, yielding

approximately 8,256,550 tons annually. Olive orchards span across 47 countries on five continents, covering a combined area exceeding 11 million hectares. Around the world, over 6.7 million families possess olive trees, each family typically managing 1.67 hectares of olive orchard. Notably, the Mediterranean region comprises 98 percent of the total global olive harvest (Papastavropoulou *et al.*, 2022).

In 2022, olives were cultivated in 30 provinces across Iran, with Rudbar County contributing to 13% of the nation's olive output. Rudbar County serves as a key region for olive cultivation in Iran, hosting the majority of the country's olive processing facilities. Notably, 80% of Rudbar's agricultural economy revolves around olive production, establishing it as Iran's primary olive trading center. The principal olive varieties in this county include 'Zard,' 'Roghani,' 'Fishmi,' 'Shenge,' 'Marri,' and 'Goluleh.' According to the Agriculture Jahad Organization of Guilan Province (2020), approximately 22,000 individuals in Rudbar County derive their livelihood from olive farming (Arji *et al.*, 2021).

Based on a report from the Ministry of Jihad and Agriculture of Iran (Table 1), olive cultivation in Rudbar County constituted 11-20% of Iran's overall olive production from 2016 to 2021.

Olive production and processing in Rudbar County offer direct and indirect benefits to numerous individuals, contributing significantly to the enhancement of capital assets for olive cultivators and fostering positive livelihood outcomes. This study explores the evaluation of capital assets among olive farmers in Rudbar County utilizing a sustainable livelihood approach. While initially developed in affluent nations, the sustainable livelihood approach has been acknowledged as a valuable instrument for enhancing living standards in many impoverished or developing regions. Recent research has delved into diverse livelihood components, encompassing capabilities, assets, and essential activities for sustenance.

Given the present circumstances, research concerning olive production holds particular significance in attaining the goals of the olive development strategy. This enables a focus on the status of olive production entities and the opportunities for enhancing productivity and maximizing resource utilization to bolster the income and livelihoods of olive farmers. The subsequent section outlines notable research endeavors in this domain.

Table 1 A comparative analysis of olive production in Iran and Rudbar County from 2016 to 2021

Year	Iran (tons)	Rodbar (tons)	Production ratio (percentage)
2016	108173	15668	14
2017	109273	15600	14
2018	108895	21450	20
2019	158378	17550	11
2020	122150	18080	15
2021	128588	16632	13

Source: Ministry of Agriculture Jihad, ICT Center, 2021

García Tejada (2019) conducted a study on the olive production chain, concentrating on small-scale producers in Karavali province, Spain. The research aimed to enhance the economic conditions of these producers throughout the entire cropping cycle, spanning from harvest to processing, marketing, and delivery to consumers. Given that olive production was a significant source of employment in the region, it was observed that smallholders faced financial challenges and lacked adequate organization due to the limited income from olive sales. The study aimed to augment the income of smallholders by analyzing the production chain and suggesting strategies for value addition. Recommendations included optimizing the olive production chain among small-scale producers to boost their income and overall quality of life.

Paul and Vogel (2013) applied a conceptual framework grounded in assets using a sustainable livelihood approach to examine the effects of organic shrimp farming on livelihoods. The study revealed that enhancing farmers' resilience capacity can create additional avenues to enhance livelihoods. Organic shrimp farming was found to bolster farmers' assets, diminish vulnerability, and foster sustainable livelihoods.

Mudavanhu *et al.* (2013) assessed the potential of transitioning smallholder horticulture into a sustainable livelihood approach in Zimbabwe, revealing its role in providing food, income, and employment opportunities. Sahne *et al.* (2022) investigated the influence of sericulture on enhancing the sustainable livelihood capital of rural households in Ramyan County, observing a noteworthy correlation between sericulture and the improvement of various forms of capital. Employment emerged as a significant factor affecting economic, social, physical, human, and natural capital, with human capital exhibiting a prominent contribution relative to other forms of capital. Issa Zehi *et al.* (2021) investigated the status of sustainable rural livelihood capitals in Saravan County, examining the sustainable rural livelihood index encompassing physical, financial, social, human, and environmental capitals. The study highlighted the significance and status of these capitals, emphasizing their importance in safeguarding the livelihoods of villagers. Analysis revealed that physical, financial, social, human, and environmental capitals were crucial for sustaining livelihoods. Additionally, villages in closer proximity to the city center exhibited superior social, economic, educational, health, and welfare infrastructures compared to other villages. Shokohi *et al.* (2021) explored the impact of data processing industries on enhancing the sustainable livelihoods of rural households in Qir and Karzin. The research revealed that data production and the development of data processing industries served as the primary income source for rural residents in the region. These industries facilitated employment generation, income growth, reduced product

wastage, enhanced sustainable livelihood capital among rural households, and deterred village migration.

Nazari Goran *et al.* (2019) highlighted in their study "Designing a Green Closed Loop Supply Chain for the Production of Olive Products under Risk Conditions" that enhancing olive processing facilities and establishing factories to process waste from oil extraction can boost the efficiency of olive processing industries by utilizing waste for valuable material recovery or production. Langrodi *et al.* (2019) assessed the levels of livelihood sustainability among villagers in Saqez County, revealing a low sustainability status across various aspects of sustainable livelihood in the area. The study identified a direct and significant correlation among the components of sustainable livelihood, with economic and physical assets exerting a more substantial influence on the sustainable livelihood of the residents.

Alibeigi and Mehdizadeh (2015) investigated the impact of small industries on enhancing the livelihood of rural households in Sirvan and Cherdavel County, Ilam province. Their research indicated that engagement in small industries led to an increase in the number of employed households, enhancing human, financial, social, and physical assets, aside from natural capital. Najafi *et al.* (2016) studied the impact of factors such as bank facilities on enhancing olive orchard management in Tarem County. Their research revealed a positive and significant influence of bank facilities on improving the management of olive orchards in the region.

Overall, the sustainable livelihood framework offers a robust foundation for understanding the intricate nature of rural livelihoods. By adopting this approach, rural development is viewed holistically, moving beyond isolated approaches that solely target specific aspects of poverty alleviation. Embracing this framework enables a comprehensive outlook on livelihood and rural development, fostering a more integrated and impactful approach towards sustainable progress.

A sustainable livelihood system consists of five core components: capital assets, evolving structures and processes, vulnerabilities, livelihood outcomes, and livelihood strategies or activities. This article delves into the analysis of capital assets and livelihood outcomes within this framework. Figure (1) depicts the model of the sustainable livelihood approach.

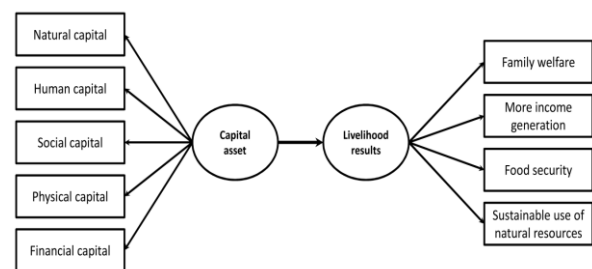


Fig. 1 The conceptual model of the research

MATERIALS AND METHOD

The study was conducted as an applied research, combining descriptive and analytical approaches. Data collection was carried out through a quantitative survey.

The study population comprised all registered olive orchard owners in Rudbar County between October 2021 and April 2022 with online access through the Comprehensive Zonation System of Agriculture Jihad Organization. The sample size initially set at 598 individuals based on Bartlett *et al.*'s (2001) minimum sample size table was increased to 620 to ensure meeting the required minimum sample size. Ultimately, 604 questionnaires were collected. The research variables were measured using a Likert scale in the questionnaire.

To enhance the questionnaire's validity, experts in agricultural development, extension, and horticulture reviewed and contributed suggestions, which were integrated into the questionnaire. Content and face validity were subsequently verified. The questionnaire's reliability was assessed using Cronbach's alpha. Data analysis was conducted utilizing SPSS24 and LISREL software, incorporating confirmatory factor analysis. The sample size for the villages under study was determined proportionally to the population size through the proportional allocation method, with participants selected via simple randomization.

Following data collection, the questionnaire's reliability was evaluated using SPSS software, yielding a satisfactory result with a Cronbach's alpha of 0.974. The library

method involved extracting a list of research indicators and variables by reviewing existing documents and theoretically elucidating the issue. Subsequently, this list was implemented in the field study phase through the distribution of a ten-point Likert scale questionnaire to olive growers.

RESULTS AND DISCUSSION

Six hundred and four individuals participated in the research survey, with 97.7% (590 individuals) being male and 2.3% (14 individuals) female. The average age of the participants was 47.95 years. The largest group, comprising 160 individuals (26.5%), fell within the age range of 51-60 years. In terms of education, 10.4% were illiterate, while only 13.9% held a bachelor's degree or higher. The study findings revealed that a significant proportion of orchard owners (76.8%) had one family member employed in the orchard, whereas only a small percentage (3.8%) had three or more family members working in their orchards. Regarding experience in orchard establishment and olive tree production, the owners possessed a range of 3 to 50 years of experience. The predominant experience ranges were 11-20 years and 21-30 years, encompassing 169 individuals (28%), whereas the least common range was over 41 years, involving only 10 individuals (1.7%). The average experience was 22.12 years, with a median of 20 years, a mode of 30 years, and a standard deviation of 11.05 years. Further details and results are available in Table 2.

Table 2 The distribution of the respondents based on their demographic and professional characteristics

Variable	Levels	Frequency	Percent	Other statistical indices
Gender	Male	590	97.7	Mode = male
	Female	14	2.3	
Age (year)	<30	61	10.1	Mean = 47.95
	31-40	115	19	Mode = 44
	41-50	153	25.4	SD = 11.99
	51-60	160	26.5	Min = 26
	>61	115	19	Max = 72
Number of family members working in the orchard (person)	1	464	76.8	Mean = 1.26
	2	117	19.4	SD = 0.52
	3 or higher	23	3.8	Mode = 1
Educational level	Illiterate	63	10.4	Mode = diploma
	Elementary	114	18.9	
	Intermediate and under-diploma	125	20.7	
	Diploma	186	30.8	
	Associate degree	32	5.3	
	Bachelor's degree or higher	84	13.9	
History of activity (year)	≤10	144	23.8	Mean = 22.12
	11-20	169	28	Mode = 30
	21-30	169	28	SD = 11.05
	31-40	112	18.5	Min = 3
	≥41	10	1.7	Max = 50

(Source: Research findings)

The Living Standard of Olive Farmers in Rudbar County

The study evaluated olive gardeners' livelihood levels through four components and 13 items on a Likert scale to gauge sustainable livelihood outcomes. These outcomes encompassed household welfare, income, food security, and the sustainability of natural resources. The findings in Table 3 highlight that the primary areas of focus for enhancing the well-being of olive gardeners were enhancing living conditions and ensuring access to basic necessities. Given that numerous gardeners in Rudbar County primarily depend on gardening for their livelihood and income, the adequacy of basic necessities and living accommodations is intricately linked to their productivity levels. Consequently, these factors emerge as crucial variables for elevating the well-being of olive gardeners in the region. Enhancing savings emerged as the primary focus for improving household income among olive gardeners. This emphasis on savings is essential as it plays a pivotal role in ensuring future financial security and supporting both production activities and family well-being. The research findings revealed that stabilizing the effects of production and price fluctuations on households ranked lowest in terms of income priorities. In terms of food security, the emphasis shifted towards reducing conflicts and crime levels, indicating a multifaceted approach to enhancing the well-being of olive gardeners in Rudbar County. The positive correlation between income growth, enhanced well-being, and increased awareness, education, and economic engagement serves as a deterrent against delinquency, crime, and disruptive behaviors. This cascade effect ultimately contributes to bolstering food security and stability within communities. The strategic use of natural resources has played a crucial role in enhancing sustainability by curbing degradation and contamination of pastures and resources, thereby fostering their preservation for future generations. However, there has been a lesser focus on revitalizing and advancing these resources to ensure their long-term sustainability and resilience in the face of evolving environmental challenges. By adopting this approach, there is potential to optimize the efficient use of water resources and integrate contemporary methods for planting, cultivating, harvesting, processing, and marketing agricultural products. Furthermore, it could play a vital role in minimizing land degradation, while facilitating the rejuvenation and enhancement of natural resources for sustainable agricultural practices and ecological balance. The livelihood levels of olive orchard owners in Rudbar County were evaluated utilizing the Interval of Standard Deviation from the Mean (ISDM) methodology. Factors influencing livelihood levels were ranked according to their mean, standard deviation (SD), and coefficient of variation. Subsequently, the mean and total standard deviation were computed, resulting in a mean value of 7.56 and standard deviation of 0.983.

In this methodology, the scores are categorized into four levels as outlined below:

A = weak	$A < \text{Mean} - \text{SD}$
B = moderate	$\text{Mean} - \text{SD} < B < \text{Mean}$
C = good	$\text{Mean} < C < \text{Mean} + \text{SD}$
D = excellent	$\text{Mean} + \text{SD} < D$

As per Table 4, the breakdown of livelihood levels among individuals was as follows: 16.4% were classified as having a weak livelihood level, 33.1% were at a moderate livelihood level, 35.6% were deemed to have a good livelihood level, and 14.9% were situated in the excellent livelihood level category.

The Structural Model of the Research

The study utilized Structural Equation Modeling (SEM) to achieve two primary goals: measuring phenomena and exploring their interrelationships. This involved testing structural hypotheses and evaluating the model's fit. The SEM analysis was carried out using the Lisrel (ver. 10) software package. Figure 2 displayed the model with standard coefficients, while Figure 3 illustrated the model in the significance state. Tables 5 and 6 provided the model's fit indices and the outcomes of hypothesis testing, respectively.

The goodness-of-fit indices presented in Table 5 demonstrate a favorable fit for the structural model, with the RMSEA value below 0.08. Moreover, the NNFI, IFI, GFI, AGFI, NFI, and CFI values exceeding 0.9, along with PNFI and PGFI values surpassing 0.50, indicate a well-suited model fit. Hence, the overall fit of the structural model can be deemed acceptable.

The Correlation between the Capital Assets of olive Farmers and their Standard of Living

The findings revealed a positive and statistically significant correlation between various capital assets (natural, human, social, physical, and financial) and the livelihood standards of olive farmers. This implies that enhancing the capital assets of olive farmers contributes to an enhancement in their living standards, and vice versa, an improvement in living standards leads to an increase in capital assets. Additionally, all indicators (dimensions) displayed t-values exceeding 1.96, validating the appropriateness of the chosen dimensions for assessing the influence of capital assets on the sustainable livelihood of the studied population, reinforcing the importance and accuracy of the measurement model. These outcomes underscore the impact of capital assets on the sustainable livelihood of olive farmers.

Based on the study findings, all five categories of physical, social, financial, human, and natural capital exhibited positive relationships with the living standards of olive growers, underscoring the importance of enhancing, promoting, and sustaining their livelihood. This holistic view emphasizes the suitability of the current model structure, given the significance of all dimensions of capital assets and their measurement indicators,

highlighting the positive impact of capital assets on the livelihood of olive farmers.

The results from hypothesis testing indicated a standardized coefficient (path coefficient) of $\beta = 0.97$ between capital assets and the livelihood level of

gardeners, with a corresponding significance coefficient (t-statistic) of $t = 5.36$. As the t-value exceeds 1.96 in absolute terms, supporting the research hypothesis, it can be inferred that capital assets have a substantial influence on farmers' livelihood.

Table 3 The ranking of the factors that determine the quality of life for olive gardeners

Rank	Component/Object	Average	Standard Deviation	Coefficient of variation
	Family Welfare	8.04	1.46	18.03
4	Feeling content with life	7.92	1.56	19.8
3	Improving the physical and mental health of the family	8.02	1.46	18.2
1	Improving living facilities	8.22	1.43	17.5
2	Providing basic needs	7.99	1.41	17.7
	Income generation	7.77	1.39	18.06
2	Increasing income through garden products	7.84	1.42	18.2
1	Increasing saving	7.86	1.2	15.4
3	Stabilizing the effects of production and price on household fluctuation	7.61	1.56	20.6
	Food Security	7.45	1.40	18.76
3	Helping improve household nutrition	7.66	1.58	20.7
2	Improving special and temporal access to food	7.79	1.42	18.3
1	Reducing the level of conflict and crime	6.91	1.19	17.3
	Sustainable utilization of natural resources	6.80	1.40	20.66
1	Reducing the destruction and pollution of pastures and natural resources	6.85	1.29	18.8
2	Improving soil fertility and the possibility of increasing resource productivity	6.93	1.5	21.6
3	Revival and development of natural resources of the village	6.63	1.43	21.6

Table 4 The frequency distribution of the livelihood levels of olive orchard owners in Rudbar County based on their scores

Score	Livelihood level	Frequency	Percentage	Cumulative percentage
< 6.577	Weak	99	16.4	16.4
6.577-7.561	Moderate	200	33.1	49.5
7.561-8.544	Good	215	35.6	85.1
>8.544	Excellent	90	14.9	100

Mean = 7.561; SD = 0.983; Minimum = 4.62; Maximum = 9.85

Table 5 The model's fit indices in a broad sense

Index	Proposed level (Acceptable fit)	Value reported	Status
χ^2/df	≤ 3	1.881	Suitable fit
RMSEA	≤ 0.08	0.038	Suitable fit
P-VALUE	≥ 0.05	0.000001	Unsuitable fit
GFI	≥ 0.90	0.913	Suitable fit
AGFI	≥ 0.90	0.900	Suitable fit
NNFI	≥ 0.90	0.952	Suitable fit
NFI	≥ 0.90	0.911	Suitable fit
CFI	≥ 0.90	0.956	Suitable fit
IFI	≥ 0.90	0.956	Suitable fit
PNFI	≥ 0.50	0.837	Suitable fit
PGFI	≥ 0.50	0.790	Suitable fit
RMR	≤ 0.50	0.032	Suitable fit

Table 6 The results of the impact and significance coefficients of model assumptions

Path	Path factor	Significance	Test result
Capital assets \rightarrow Livelihood level	0.97	5.36	Confirmed

Table 7 The ranking of the impact of first-order indicators on the formation of the second-order structure

rank	First-order indicators	Factor loading	t-statistic	Sig
1	Social capital	1	20.74	0.000001
2	Human capital	1	21.61	0.000001
3	Physical capital	0.99	22.19	0.000001
4	Financial capital	0.99	20.09	0.000001
5	Natural capital	0.98	21.36	0.000001

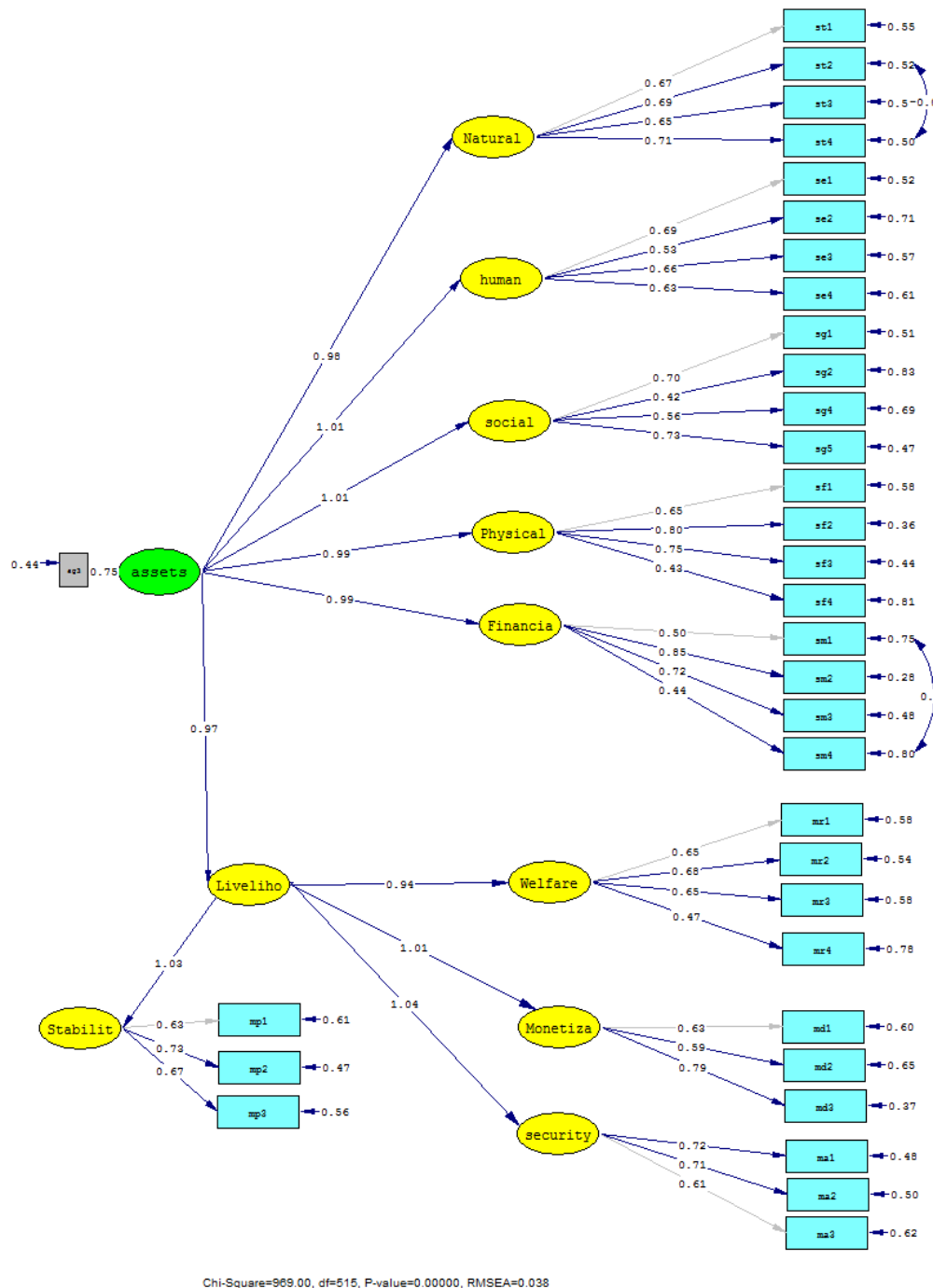


Fig. 2 The research structural model with standard coefficients

CONCLUSIONS

The assessment revealed that the livelihood of olive orchard owners in Rudbar County is perceived to be relatively favorable by the respondents. Over half of the participants rated their livelihood as good or excellent, while only 16.4% assessed it as weak. The outcomes from Model 2 in Figure 3 highlight that when the t-value exceeds 2.58, the factor loadings are statistically significant at the P = 0.01 level. Furthermore, if the t-value falls between 1.96 and 2.58, the factor loading is deemed significant at the P = 0.05 level, supporting the null hypothesis regarding the substantial impact of the indicator (variable) on the construction of the target

construct (factor). This acceptance underscores the significance of the relationships as per the research assumption within the second-order Confirmatory Factor Analysis (CFA) framework (Todman & Dugard, 2007). In this research, the chi-square value divided by the degrees of freedom yielded 1.88, signifying a well-fitted model. Consequently, the reported suitability indices indicate that the model evaluating the influence of capital assets on the livelihood level of Rudbar olive gardeners demonstrates a fitting and satisfactory fit. Furthermore, the findings suggest that the chosen dimensions for assessing the impact of capital assets on the livelihood of olive gardeners were precise and comprehensive.

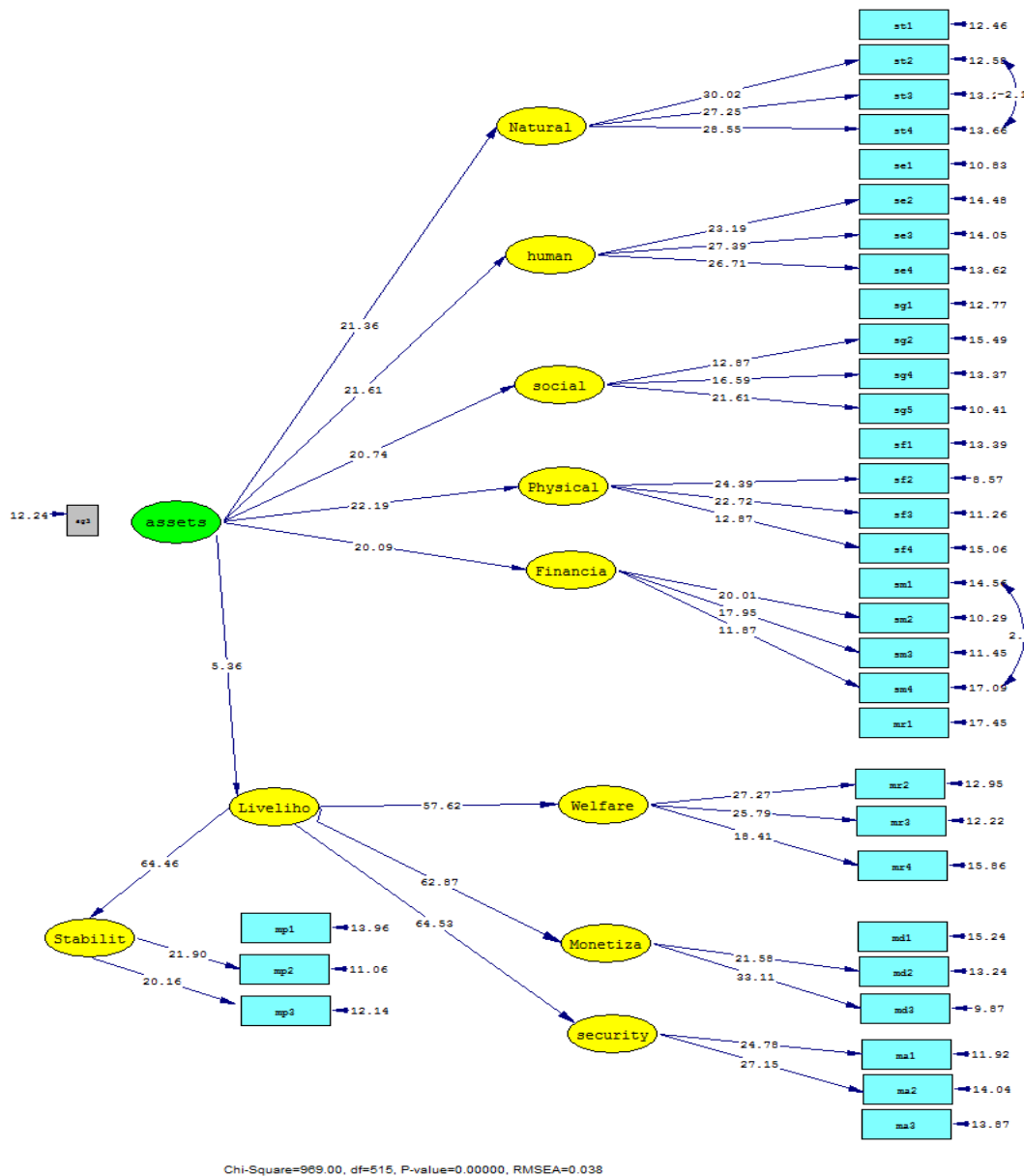


Fig. 3 The research’s structural model with standard coefficients

The results from the confirmatory factor analysis further validate the significance and appropriateness of the measurement model in evaluating the impact of capital assets on livelihood levels through the lens of the five capitals. Subsequently, the standardized path coefficient (λ) and its significance level were employed for each of the five capital types to determine their respective influence on the livelihood of olive growers in Rudbar County (refer to Table 7). These standardized path coefficients elucidate the connection between the first-order and second-order factors. Notably, the outcomes reveal that social capital emerged as the most influential indicator ($\lambda = 1$), followed by human, physical, financial, and natural capital, in descending order of importance, in assessing the livelihood level of olive gardeners in Rudbar County. Human capital plays a pivotal role in covering health expenses and fostering family well-being. The intangible nature of human capital can act as a catalyst for societal

advancement, directly influencing human development. Progress in human development drives both quantitative and qualitative advancements. These results align with Sahneh *et al.*, (2022) study, underscoring the substantial impact of human capital on livelihood sustainability compared to other capital types. Hence, expanding olive production is advised, as it not only benefits human societies but also boosts social vitality and health through increased production and consumption, ultimately fostering human development. To boost human capital and enhance individuals' livelihoods, it is essential to prioritize the development and implementation of educational programs. Moreover, initiatives should focus on improving gardeners' skills through training on modern equipment and technologies, as well as enhancing their theoretical and practical knowledge. In terms of social capital, there is observable growth in trust within local community members,

particularly among groups. The ability of olive gardeners to collaborate effectively in groups underscores the positive influence of social capital, emphasizing the synergy between social capital and communal activities. These results align with the findings of Issa Zahi et al. (2021). Therefore, in light of the limited efficiency of agricultural organizations, it is advisable to establish olive associations and horticultural production cooperatives with the backing of government institutions.

In terms of financial capital, there is a notable potential for creating diverse job opportunities and additional sources of income. With increased income, olive gardeners can enhance their enterprises and generate employment prospects through the expansion of secondary activities like processing and selling olive products. This fortifies their financial capital and yields a discernible positive impact on their livelihoods. To further bolster this aspect, it is recommended to provide support for procuring gardening machinery and tools, along with training on their proper and efficient utilization.

Regarding the physical capital within the region, it has been identified that the enhancement of communication infrastructure and infrastructure development, especially in connectivity with villages and nearby cities, has contributed to economic progress and regional development. Beyond communication infrastructure, improved access to markets and shopping centers, as well as the enhancement and revitalization of settlements or housing, have also played pivotal roles in fostering development.

In the realm of natural capital, collaborative environmental conservation initiatives have yielded a significant impact, particularly in mitigating soil erosion and enhancing conservation efforts. These outcomes are aligned with the research findings of Shokohi et al., (2021), Matiei et al., (2018), and Ali Beigi and Mehdizadeh (2016), which highlight the greater influence of financial and physical assets on sustainable livelihoods compared to other assets. As such, it is advisable to establish the essential infrastructure for swift product delivery to the consumer market and to assist olive growers in enhancing their physical capital. This entails acquiring appropriate transportation machinery, constructing accessible roads to the olive gardens, providing adequate housing, and enhancing connectivity through media and communication networks. Furthermore, given the high-quality olives produced in Rudbar County, leveraging the global market capacity for exporting this product is recommended.

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