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Effect of the Olive Value Chain on the Assets of Olive Orchard Owners in Rudbar County: The Application of Sustainable Livelihood Approach

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Abstract

This descriptive-analytical research aimed to investigate the effects of the olive value chain on the assets of olive orchard owners in Rudbar County using the sustainable livelihood approach through library and field methods employing a questionnaire. The content and face validity of the questionnaire were confirmed by a panel of experts after revision, and its general reliability was estimated at 0.97 by Cronbach's alpha. The study was conducted in Rudbar County. The statistical population consisted of 5053 olive orchard owners, from which 604 people were sampled based on Bartlett's table. Data were analyzed using the SPSS and LISREL software packages. According to the applied LISREL analysis, the main findings were as follows: p-value<0.01, NNFI = 0.907, CFI = 0.910, RMSEA = 0.036, $\chi 2/df$ = 1.51, IFI = 0.910, and PGFI = 0.768. Results revealed that among the five resources studied, social capital was the strongest factor affecting respondents' livelihoods in the area (λ = 1.02). The findings also indicated that the fit of the measurement model was appropriate and acceptable. Additionally, it was observed that capital assets significantly and positively influence livelihood outcomes, suggesting that increasing capital assets would lead to an elevation in livelihood levels.

Keywords:
Livelihood assets, Rudbar County, sustainable livelihood; value chain

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INTRODUCTION

Today, livelihood has transcended mere economic and income considerations to become an integral aspect of human life, profoundly impacting the stability of family life and overall welfare. The development of an economic framework in rural areas has brought forth several challenges, such as reduced resilience to short-term climatic variations, volatility in crop prices during harvest periods, constraints in crop marketing, reliance on external factors outside the village, overt and covert unemployment, diminished returns on invested capital, degradation of essential natural resources, susceptibility of rural economies to vulnerability and income source instability, lack of job security, low quality of life, and ultimately, the emergence of unsustainable rural livelihoods (Ahmadi et al., 2019).

Livelihood is typically studied at the household level (Diniz et al., 2015) and can be characterized as the amalgamation of various assets and activities that contribute to the income of local residents (Su et al., 2019; Ellis, 2000). The emphasis on livelihood as a means to enhance quality of life and welfare represents a novel approach to determining optimal development strategies in developing societies, aiming to furnish resources through which individuals can enhance and enjoy their lives (Asghari Saraskanrud et al., 2016: 313; Sadrmousavi et al., 2021: 194).

Achieving sustainable livelihood requires the adoption of strategies across various planning periods, taking into account the internal and external conditions of rural communities. Sustainable livelihood is a process-oriented endeavor facilitated by the interaction and collaboration of institutions responsible for rural development, along with the establishment of coordinated connections among different components that influence sustainable livelihood in the long term. The attainment of sustainable livelihood necessitates strategic planning and the identification of effective strategies (Sojasi Ghidari et al., 2016).

Capitals and assets represent fundamental components of a sustainable livelihood framework, with investments in these capabilities supporting livelihood sustainability (Zenteno et al., 2013). According to Chambers, livelihood becomes sustainable when it demonstrates resilience to stresses and shocks, maintains capabilities and assets not only for the present but also for the future, and generates net benefits for livelihoods at both national and local levels in the short and long term (Department for International Development, 2008).

The sustainable livelihood approach has emerged as a novel strategy for rural development aimed at alleviating or eradicating rural poverty (Ariuon et al., 2012; Veisi and Nikkhah, 2019: 329). This approach integrates welfare, security, and capability concepts with comprehensive analyses of poverty, vulnerability, resilience, and sustainability of natural resources. It encompasses human resources, technical assets, natural resources, social assets, and financial assets as crucial indicators for measuring livelihood security (Isazehi & Sharifzadeh, 2021; Sharifinia, 2021: 214; Shah et al., 2013; Subba et al., 2016). Based on the livelihood approach, livelihood capitals (physical, natural, human, financial, and social) serve as the foundation for rural people's capability and capacity to influence their social and personal destinies. These capitals shape and guide the perceptions, expectations, and activities of individuals and families in rural areas (Badko et al., 2020; Barimani et al., 2016).

The value chain encompasses all activities associated with a crop, from initial inputs through processing, delivery to the final market, and post-consumption disposal. Throughout this process, the product undergoes various stages, involving transactions among different stakeholders, exchange of money and information, and gradual addition of value (UNIDO, 2009). It represents a series of factors and interconnected markets that transform inputs and services into products

meeting consumers' preferences (Andre Devaux et al., 2018). The value chain concept suggests that the livelihood approach can complement it by offering a comprehensive understanding of the dynamics directly or indirectly influencing people's lives. Therefore, alongside value chain analysis, livelihood approach analysis is often employed, chosen not only for its perspective but also for its methodology (Krap, 2012). Furthermore, value chain analysis serves as a valuable tool for examining the role of the value chain in achieving various political objectives, such as poverty alleviation, sustainable growth, and reduction of inequality (Bellu, 2013). Changes within the agricultural value chain have significant implications for farmers' livelihoods and their vulnerability (Fournier, 2019). Olive cultivation is traditionally conducted for both raw and processed forms, making it an economically significant and highly valuable crop cultivated in various regions of Iran, often considered a strategic crop in certain provinces (Chegini et al., 2015).

Given that Iran ranks among the top 10 countries globally in terms of horticultural production and holds the third position in crop diversity, the horticultural sub-sector carries significant importance. This sub-sector contributes to 25 percent of added value, 30 percent of employment, and 80 percent of agricultural sector exports (Ghasemi and Bakhshi Shadmehri, 2019). Within this context, olive cultivation emerges as a noteworthy crop. Globally, olive orchards span across 47 countries on five continents, covering an aggregate area exceeding 11 million hectares. Approximately 6.7 million families worldwide own olive trees, averaging 1.67 hectares of olive orchard per family. However, 98 percent of the global olive harvest is related to the Mediterranean region (IOC1,2020). FAO (2021) reports that Spain is the leading olive producer in the world with a production rate of 8,256,550 tons per year.

In Iran, Rudbar County stands out as one of the primary regions for olive production and hosts the majority of olive processing factories in the country (see Table 1). Remarkably, 80 percent of Rudbar's agricultural economy relies on the olive crop, establishing the county as the epicenter of the olive trade in Iran. The principal olive cultivars cultivated in this county, listed in order of cultivation area, include 'Zard', 'Roghani', 'Fishmi', 'Shenge', 'Marri', and 'Goluleh'. According to the Agriculture Jahad Organization of Guilan, in 2020, approximately 22,000 individuals in Rudbar County derived their livelihood from olive production (Jahad Agriculture Organization of Guilan Province, 2021).

Table 1
Information on The Cultivation Area, Production Rate, And Yield of Olives in Rudbar County in 2020-2021.

Total cultivated area including dispersed trees (ha)							Production rate (t)			Yield	
Non-fertile			Fertile								
Irrigated	Rain-fed	Total	Irrigated	Rain-fed	Total	Total area	Irrigated	Rain-fed	Total	Irrigated	Rainfed
230	2	232	8466	131	8597	8829	16304	325	16632	1926	2474

Source: ITC Center, Deputy of Planning and Economy, Ministry of Agriculture Jahad, 2021

Due to the necessity of processing before marketing, the olive crop holds significant value as an industrial plant with added value. Beyond farm-level production, various marketing stages, including harvesting, transportation, oil extraction, sales, and

involvement of financial and credit institutions, contribute to the creation of value for the crop (Chegini et al., 2015; Kheiri, 2007). Agricultural development programs in Iran consistently prioritize goals such as increasing crop production and processing, reflecting the focus of development policymakers on enhancing rural households' livelihoods (Sawari et al., 2018). Olive cultivation, being the primary crop in Rudbar County, benefits

from a favorable market demand across Iran. Nevertheless, given the absence of government support services in the region, the presence of a robust market, and the potential for regional branding of olives, research on this crop is imperative to contribute to its value addition (Soleymani et al., 2020).

Therefore, considering the pivotal role of olives in the agricultural economy of Rudbar County, it is imperative to enhance the value chain of this crop. This entails the adoption of appropriate strategies and policies aimed at improving its value chain. The research endeavors to explore the dimensions and dynamics of the olive value chain in Rudbar while assessing the level of livelihood sustainability among olive orchard owners using sustainable livelihood indices. By doing so, the study aims to investigate the various dimensions of the olive value chain and their impact on capital assets and the livelihood status of olive orchard owners. Furthermore, it seeks to propose solutions for enhancing the livelihoods of orchard owners. The subsequent section will review the theoretical literature concerning the olive industry and the livelihoods of olive orchard owners. Following that, the research methodology and the structural model will be elucidated. Finally, the study will conclude with some key points and recommendations.

Literature Review

Currently, research on the value chain of olives holds critical significance for achieving the objectives of the olive development project in Iran. Such research enables the exploration of the potential of olive production units to increase productivity, optimize resource utilization, and enhance the income and livelihood of olive orchard owners, while also studying their economic impact. However, existing studies, as reviewed below, have only partially addressed the olive value chain.

Pravakar et al. (2013) identified various factors affecting farmers' livelihoods, including human capital (such as religious structure, family size, and literacy level), financial capital (including credit sources, employment, and annual family income), physical capital (access to healthcare facilities and clean drinking water sources), and social capital (education level and social status of farmers). Similarly, Badko et al. (2020) examined livelihood assets and capital across human, financial, physical, natural, and social domains. Their findings indicated variations in these assets and capital, with decreases observed in physical, financial, and natural assets, and increases noted in social and human assets due to vulnerability in various areas in recent years. They also revealed disparities in the sustainability of livelihood assets, with financial and physical capitals being the least sustainable and social and human capitals being the most sustainable. The mean sustainability scores for these capitals were reported as 1.41, 2.46, 3.68, and 3.25, respectively. Additionally, Aazami and Shanazi (2018) highlighted the significant impact of the Zarivar wetland on the five dimensions of livelihood (natural, human, physical, social, and financial assets) of families residing in its vicinity. They found that the wetland improved various components of each capital, thereby enhancing the asset and livelihood levels of the local population.

Aazami et al. (2018) conducted a study employing confirmatory factor analysis and structural equation modeling using LISREL to assess the various effects of the agro-industry on sustainable livelihood assets. Their results indicated that among the five resources examined, natural capital exerted the strongest influence on respondents' livelihoods in the study area (λ=0.90). The findings also demonstrated that the measurement model fit was appropriate and acceptable.

In contrast, Mchopa et al. (2021) conducted a study aiming to analyze the impact of sunflower value chain activities on the potential for livelihood sustainability among households of smallholders. Their findings revealed that a significant portion of households had lower chances for livelihood sustainability (67.1%), while only a small

percentage of households (12.5%) were categorized as having high livelihood sustainability. The study concluded that the sunflower value chain exhibited potential for enhancing households' livelihood sustainability compared to other socio-economic activities, as it enabled smallholders to better withstand livelihood shocks and stresses through increased household income.

García Tejada (2019) conducted a study on the olive production chain, focusing on small producers in Karavali province, Spain, with the aim of improving their economic conditions throughout the entire production process, from the beginning of the cropping season to harvest time, processing, and final marketing until the crop is delivered to consumers. The research revealed that despite olive production being a significant source of employment at all levels in the region, smallholders faced financial challenges due to low income and lacked organizational capacity. To address these issues, the study analyzed the production chain and proposed value-added production solutions, aiming to enhance the income and quality of life of small olive producers.

Boudi et al. (2016) found that although the value chain was profitable for all participants, various shortages and bottlenecks hindered its overall development. Key bottlenecks included poor agricultural performance, institutional shortcomings, issues related to the natural, structural, technological, and economic environment, lack of market transparency, uncertainty, absence of quality control, inadequate monitoring systems, lack of certification and labeling, and the limited presence of organized structures around the crop.

Soleymani et al. (2020) reported that supply chain development strategies aligned closely with competitive strategies. They identified key competitive strategies, including expanding the cultivation of high-yielding and marketable cultivars, adopting modern irrigation methods like drip irrigation, establishing seedling production centers across the county to facilitate access to high-yielding cultivars, allocating governmental lands with supportive facilities to increase cultivation area, and incentivizing agriculture graduates to establish mechanized orchards by supporting their plans.

In a study on the marketing behavior of olive farmers in Tarom Township, Iran, Chegini et al. (2015) found that farmers supplied their crop to the market in three forms - green, broken, and canned. The study identified several variables significantly related to farmers' marketing behavior, including age, selling price, crop quantity and quality, orchard area, attendance in extension classes, and risk-taking propensity.

Najafi et al. (2016) investigated the impact of various factors, particularly bank facilities, on enhancing olive orchard management in Tarom. They found that bank facilities positively and significantly influenced olive orchard management in the study site, with improved management leading to increased olive production. Moreover, they suggested that management improvement could contribute to the expansion of olive orchards across the region.

In a study on designing a closed-loop green supply chain for olives under risk conditions, Nazari Gooran et al. (2020) demonstrated the profitability of the chain by $55.417 billion USD. However, they highlighted a significant issue with waste recycling, indicating a poor performance in this aspect of the supply chain. They proposed modifications to reduce the ratio of disposal cost to waste recycling profit by 79 percent, thereby improving the efficiency of waste recycling. Additionally, they noted that the olive supply chain under risk conditions could satisfy all market needs and demands of exporting centers without any sales loss, suggesting that enhancing the productivity of olive processing industries could be achieved through equipping olive processing factories and establishing factories for processing waste from oil extraction or producing valuable products from this waste.

As evident from the literature, the olive value chain comprises diverse dimensions, each influenced by various factors such as demographic, economic, technical, infrastructural, institutional, policymaking, and marketing factors.

The literature highlights that olive orcharding, with its unique characteristics, serves as a significant source of income for local communities. However, it faces numerous unresolved gaps and challenges across different stages. Adopting a sustainable livelihood approach could provide partial solutions to these issues, necessitating comprehensive research. Therefore, this study aims to explore the dimensions and contexts that constitute sustainable livelihood within the olive value chain framework (see Figure 1) as a means to enhance the livelihoods of olive orchard owners.

Based on the study's findings, improving olive growers' access to assets can enhance their ability to withstand crises and maintain sustainable livelihoods. Adequate access to these livelihood resources is essential for olive growers to achieve strong and sustainable livelihoods through olive production. The present study identifies factors affecting the development of the olive value chain and its impact on the capital assets and livelihood outcomes of Rudbar olive growers. Figure 1 illustrates the primary research model.

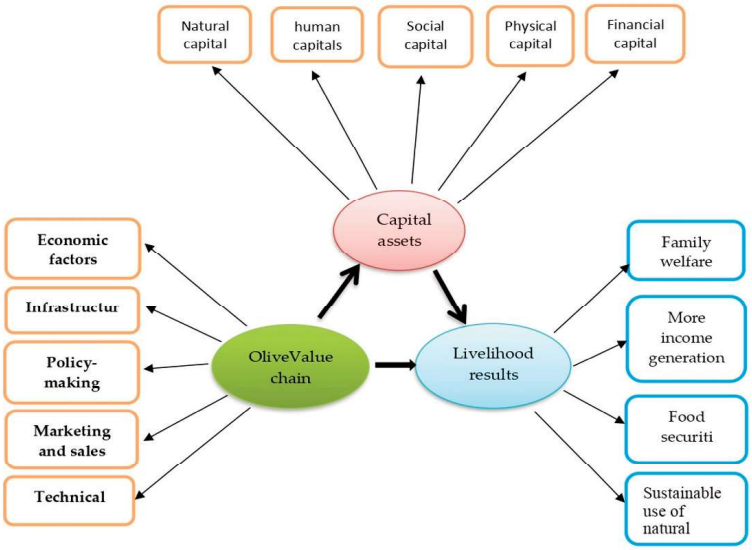

Figure 1. Conceptual Model of the Research

Methodology

The research was conducted as an applied study, employing both descriptive and analytical approaches, with data collected through a survey utilizing a quantitative approach. The statistical population consisted of all olive orchard owners in Rudbar County who were registered in the Comprehensive Zonation System of Agriculture Jahad Organization and accessible to online users, totaling 5053 individuals. The sample size was initially determined as 598 people based on the least sample size table of Bartlett et al. (2001). However, considering the common occurrence of fewer returned questionnaires compared to those distributed in similar studies, the sample size was increased to 620 people to ensure meeting the minimum sample size requirement. Ultimately, 604 questionnaires were returned and considered for analysis.

In the questionnaire, a Likert scale was utilized to measure the research variables. To ensure the validity of the questionnaire, a panel of experts consisting of individuals with expertise in agricultural development,

extension, and horticulture was consulted, and their feedback and suggestions were carefully considered. Following this, content and face validity were confirmed. Reliability of the questionnaire was assessed using Cronbach's alpha coefficient. Data analysis was conducted using SPSS24 and LISREL software, employing confirmatory factor analysis.The primary data collection instrument was a self-designed questionnaire comprising 81 items. It aimed to assess the olive value chain as the independent variable, consisting of five dimensions, livelihood assets as the mediating variable, with five dimensions, and livelihood sustainability as the dependent variable, comprising four dimensions.

Table 2
The Results of Cronbach's Alpha for the Research Variables

Variable	Cronbach's Alpha
Infrastructure	0.803
Marketing and sale	0.7
Policymaking and institutional	0.767
Technical factors	0.823
Economic factors	0.766
Natural capital	0.765
Human capital	0.715
Social capital	0.766
Physical capital	0.744
Financial capital	0.724
Welfare	0.71
Income	0.711
Food security	0.713
Sustainability of natural resources	0.712
Overall	0.794

Based on Table 2, the Cronbach's alpha coefficients for the criteria included in the latent variables were found to be appropriate, with values meeting or exceeding the recommended threshold of 0.7. This supports the reliability of the research instrument. The sample size for the studied villages was estimated in proportion to the population size using the proportional allocation method. Finally, participants were selected through simple randomization. Table 3 presents the sample size distribution across the studied villages.

Table 3
Distribution of the Statistical Sample of the Research Based on the Important Olive Producing Villages in Rudbar County

Region	District	Village	Olive orchard owners	Sample size
Central	South Rostamabad	Shemam	160	47
		Joben	171	48
		Ganje	94	28
		Glavarz	37	12
	Keleshter	Telabar	123	38
		Aliabad	189	61
		Nezamivand	39	12
		Torkneshin	39	12
		Pachenar	65	19
		Lushan	600	186
		Gharehtikan	48	15
Rahmatabad and Blukat	Rahmatabad	Roodabad	16	3
		Kiaabad	68	14
		Nesfi	187	36
		Fishom	57	12
	Dashtevil	Seidan	22	7
		Chelebar	32	10
Amarlu	Jirandeh	Bivarzen	33	9
		Paroodbar	44	12
		Pakdeh	60	18
	Klishom	Layeh	18	3
		Anbuh	7	2
Total				604

A total of 604 people filled out the research instrument, among whom 97.7 percent (590 people) were male, and 2.3 percent (14 people) were female. Their average age was 47.95 years. The highest frequency was 160 people (26.5%) in the age range of 51-60 years. In terms of educational level, 10.4 percent were illiterate, and only 13.9 percent had a bachelor's degree or higher. According to the results (Table 2), the highest number of family members employed in the orchard (76.8%) was one person, while in only 3.8 percent of the participants' families, three members or more were working in their respective orchards. Regarding the history of orchard establishment, olive tree production, and cultivation, the studied olive orchard owners had 3-50 years of experience. The highest frequency was for the experience ranges of 11-20 years and 21-30 years (169 people, 28%), and the lowest for the range of >41 years with a frequency of 10 people (1.7%). It was also found that the mean experience was 22.12 years with a median of 20 years, a mode of 30 years, and a standard deviation of 11.05 years. Additional results are presented in Table 4.

Table 4
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 (years)	<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
No. of family members working in the orchard (persons)	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 (years)	≤10	144	23.8	Mean = 22.12
	20-Nov	169	28	Mode = 30
	21-30	169	28	SD = 11.05
	31-40	112	18.5	Min = 3
	≥41	10	1.7	Max = 50

The livelihood levels of the olive orchard owners in Rudbar County were assessed using the Interval of Standard Deviation from the Mean (ISDM) method. The components determining livelihood levels from the perspective of the people were ranked based on mean, standard deviation (SD), and coefficient of variation. Subsequently, the mean and total standard deviation were determined (mean = 7.56; SD = 0.983).

In this method, the scores obtained are converted into four levels as follows:

A = weak A < Mean - SD
B = moderate Mean – SD < B < Mean
C = good Mean < C < Mean + SD
D = excellent Mean + SD < D

Table 5
The Frequency Distribution of the Livelihood Levels of Olive Orchard Owners in Rudbar County Based on the Scores Obtained

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 shows that 16.4 percent of the people were at the weak livelihood level, 33.1percent were at the moderate livelihood level, 35.6% were at the good livelihood level, and 14.9 percent were at the excellent livelihood level.

The analysis of the effect of the olive value chain on the capital assets of olive orchard owners with the sustainable livelihood approach

Table 6
Ranking of the Effect of First-Order Indices on the Formation of the Second-Order Construct

First-order indices	Factor loading	t-statistic	p-value	Rank
Natural capital	0.99	72.81	0	3
Human capital	1.01	64.29	0	2
Social capital	1.02	57.82	0	1
Physical capital	0.98	75.76	0	5
Financial capital	0.99	68.52	0	4

In the statistical section, the Structural Equation Modeling (SEM) method was implemented using the Lisrel software package. Within the measurement section, the relationship between the indicators (i.e., questionnaire items) and the constructs was analyzed. Confirmatory Factor Analysis (CFA) was utilized to assess the degree to which the research constructs aligned with the selected indicators chosen for their measurement.

The structural model of the research

SEM serves two main purposes: measuring phenomena and examining relationships between phenomena. This current research pursued both objectives, encompassing the testing of structural hypotheses and scrutinizing the model fit. To test the research hypotheses, SEM was conducted using the Lisrel (ver. 10) software package. Figure 2 illustrates the model alongside the standard coefficients, while Figure 3 depicts the model in the significance state. Tables 9 and 10 provide the model's fit indices in a general sense and the results of hypothesis testing, respectively.

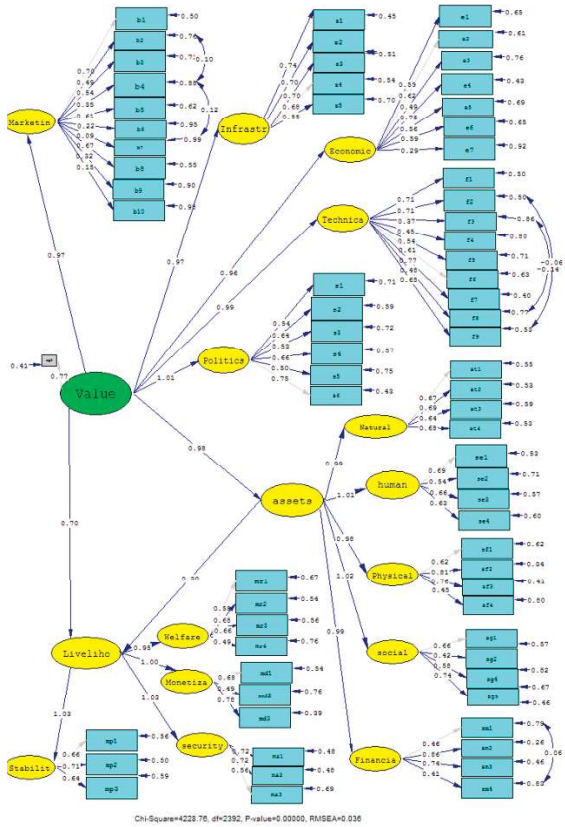

Figure 2. The Structural Model of the Research Along With Standard Coefficients

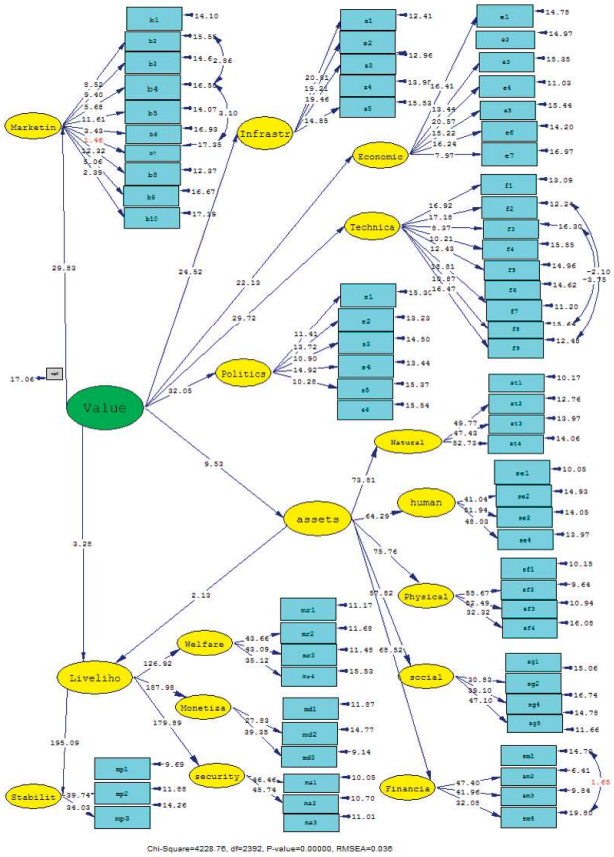

Figure 3. The Structural Model of the Research Along With the Significance Coefficients (t-test)

Table 7
The Model Fit Indices in a Broad Sense

Index	Proposed level	Value reported	Status
χ2/df	(Acceptable fit)	1.767	Suitable fit
RMSEA	≤ 3	0.036	Suitable fit
P-VALUE	≤ 0.08	1e-06	Unsuitable fit
GFI	≥ 0.05	0.82	Unsuitable fit
AGFI	≥ 0.90	0.808	Unsuitable fit
NNFI	≥ 0.90	0.907	Suitable fit
NFI	≥ 0.90	0.815	Unsuitable fit
CFI	≥ 0.90	0.91	Suitable fit
IFI	≥ 0.90	0.91	Suitable fit
PNFI	≥ 0.90	0.785	Suitable fit
PGFI	≥ 0.50	0.768	Suitable fit
RMR	≥ 0.50	0.046	Suitable fit

The results for the goodness-of-fit indices of the structural model in Table 10 indicate an acceptable fit as follows: the RMSEA value is smaller than 0.08, and the NNFI, IFI, and CFI values are greater than 0.9. Additionally, the PNFI and PGFI values are greater than 0.50. However, the GFI, AGFI, and NFI values are smaller than 0.9, indicating an unsuitable fit according to these indices. Nonetheless, considering the proper values of the other indices, the general fit of the structural model can be accepted.

Table 8
The Results of the Effect and Signficance Coefficients of the Model Hypotheses

Path	Path factor	Significance	Test result
Capital assets > Livelihood level	0.3	2.13	Confirmed
Value chain > Capital assets	0.98	9.53	Confirmed
Value chain > Livelihood level	0.7	3.28	Confirmed

Results

Based on the results, it can be concluded that the livelihood of olive orchard owners in Rudbar County is relatively optimal from the perspective of the respondents. A majority of the respondents described their livelihood level as good or excellent, with only 16.4 percent assessing it as weak. According to the findings from Model 2 in Figure 3, a t-value exceeding 2.58 indicates that the factor loadings are significant at the $p < 0.01$ level, while t-values ranging from 1.96 to 2.58 indicate significance at the $P = 0.05$ level. This supports the null hypothesis regarding the significance of the role of the indicator (variable) in forming the target construct (factor), thereby accepting the significance of the relationships (the research assumptions) within the second-order Confirmatory Factor Analysis (CFA) (Todman & Dugard, 2007). The research utilized various fit indices including χ2, normed fit index (NFI), non-normed fit index (NNFI), incremental fit index (IFI), root mean square residual (RMR), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), comparative fit index

(CFI), and the root mean square error of approximation (RMSEA).

The value of $\chi 2/df$ was calculated to be 1.76, indicating a good fit of the model. Based on the reported fit indices in Table 6, the measurement model assessing the effect of the value chain on the livelihood level of olive orchard owners in Rudbar demonstrates a good fit. In Table 8, standardized factor loadings, standard error, and the significance of the paths in this measurement model are presented. Notably, all indicators exhibit t-values >1.96, indicating their statistical significance. Therefore, it can be concluded that all selected dimensions are sufficiently accurate to measure the effect of the value chain on the livelihood level of olive orchard owners. Indeed, the results of Confirmatory Factor Analysis (CFA) confirm the significance and fit of the model for measuring the effect of the olive value chain on the livelihood level within the five-fold capitals.

Then, standardized path coefficients (λ) and their significance levels were calculated for the five capital groups to rank them in terms of their effectiveness on the livelihood level of olive orchard owners in Rudbar (Table 9). Standardized path coefficients represent the intensity of the relationship between first-order factors and the second-order factor. According to the results, social capital emerged as the strongest index ($\lambda = 1.02$). Following this, the other capital groups were arranged in the order of human capital, natural capital, financial capital, and physical capital in terms of their importance in measuring the livelihood level of olive orchard owners in Rudbar.

The results for testing hypothesis 1 revealed that the standardized path coefficient between the two variables (the olive value chain and capital assets) was $\beta = 0.98$, with a coefficient of significance (t-statistic) of $t = 9.53$ (>1.96), indicating a significant relationship. Therefore, H0 is refuted, and H1 is supported, suggesting that the olive value chain significantly affects capital assets. This finding aligns with the results reported by Mchopa et al. (2021) and Tejada et al. (2019).

Regarding hypothesis 2, the standardized path coefficient between capital assets and the livelihood level of orchard owners was $\beta = 0.30$, with a coefficient of significance (t-statistic) of $t = 2.13$ (>1.96), demonstrating a significant relationship. Consequently, H0 is refuted, and H1 is supported, implying that capital assets significantly influence the livelihood level of orchard owners. This result is consistent with the findings of Najafi et al. (2016), Pravakar et al. (2013), Badko et al. (2020), Aazami and Shanazi (2018), and Nazari Gooran et al. (2020).

Based on the results for hypothesis 3, the standardized path coefficient between the olive value chain and the livelihood level was estimated at $\beta = 0.7$, with a coefficient of significance (t-statistic) of $t = 3.28$ (>1.96), indicating a statistically significant relationship. Therefore, H0 is rejected, and H1 is supported, suggesting that the olive value chain has a significant effect on the livelihood level. Similar findings have been reported by Mchopa et al. (2021) and Tejada et al. (2019).

Conclusions and Recommendations

The optimal utilization of resources and facilities to meet human needs, including increasing production, income, employment, and welfare, stands as one of the most significant development goals in all countries.

The livelihood status of olive orchard owners in Rudbar County was examined from the perspective of respondents. Results indicate that the promotion and development of value chain activities can enhance livelihood assets and subsequently, livelihood outcomes. The selected indicators for the research exhibited a significant effect on measuring capital assets (natural, human, social, physical, and financial) and the olive value chain in Rudbar County. Consequently, the model possesses an appropriate structure given the significance of all dimensions of capital assets and their measurement indicators, aligning well with the theoretical foundation of the research. This suggests that capital assets pos-

itively influence the livelihood of olive orchard owners. Based on the findings, olive production and processing contribute to the creation of financial capital, thereby improving income and livelihood. To further enhance this activity, recommendations include reducing power and water tariffs, subsidizing inputs, facilitating crop marketing, minimizing wastage, and providing low-interest bank facilities. Developing the business environment through the adoption of technologies for producing and supplying new olive products in varied packaging is essential for value chain enhancement. Infrastructure improvements are necessary to expedite olive marketing. Supporting the profession through physical capital enhancement measures such as acquiring transportation and processing equipment, establishing suitable access roads to orchards, providing adequate housing, and increasing access to media and communication networks is advised. To protect the environment and boost productivity in the olive processing industry, equipping olive processing plants and constructing facilities for processing oil extraction waste are recommended. Given the positive and significant relationship between factors underpinning the olive value chain and capital assets, efforts to overcome barriers hindering the development of this economic activity are crucial. These include increasing income, production, and per capita consumption. Despite the health benefits of olives, their consumption in Iran is low compared to European countries. It is suggested to include olives in the Iranian food basket, considering the nutritional value and health benefits of olive oil. While the research focused on the impact of the olive value chain on the livelihood of orchard owners, it's essential to acknowledge that livelihoods are influenced by numerous factors. Therefore, it is recommended to explore and analyze tools equivalent to other influencing factors in the research literature.

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Conflict of Interest

The authors have not declared any conflict of interest.

Authors' Contributions

All authors have read and approved the final manuscript.

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