

Micro-watershed management and quality of life of the inhabitants of Quera, Huánuco 2021

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Abstract

The purpose of the study is to prove that there is a high relationship between micro-watershed management and quality of life in the inhabitants of San Sebastián de Quera in Huánuco; for this purpose, correlational research and non-experimental design were developed with a sample of 300 families. The data were collected with an evaluated test designed with four dimensions for variable one, and the instrument for variable two was designed without dimensions and with ten items; simple linear regression was used for data processing, obtaining the following result and conclusion: The null hypothesis is rejected since $0,8518 \geq 0,164$; consequently, it is concluded that there is a high positive relationship between Micro-watershed Management and Quality of Life (Manejo de microcuencas and Calidad de Vida) in the inhabitants of San Sebastián de Quera, and coherent with the hypothesis test, it is affirmed that micro-watershed management has a high explanatory power of (72,56 %) on the variability of the Quality of Life of the inhabitants of San Sebastián de Quera in Huánuco.

Keywords : Micro-watershed management; Quality of life.

INTRODUCTION

The town of San Sebastián de Quera is located in the micro-watershed of the same name, in the district of Santa María del Valle, at latitude 9° 51' 6.6" south and longitude 76° 16' 27.8" in the province of Huánuco, with access from the capital through the road to Tingo María; it has an average population of more than six thousand inhabitants; its location on the ecological floors is between the regions of fluvial yunga, quechua and suni, bathed by the river Quera that runs from west to east; the place in its high Andean space presents elevated hills of reddish earth, covered with small natural shrubs among which the ichu stands out and in the hillsides, it presents a variety of shrubs that the farmers use as firewood for the kitchen (Instituto Nacional de Estadística e Informática, 2000).

Culturally, it has an educational institution of the secondary level, which is called San Sebastian, and the town center where the micro-watershed under study is located has a long historical tradition of settlement because in it are the archaeological complexes of Pomachahuin in the jurisdiction of Mituquera. There is also Puyhuan between Macha and Yanayacu and it is a natural totem that the ancient inhabitants revered as their main pacarina (place of origin); another ancestral remaining is Ñaupamarca; it also has rock art paintings located around Quera and in the colonial period there are the remains of 8 chapels and the main church.

As a background study, the Alto Huallaga Thesis by Javier Pulgar Vidal describes the water resources, food products, and varieties of flora and fauna, but with a very little contribution to the management of the sub-basin

and its importance in the development of San Sebastián de Quera (Pulgar Vidal, 2017). In addition, the geodynamic inspection technical report highlights the various features and risks of the erosion system with the topography and geography of the town under study (Núñez, S., Albínez, L., & Lara, 2018).

Also, Almagro & Venegas (2009) state that the good performance of an economy requires sustained growth accompanied by economic and social development that allows improving the levels and quality of life of the population (Canaza, 2019). The authors of the study, postulate a peaceful and gradual social change based on the environment and modifying the relationship with nature, seeking sustainable development, while the authors of the study state that the educational experience is a key factor in the development of a sustainable economy (Aparicio & González, 2018). The authors of the study state that the educational experience allows the development of skills and implements collective values to reflect during community and environmental education that involve social values (Tarazona Aguirre, 2019). Finally, they say that environmental education allows the formation of environmentally responsible citizenship and a sustainable, competitive, inclusive society with identity. Aristizabal et al., (2017) say that one way to mitigate environmental impacts is through the Project Portfolio since it is a planning tool that helps organizations to determine a short, medium, and long-term action plan, which seeks to contribute to the improvement of watershed management.

Theoretical Framework

The San Sebastián de Quera micro-watershed is home to a diversity of microclimates, small rivers, streams, flora, and fauna such as quinal, chilca, alder, kisuar, arrayan, willow, chipe, mate, and others. The microclimates are highly valued spaces for the cultivation of food products according to the ecological levels, as in Conchumayo with the warm climate, Quera is temperate, Mitsuquera is temperate and frigid, Yanacocha is frigid, which adapts the products to each altitudinal zone (Checa, & Naveros, 2017).

Anthropocentric management is not environmentally conducive, so biocentric management should be promoted, seeking the

adaptation of degrading economic and social development styles that currently prevail, to an environmentally desirable and sustainable one, moving from a way of life that ignores the environment, with a contextualized and articulated education for the environment. (Paragua, 2014) since it is men who extinguish species, depredate non-renewable resources, exercise the dominant power on planet Earth, and are causing an environmental crisis, uncontrollable knowing that they will also be affected (Rojas, 2011).

It was necessary to formulate the question: to what extent is micro-watershed management related to the quality of life of the inhabitants of San Sebastian de Quera, Huanuco 2021? to prove that there is a high relationship between micro-watershed management and the quality of life, through scientific research.

Materials and methods

The research is correlational (Paragua, 2014) because the variables are not manipulated. After all, it seeks the degree of dependence of the quality of life variable, for micro-watershed management; in that sense, also, it has the characteristic of being reproducible in other scenarios with adaptations of the data collection instruments. The design is non-experimental (Paragua, M. 2012). The approximate population is three thousand families living in the town center of San Sebastián de Quera; and the type of sampling assumed is non-random with a ceiling of ten percent, i.e., three hundred, identified with systematic sampling.

The data on micro-watershed management and quality of life were collected with the Validated Test validated by lower variability. (Paragua, M., Bustamante, N., & Ortega, A. 2021) The data collected were processed with Excel, obtaining the simple linear regression statistics, finding the correlation coefficient and the degree of dependence, as well as the mathematical equation of the model that expresses the relationship between the variables studied in the research process.

Results

During the research process, it was found that: there is a moderate and positive correlation that generated a degree of dependence of

30.08% between the dimensions of Soil Conservation and Development and Quality of Life; furthermore, it was found that there is a medium and positive correlation, which generated a degree of dependence of 37.90% between the dimension Water Conservation and Development and Quality of Life; on the other hand, it was also determined that there was a moderate and positive correlation, which generated a Degree of dependence of 27.71% between the dimension Air Conservation and Development and Quality of Life; also, it was found that there is a moderate and positive correlation, showing a degree of dependence of 42.79%, between the dimension Sustainable and Community Development and Quality of Life in the inhabitants of San Sebastián de Quera, Huánuco 2021.

The statistics for the analysis of the variables under study are shown in Table 1.

Table 1. *Degree of dependence and level of relationship between micro-watershed management and quality of life of the inhabitants of San Sebastián de Quera, Huánuco 2021.*

Regression Statistics	
Correlation coefficient (r)	0,8518
Coefficient of determination (r^2)	0,7256
Degree of dependence ($r^2\%$)	72,56%
Interception (b)	-7,15
GM Strategic Management (a)	0,55
n	300,00
$y = ax + b \rightarrow y = 0,55x - 7,15$	

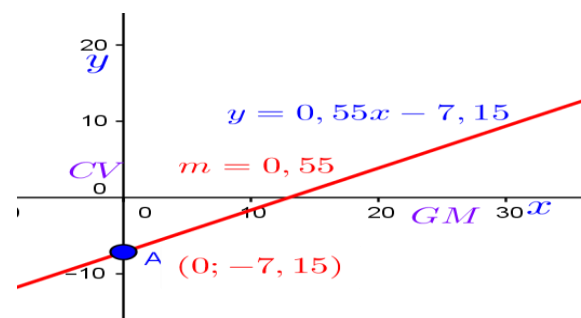
Source: Data collection instrument. Design and statistical process: Researchers

The table shows that the correlation coefficient is high and positive, which was corrected by determining the degree of dependence, whose value is 72.56%. $r=0,8518$ is high and positive, which was corrected by determining the degree of dependence whose value is 72.56%. This means that the variable Micro-watershed Management explains approximately seventy-three percent of the variability of the Quality of Life in the

inhabitants of San Sebastian de Quera, Huanuco 2021. Therefore, the difference of 27.44% in the quality of life is unexplained or is explained by other factors.

The evidence in terms of measures is conclusive, in that sense, the Quality of Life of the units of analysis improves, which allows affirming that the Micro-watershed Management, applied with environmental education in close coordination with all the inhabitants of San Sebastián de Quera, Huánuco 2021, is effective and deserves its generalized application in the other populated centers of the region (Dávila, 2019). The graphical expression of the analyzed result is shown in the graph (Figure 1) of the mathematical model that was found as a result; which allowed the following contrast. There was a high and positive correlation of 0.8518, and from this, it was determined that the degree of dependence is 72.56%, between the variables Micro-watershed Management and the Quality of Life of the inhabitants of San Sebastian de Quera, Huanuco 2021.

Figure 1. *Normal probability curve of the degree of dependence and level of relationship between micro-watershed management and quality of life in San Sebastián de Quera, Huánuco 2021.*



Source: Data collection instrument, Annex 2.

Statistical design and process: Researchers

Hypothesis testing

The linear regression statistical results show a high and positive relationship between the variables Micro-watershed Management and Quality of Life in the inhabitants of San Sebastián de Quera, Huánuco 2021. In the study, it was considered that the random variables, and products of observation are together in a bivariate distribution generating a cloud of points that allows proving that they are linearly

correlated. The study considered that the random variables x , y , products of the observation, are jointly in a bivariate distribution generating a cloud of points that allows testing that they are linearly correlated, and for this purpose, it was determined that the test statistic is r , which is equivalent to ρ which reads rho; then, the condition is to reject H_0 si $r \geq r_{0,05}$.

So, the value of $r_{0,05}=0,164$ from Pearson's table of critical values for r ; and the value of $r=0,8518$ value from the T-Distribution Table, allows the following test to be performed: $r \geq r_{0,05} \rightarrow 0,8518 \geq 0,164$; consequently, H_0 is rejected since $0,8518 \geq 0,164$. The conclusion is that there is a high positive relationship between micro-watershed management and quality of life in the inhabitants of San Sebastián de Quera, Huánuco 2021.

Discussion of results

Adequate management for the improvement of ecosystem services in the San Sebastián de Quera micro-watershed, presented an opportunity for the strengthening and development of the mentioned community, through a community participation management in the management of the micro-watershed of its jurisdiction, facilitating a space for empowerment, interrelation of knowledge, reflection, and analysis on the current situation of the micro-watersheds, through the proposal of community environmental management, which should be understood as an integrating element of the social, economic and environmental dimension (Jiménez, D. L. 2014).

First, the relationship of the settler with his environment must be understood and from there identify the ecosystem services; in addition, the impacts generated towards the micro-watersheds were analyzed, which undeniably with good management generates development and improvement of the quality of life of the inhabitants with sustainability criteria, the proposal arises to reorient the aspects of land management in such a way that there is an equitable and rational use of resources, for conservation, social empowerment, and economic development (Franco & Amaya, 2016).

The first purpose of the research was to determine the existing relationship between soil conservation and development and the quality of

life in the inhabitants of San Sebastián de Quera, finding that there is a moderate and positive correlation, which generates a Dependence Grade=30,08%. In this sense, the high rainfall that occurs in the study area is a factor that generates landslides, rock falls and debris flows, which is why on the steep slopes with poor quality rocky substrates and subjected to intense deforestation, the soil shows a shortage of nutrients to favor agriculture (Núñez et al., 2018).

All the sliding material accumulates on both banks of the Quera River, leaving the steep slopes impoverished and it is in the narrow valley that there is an incipient development of agriculture, which requires adequate management of soil, water, and air, favoring a sustainable and sustainable community development of the mentioned resources and thus improving the quality of life of the inhabitants of San Sebastián de Quera (Condori, 2011).

This has an impact on the development of the soil linked to the management of micro-watersheds and the inhabitants can generate an improvement in the quality of life linked to the conservation and development of the soil, then, it is very necessary for an environmental education linked to this dimension in addition to a motivation to the inhabitants so that they participate in the task of improving with a committed and voluntary participation (Ruiz, 2020).

The second purpose of the study is to determine the relationship between water conservation and development and the quality of life for the inhabitants of San Sebastián de Quera. In this sense, it was found that there is a medium and positive correlation, which generates a degree of dependence of 37.90% and in the rating scale is moderate, between the dimension of Water Conservation and Development and the Quality of Life in the inhabitants of San Sebastián de Quera (Bustamante & Paragua, 2022).

Water management goes hand in hand with soil management, so the physical control of some areas should be with conservation talks and agricultural management of adjacent slopes, allowing the growth of native vegetation cover, as well as reforestation with deep-rooted trees on the slopes to stabilize erodible land. Therefore, it should be understood that the land and soils

are the basis for the sustainable development of agriculture, the essential functions of ecosystems, and food security, and therefore are the key to sustaining life, in short, contribute to the quality of life of the people of San Sebastian de Quera, Huanuco 2021 (Vargas, O. 2011).

The management of water resources includes its rational use, saving, and preservation of its quality and is a task at two levels of responsibility: first at the collective level, where water flowing in common spaces must be managed; and the other, at the private level, which is the management of water on the property. In the first case, management includes the protection of slopes and springs on communal lands and also regulation on private lands, then, agreements for the distribution of water among various users in charge of the basin councils and user boards. At the farm level in agriculture, livestock, agribusiness, and other activities, responsibility includes good management to save water and not have high costs, avoid waste and not contaminate water with agrochemicals or waste from agricultural, mining, and industrial activities (Paltán, 2014).

Water management is of high responsibility at both levels, at least in theory it is understood that it is from the good care of the properties and communal lands that the waters maintain their quality as a common good, and that allows producers to obtain higher profits and mitigate the damages associated with instability in climate change. This creates the need for environmental education for the inhabitants of the different micro-basins and especially for the inhabitants of San Sebastian de Quera, Huanuco 2021 (IICA, 2015).

The third purpose of the research is to determine the relationship between air conservation and development and the quality of life of the inhabitants of San Sebastián de Quera, Huánuco 2021. $r=0,5264$ was found, which indicated that there is a moderate and positive correlation, which generates a Dependence Grade=27,71%. The correlation coefficient value was found to indicate that there is a moderate and positive correlation between the dimension Air Conservation and Development and the Quality of Life in the inhabitants of San Sebastián de Quera, Huánuco 2021.

Air pollution represents a major environmental risk to the health of biodiversity and is a product of non-compliance with limited

values for the health protection of air pollutants in the air. In that sense, reports say that approximately 92% of the world's population lives in places where the guide values of air quality are not respected and estimate that air pollution in cities and rural areas around the world causes three million deaths each year, so it is necessary to design policies and raise awareness among citizens and residents to mitigate the emission of pollutants to improve the quality of the air (Querol, 2018).

Air pollution caused by man himself is an acute, cumulative and chronic threat to human health and the environment; in this sense, people in the city or the countryside are exposed to air pollutants and exposure to it can trigger or aggravate respiratory and cardiac conditions, so it is harmful to people with chronic lung or heart disease, pregnant women, the elderly and children, it affects more the poorer populations who work in the streets and people who live in precarious conditions (CEPAL, 2001).

Programs to improve air quality include the control of pollutant emissions and are based on the relationship between the emission of pollutants by the sources that produce them and the impact they cause on air quality and people's health; in that sense, the health effects depend on the patterns of exposure of people to pollutants whether at home, public or private transport, work. In addition, by the duration, intensity, and frequency in which the pollutants are breathed, once they are transported and dispersed in the atmosphere. As can be seen, this is slower in rural populations where pollutants are emitted in smaller quantities and others arrive by the movement of air masses, as is the case of the smoke that arrives from the jungle in August due to the burning of trees and bushes caused by the farmers (Carvajal & García, 2016).

The fourth purpose of the study is to determine the relationship between sustainable development and sustainable community development and quality of life in the inhabitants of San Sebastián de Quera, Huánuco 2021, and it was determined that there is a moderate and positive correlation. As a result, it shows a degree of dependence of 42.79%, between the dimension of Sustainable Development and Sustainable Community Development and Quality of Life in the inhabitants of San Sebastián de Quera. In this sense, it must be admitted that humanity can

make development sustainable, making sure to satisfy the needs of present generations without compromising the possibilities of future generations to meet their own needs.

It should be understood that sustainable development has no absolute limits because they are imposed by the current state of technology and social organization on environmental resources, as well as the capacity of the biosphere to absorb the effects of human activities, but, technology and social organization can be managed and improved in order to shape a new form of economic growth in the inhabitants of San Sebastian de Quera because poverty is taking hold of them and in return, sustainable development requires that their basic needs are met and that they are guided to identify opportunities to develop their aspirations to improve their quality of life (Castillo, 2011).

If sustainable development is focused at the local level only for San Sebastian de Quera, changes and solutions can be seen more immediately, for example, environmental education based on talks on management of the Quera River micro-watershed, since they are where the consequences of environmental degradation are felt more and where interventions can be more successful and comprehensively help them the conservation and sustainable development of soil, water and air, to improve the quality of life of the inhabitants of San Sebastian de Quera, Huanuco 2021 (Polanía, 2020).

In the study, sustainable community development is proposed as one of the ways to improve the Quality of Life of the villagers of Quera, because it is the most effective way to achieve sustainability in the long term and on a large scale because the concept of sustainability is located in the local context where the results of the actions of the villagers can be seen. Then as the successes and failures of sustainable solutions are felt in the daily lives of the villagers, the concept of sustainability will gain legitimacy and acceptance by the villagers of San Sebastián de Quera, Huánuco 2021 (Salas Razo et al., 2018).

The general purpose is to verify that there is a positive average to the plus relationship between micro-watershed management and the quality of life of the inhabitants of San Sebastián de Quera, Huánuco 2021. In this sense, it has

been proven in situ that there is a deficient institutional focus on the management of the Quera river micro-watershed since no specific actions have been found that show the opposite. To reverse this, the first step would be to have the micro-watershed declared as high risk and manage it as a protected area so that the use of water resources and the projects to be executed for the management of the basin are rational and relevant to the solution of basic problems of the population of San Sebastian de Quera, Huanuco 2021 (Bustamante & Paragua, 2022).

The study shows that the organizational capacity of the inhabitants of San Sebastián de Quera for the management of the Quera River micro-watershed is not very committed, although it was found that there is a high and positive correlation, so the degree of dependence is 72.56%, between the variables Micro-watershed management and the quality of life of the inhabitants of San Sebastián de Quera, Huánuco 2021.

Conclusions

Concerning the relationship between soil conservation and development and quality of life, it was determined that there is a moderate and positive correlation, which generates a positive correlation between the variables soil conservation and development and quality of life in the inhabitants of San Sebastián de Quera, Huánuco 2021. Dependence Grade=30,08% between the dimension variables Soil conservation and development and quality of life in the inhabitants of San Sebastián de Quera, Huánuco 2021.

Regarding the relationship between water conservation and development and quality of life, it was determined that there is a medium and positive correlation between the dimensions of Water Conservation and Development and Quality of Life in the inhabitants of San Sebastián de Quera, Huánuco 2021, with a degree of dependence of 37.90% and a moderate rating scale.

Regarding the relationship between air conservation and development and quality of life, it was determined that there is a moderate and positive correlation, which generates a positive correlation between air conservation and development and quality of life in the inhabitants of San Sebastián de Quera, Huánuco

2021. Dependence Grade=27,71% between the dimension Air Conservation and Development and Quality of Life in the inhabitants of San Sebastián de Quera, Huánuco 2021.

Regarding the relationship between sustainable development and sustainable community development and quality of life, it was determined that there is a moderate and positive correlation between the dimensions of Sustainable development and Sustainable Community Development and Quality of Life in the inhabitants of San Sebastián de Quera, Huánuco 2021, showing a degree of dependence of 42.79%.

Regarding the relationship between micro-watershed management and quality of life in the inhabitants of San Sebastián de Quera, Huánuco 2021, it was determined that there is a high and positive correlation, so the degree of dependence is 72.56%, between the variables Micro-watershed management and the quality of life of the inhabitants of San Sebastián de Quera, Huánuco 2021.

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