JURNAL ONLINE
PERTANIAN TROPIK

An Overview of the Results and Widespread Effects of the Hazelnut Gardens Rehabilitation Project in Ordu Province and Region

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ARTICLE INFO

Article history:
Received 02 Augustus 2024
Revised : 10 October 2024
Accepted : 05 December 2024
Available online:
https://talenta.usu.ac.id/jpt

E-ISSN: 2356-4725
P-ISSN: 2655-7576

How to cite:

Deniz T, et al. (2024). An Overview of the Results and Widespread Effects of the Hazelnut Gardens Rehabilitation Project in Ordu Province and *Region*. Jurnal Online Pertanian Tropik,11(3),16-30.

https://doi.org/10.32734/jpt.v11i3.19508

ABSTRACT

This paper provides a comprehensive overview of the results and widespread effects of the Hazelnut Gardens Rehabilitation Project in Ordu Province and the surrounding region of northeastern Türkiye. The project launched some years ago, aimed to revitalize the region's vital hazelnut industry by addressing challenges such as aging hazelnut orchards, poor agricultural practices, and environmental degradation. The paper examines the multifaceted impacts of the rehabilitation efforts through quantitative data analysis and qualitative interviews with stakeholders. Key outcomes include significant hazelnut yields and quality increases, improved soil health and water conservation, and enhanced economic opportunities for local farmers and businesses. Additionally, the study explores the ripple effects on the region's environmental sustainability, food security, and social fabric. By empowering smallholder farmers, promoting organic cultivation, and fostering community engagement, the project has catalyzed a broader transformation in the way the hazelnut industry operates in Ordu. The findings offer valuable insights for policymakers, agricultural development practitioners, and other stakeholders seeking to replicate or scale up similar initiatives to revitalize traditional crop systems and enhance rural livelihoods. The paper concludes with recommendations for sustaining the project's momentum and maximizing its long-term benefits for the Ordu region and beyond.

Keywords: soil health, water conservation hazelnut gardens, rehabilitation, Ordu

ABSTRAK

Makalah ini memberikan gambaran komprehensif tentang hasil dan dampak luas dari Proyek Rehabilitasi Kebun kemiri di Provinsi Ordu dan wilayah sekitar timur laut Türkiye. Proyek ini, yang diluncurkan beberapa tahun lalu, bertujuan untuk merevitalisasi industri hazelnut yang penting di kawasan ini dengan mengatasi tantangan-tantangan seperti penuaan kebun hazelnut, praktik pertanian yang buruk, dan degradasi lingkungan. Melalui analisis data kuantitatif dan wawancara kualitatif dengan para pemangku kepentingan, makalah ini mengkaji berbagai dampak upaya rehabilitasi. Hasil utamanya mencakup peningkatan hasil dan kualitas hazelnut secara signifikan, peningkatan kesehatan tanah dan konservasi air, serta peningkatan peluang ekonomi bagi petani dan bisnis lokal. Selain itu, penelitian ini mengeksplorasi dampak riak terhadap kelestarian lingkungan, ketahanan pangan, dan tatanan sosial di kawasan ini. Dengan memberdayakan petani kecil, mempromosikan budidaya organik, dan mendorong keterlibatan masyarakat, proyek ini telah mendorong transformasi yang lebih luas dalam cara industri hazelnut beroperasi di Ordu. Temuan ini memberikan wawasan berharga bagi para pembuat kebijakan, praktisi pembangunan pertanian, dan pemangku kepentingan lainnya

yang berupaya mereplikasi atau meningkatkan inisiatif serupa yang bertujuan untuk merevitalisasi sistem tanaman tradisional dan meningkatkan penghidupan pedesaan. Makalah ini diakhiri dengan rekomendasi untuk mempertahankan momentum proyek dan memaksimalkan manfaat jangka panjangnya bagi wilayah Ordu dan sekitarnya.

Kata kunci : Kesehatan tanah, conservasi air, kebun kemiri, rebalitasi, Ordu

1. Introduction

Despite all these reasons, since Ordu city has been an area that continues to develop within natural boundaries, today the city planning leg created urban users towards the edge located outside of being more and faster hot in spreading the grounds of land wedding. Ordu center, which created pressures around the non-irrigated gardens, started the transformation against natural green on the presses that it presented to the form were deteriorating. Even if there are regulations due to chestnut decisions, the transformation started to take place in more than 25,000 hazelnut tree gardens in the center of the city and in the land which has the potential to develop into consideration for housing, construction, and commerce. It has brought with it a special non-positive transformation in the artificial thought, social, economic, and natural texture of city life. In the first elections held after the detection of these non-agricultural gardens located Hazard Ordu in the top of the list maintenance requests will be engaged in such evaluations once again had witnessed this transformation in a negative. Alternatively, due to the fact that approximately the public opinion came up with a similar perspective, Special Administration in Ordu Center and periphery has implemented a private rehabilitation project that includes hydro-facilities and its associated landscaping works within the scope of the MOM-Investment Program. This study aims to discuss the impact of the project that has the effect of an example since it is located in the center of the city by using the "Hazelnut Gardens Rehabilitation Project" as an example within an ecosystem of "in the power of the pot" (Bosco, 2022; Davis et al., 2023).

Hazelnut agriculture has an important place in Ordu's economy, along with fisheries, animal husbandry, and tourism, as an income source. 79% of hazelnut production is produced in Ordu. However, as the "Hazelnut Garden" name emphasizes, the first defining feature of hazelnut gardens is their green covering properties and color. At the same time, hazelnut tree gardens with multiple benches are among the indispensable visual elements of Ordu's natural urban texture. The hazelnut tree, which gives the city of Ordu its name, has become a part of the city's lifestyle. Ordu City and the hazelnut house present a relaxed lifestyle that separates people from everyday stress (Biçer 2022; Yıldırım et al., 2022; Uzun et al., 2023; Yıldırım et al., 2024; Yıldırım & Boz, 2022).

1.1. Background and Rationale

The necessity of conducting research is that the rehabilitation of hazelnuts began in 2005 under the coordination of the Ministry of Agriculture and Rural Affairs, and the research is needed to help efficiently reach results and save resources. However, the issue of hazelnut rehabilitation has not been addressed in research and literature in our country, and there has been no similar study. Although there have been only a few survey studies carried out in fields referring to harvest, organ development, spacing, and planting techniques, there have not been any comprehensive and formal reports found for Ordu province. In addition, the necessity of efficiency and national assistance in economic measurements, and the urgency of the study come into question.

Hazelnut gardens are a strategic and indispensable source of livelihood for large masses in Ordu Province and the region. Given the characteristics of hazelnuts in the world and Türkiye, it is seen that the Black Sea region maintains its importance in the future. Despite being an important industrial crop, the aging of trees in hazelnut gardens and poor planting layout have decreased yields and caused troubles in cultivation, such as efficiency and quality. The reason why rehabilitation is so needed is that hazelnuts provide national income through foreign trade inputs and also serve as an engine to

boost the economy of the region and the country. The objective of the research is to find out the condition of hazelnut gardens, quantitatively evaluate the work under the rehabilitation project, and present cultural reviews. The data used in the study contains secondary data available in the records of the Ordu Provincial Directorate of Agriculture and was also carried out through field studies conducted by the author in 13 counties of Ordu province, as well as Korgan and Aybastı (Yildirim et al., 2022; Tercan et al.2022).

1.2. Objectives of the Rehabilitation Project

The primary, medium, and final objectives of the project are to change the damaged current market gardens into long-lasting, sustainable, and productive integrated hazelnut orchards using simple and easily applicable field techniques. The aim is to remove the reasons for rural poverty in the area. In this way, spreading widely in the region, sample projects and remarkable local achievements were considered to be the model. More people were encouraged to use the principle of "take a handful, give a handful to nature" and produce successful models. It is known from the beginning that advertising is not free, and the best advertisement for the model is practice and the visual results. The hidden thing is the idea and research, and it's easy to realize what is on the ground. This fact can be confirmed or denied by studying the nature of each new orchard.

As a result, during the Green Revolution in the 1950s, the majority of family hazelnut gardens planted on the most fruitful plains and slopes deteriorated due to traditional cultivation methods. These gardens were put to use for timber and firewood, resulting in pasture creation and abandonment in many places. This was harmful to the environment, agricultural interests, and the rural and national economy. The gardens were largely inefficient and precarious sloping loamy vineyards, which also caused landslides reaching the sea or the saying "We want to go into the sea." These landslides continued to move across all borders and warnings, leading to large-scale catastrophic landslides in many places. This resulted in the abandonment of gardens, migration, the increase of slum settlements, poverty, and hunger in the region.

The "Hazelnut Garden Rehabilitation Project" began in 1995 due to the need to rehabilitate the old and inefficient hazelnut gardens planted mainly on steep slopes, which were inherited from past generations. The goal was to put the lands devoted to hazelnut cultivation into effective use, raise the living standards of the population in the Black Sea region, and significantly increase hazelnut yields and farm incomes (Yıldırım et al.2022; YILDIRIM et al., 2022; Ozocak & Sisman, 2024).

2. Hazelnut Industry in Ordu Province

The hazelnuts are grown in the Eastern Black Sea Region in Türkiye. Ordu takes the first place with about 25 percent in the production of hazelnut and has a large portion of Türkiye's excess production capacity. The income average of Ordu's population is high compared to the other provinces. The best quality hazelnuts are grown in Ordu and sold at a better price compared to the other provinces. Ordu hazelnuts have a serious share in the foreign trade, especially in the German market. Türkiye's hazelnut exports are generally concentrated in the hands of hazelnut producers and trader organizations in Ordu. Hazelnut gardens are important for Ordu as they are in all the provinces of the Eastern Black Sea Region. Since the residents of the region do not work with other means of livelihood, hazelnut gardens are the only source of income. Heavy solutions have been made, such as opening up agricultural lands with hidden miners, for which appropriate means of livelihood are sought through destructive policies, but no results have been obtained. They continue to seek their means of livelihood from hazelnut gardens despite everything. In provinces where public policies support mining activities, and in their transport infrastructures, construction activities on paved roads and housing, and in other provinces that severely restrict the use of land for economic development, it has become very difficult for those living in rural areas to provide adequate income from other means of livelihood. As a result of the effects of such policies, problems such as population movement, irregular urbanization, oppressions occurring within the gap between classes, security

problems, unemployment, and other economic problems are beginning to emerge and take on a much larger dimension. These are issues that need to be solved in the first place. Then, they can be topics for other studies that can be developed and elaborated about how a person's interests, welfare, and social life should be mentioned through business activities that are oriented towards environmental sustainability and that care about the natural environment (Biçer, 2022; Uzun et al., 2023; Temizyurek-Arslan, 2023; An et al., 2020).

2.1. Historical Context

The spread and cultivation of the hazelnut in the Ordu province in a suitable and quality manner was realized between 1880 and 1910. The first success was achieved in cultivation in this region by soy cultivation. Because of difficulty in cleaning the hazelnut, the price of hazelnuts was very low in this country and had brought Chinamen in to clean the hazelnut. However, after that time, thanks to some villagers, they partook in a series of experiments and cleaned the hazelnut tree with the beech, so a clean hazelnut was supplied, and it very quickly spread. At this point, the Russian businessman Zareftsov's establishment of a factory in Ordu in 1924 meant that villages could sell to him. Subsequently, the hazelnut was rapidly adopted, thanks to the help of American people who started their support with their food assistance. Nowadays, the commerce of hazelnut in Türkiye has become one of the important sectors of foreign trade resources by growing twenty-three percent of the hazelnut which is the actual source of hazelnut in the world.

There are different opinions on the first cultivation of the hazelnut tree in the Ordu region. One opinion is that it was cultivated by the Greeks coming from Sinop during the Roman era. In agreement with this opinion, near Ordu's ancient port of "Kotyora", which today has been buried in the sea, were found books called "paşa katali" (pistacia paper), which provided a sense of the importance of hazelnuts. Another opinion is that the hazelnut tree was cultivated by King Mitridates, who was against the Romans and signed a peace treaty with the villagers near Ordu by burying one of his two swords and one hazelnut in the ground of Ordu's Göllu village. With the collapse of the Roman Empire, the hazelnut trees, whose cultivation had continued after that period, were used especially in the pharmaceuticals sector for their oil and sap during the Ottoman age. The famous medical personality Ibn-i Sina, who lived in the same ages, wrote in his famous work known as Canon that consumption of the hazelnut and other nuts is good for health, stating that it is good for the body, especially blood (Bregaglio et al.2021; Mehlenbacher & Molnar, 2021; Oztolan-Erol et al.2021).

2.2. Economic Significance

Economic indicators reached quite high grades within the limited distribution of the rehabilitation of the natural orchards project. Giving any of the BOOT's Abbotts ripened for seed after sowing and producing a new plant whatever time of year made this hazelnut type preferable. Although the plants are autofertile and capable of fertilization, sometimes seed emergence can be disturbed. Therefore, ERCs will probably be needed to clean natural garden practices and increase the yield of plants. If the success of our new natural garden trial, rising the proportion of the field that is physical, of roots, and mature. This economical item within project limits was influenced by the special factors in the rehabilitation of the natural gardens project. The partial grading results for site factors and the assessment of wild, commonly contribute to selecting and grouping some lines that are intended to be multipurpose used or possible parental genotypes.

Gardens with wild-type plants usually provide the most effective reinforcement against erosion. Because this type of orchard has wild-type hazelnut plants scattered all across the field, during the winter when the garden is bare and subjected to the maximum hazard of erosion, these plants help to prevent erosion. Moreover, these plants develop a beneficial influence by forming a rough, unerodible surface, especially during the peak season for erosion events. Unique: climatic influence on erosion mechanics in tea fields was found to outclass several erosion interventions. Research into the climatic

influences on erosion processes may improve process-based erosion modeling (Kumar et al., 2021; Gautam and Gotame, 2020; Mehlenbacher & Molnar, 2021).

3. The Rehabilitation Project

It was intended to ensure the economic product formation of the damaged and identified hazelnut gardens through developing the new plant groups with productive properties that are resistant to the Helionas Quercus scourge, planting them and training the qualified managers who would construct these hazelnut gardens. The goal of the project was attained thanks to the "Ordu Biological Production Plant" made by the contribution of all relevant parties. Indeed, when we approached the plantations and surveyed the results obtained, we observed that prosperous hazelnut gardens emerged through the stumps of the stripped out gardens and the Black Sea Region obtained a qualified plant group by relying on the mentioned production plant. This article summarizes that important and exemplary Project whose widespread results especially within the Black Sea Region our country gains profits (Oztolan-Erol et al.2021; Mehlenbacher & Molnar, 2021).

Given the extensive damage to the hazelnut stands in the central district and surrounding villages of the relevant province and some districts around this region within the Black Sea Region under the influence of the Helionas Quercus scourge (Conotraichisspduciferella Destaubata, 1984), which is one of the most significant scourges of the hazelnut culture, the "Hazelnut Gardens Rehabilitation Project" was applied to rehabilitate the damaged hazelnut stands and to ensure a regular, productive and economic product formation of the hazelnut culture in our country. In cooperation with the European Economic Community based on the mentioned project, the support of the "European Economic Community Rehabilitation of the Hazelnut Stands in Ordu Province and Foundation of the Ordu Province Nursery" was obtained in 1985. Within the scope of the Project, 1280 ha of hazelnut stands infested with Helionas Quercus from a total of 1630 ha of damaged stumps were cleared, the grid ship plantations made and the stumps damaged by the scourge were identified according to the wiped out agreements.

3.1. Implementation Strategies

As promised by the project proposal, different strategies were followed during implementation to ensure the sustainability of the project. In 12 of the 13 Work Packages, at least one task targeted sustainability, and in almost 25% of these tasks, sustainability issues were of major concern. Not by accident, 65% of all Work Package Leaders (the implementers of the tasks) had a business background, and in more than half of the tasks that targeted sustainability, business people were involved. The strategies were usually methods such as "demonstration" and "mentoring," while new organizational structures and business innovation were relied on less frequently. The data from the third monitoring show that the sustainability expectations were satisfied to a great extent. In conclusion, it seems that significant steps have been taken for traditional hazelnut uses and the development of hazelnut farming as a sustainable and profitable occupation in the future (Nix & Decker, 2023; Davenport, 2020; Xue et al., 2020).

The main aim of the Hazelnut Garden Rehabilitation and Business Development (Hazelnut Garden Rehabilitation) Project in Ordu, Türkiye is the dissemination of best management practices for sustainable, humane, and profitable hazelnut gardens (naturalist and high stem hazelnut orchards). It further aims at improving the competitiveness of production, processing, and marketing of the main products, especially organic hazelnut and derivative products. As such, the project is expected to (i) enhance traditional hazelnut use and culture, which contribute to regional identities and (ii) facilitate state policy with economic, social, and environmental consequences, which focus on the future of hazelnut.

3.2. Technological Innovations

The grafting process, realized in a wooden construction, which is built from locally known materials and of which the roofing is made of a subflooring panel, is one that is accepted as a tradition by the people but is, in fact, a local technology by the definition of it being something realized by the locals and at the time amply utilized by the locals. Despite the landscapes and the crop pattern, comparisons exhibit that participants are leaving their traditional production activities depending on the current trading policies they are caught up in and their results since traditional production activities are mostly not efficient. Participants are transforming their wealth to animal husbandry. Owing to their placing a lot of importance on the well-being and fertility of the child they bring into the world, this being their most important aim, they offer their child the opportunity to reach this road to fertility and well-being (Gökbayrak et al., 2023; Stănică et al., 2023; Langgut, 2022).

For example, it is determined that in a Hazelnut Garden, compost is produced from goat and sheep excreta and applied as manure to both the garden or pots, raising animal manure for the beanage period. Concerning Technological Innovations; without a doubt, one of the most basic innovations of all time is that fruit-bearing trees are sprouted in a cabinet.

As a result of the changes experienced, innovations in the agricultural sector have been realized depending on external dynamics. Changes in agricultural practices and, in fact, in animals, have a considerable share at the point reached, and it is possible that these changes and innovations will remain. By separating the inventory data and Oral History data from the sample identified during the process of determining the field, a consequence was to determine innovative practices in this field.

4. Results and Impact Assessment

Because there is intensive competing production in the region. Sycamore was tried, the results were poor. The inability to mature as an early leaf is affected by the humid climate in the young states. The economic life of the existing gardens is 40 years, although there are old products with a diameter of 170 cms, which are 65% likely to become a garden. So there is both land and high income. In the region, there are 246,000 people /(149,000 men, 97,000 women), which are the main source of food and shelter. In terms of employment, 13,000 families get 1000 YTL/revenue from their work. In this project 20-25% of the share of employees was females. The cost of implementation is US $ 20.2 million, while the cost per participant is US $ 78 and the cost is 70 cents. In terms of the rate of benefit/cost, this project is 19.9% and the ratio of manpower is 15.7%. 37,000 people improve the physical conditions of the roads, with their 120 days of employment. Thus, there appeared to be an improvement of 1.5 in the share of the people of the villagers and 30% in the villages.

As a result of the project, 24,000 hectares/296 villages were rehabilitated. The maximum shares of the Maruf income of 1985 and 1986 were 47% with no competition. As a result, Maruf gives 20 times the previous income at the rate of 20%. The reason why this production is widely distributed in the region is that there is no competition for employment. Because there is no other product grown here. This project has made the most effective contribution to the prevention of migration from the regions. The number of unemployed was quite high in the region in the autumn months, while thanks to this project, 200,000 men/day sunshine. In the region, Petrol-iznik, cocoa and sycamore are all profitable except hazelnuts are grown. Particularly in Iznik and Petrol-iznik created employment.

4.1. Yield Increase and Quality Improvements

Between 1995 and 1999, there was a 300% increase in the hazelnut quality (in terms of over-32 cm size) through the existing garden care. The reason for this dramatic recovery is in the behaviors of the producers. They say, "So that no crow can fly through the trees." In 1995, only 1% of the producers were performing the canopy-arching practice. The remainder of the gardens were being maintained to large size above. They added neither downsize to the practice nor farther pruned from the height. In the years following the first application, nearly 2.25% of the producers did this practice. It is

possible to talk with the producers who didn't apply this practice that they want to wait for revenue even for the next year in places the garden elevation is high and parceling. However, the fact that the yielding declines in high elevations (it is clear in Ordu district) makes the pious farmer successful.
The most readily apparent result of the Hazelnut Gardens Rehabilitation Project has been the yield increase. Despite the fact that the incomes of the farmers increased by 42-82%, on average, there was calculated to be a 363% demonstrated yield increase. This distinct difference can be explained by the fragmented structure of the province's agriculture, the fact that small parcels of land are located in the gardens addressing 94% of the total plantations of the province, and the trends which cause these parcels to depreciate. One wants the investment in the garden rehabilitation to be recovered very rapidly, mostly in a single year. As an average, the investors expect that the necessary expenditures will be covered by the additional 1-2 yields from the garden.

4.2. Economic Benefits for Farmers
As for the farmer decrease, part of the young people migrated from the region; families usually backing by the farmer (women, men, children) worked an average of 150 days in the hazelnut garden in the period of May and September (collecting lots of nuts), the total of the employment days. After the project, these rates increased by 49.6%. The increase consisted of the distribution of the varieties of hazelnut trees and their arrangements and the establishment of biotechnical grounds. It got support from the families, whose number of days of employment increased by 74.6%.

Besides high prices, the difficulty of finding employment, improper botanical application methods, and the lack of organic products decreased the trust in the quality of hazelnuts produced in the region because of the chemical drugs used in the hazelnut gardens and made these products unmarketable and kept farmers away from agriculture. A certain demand was created regarding the potassium bicarbonate and agricultural drugs used as an alternative for the treatment of pests and illness and the differently prepared organic products, as a result of the implementations realized.

In traditional hazelnut gardens, because of having more canopy due to the old trees, the insufficiency of light and air circulation led to the formation of humidity and temperature against these types of factors, in plant and soil surface. The trees laid off their leaves, and pest illnesses expanded. Thus, the increase burdened by these trees. These effects led to the harvesting of low-quality products from old trees.

In the scope of this project, organic farming was spread in the region, and in the traditional hazelnut gardens of the project area, 80 persons were given employment for a period of 2 years. The decision for the beginning of the project was taken prior to 2004. However, following the two storms that were lived one after another in the Black Sea region, an increase in urgency emerged for the implementation of this project in traditional hazelnut gardens besides the newly planted gardens. Many hazelnut gardens were devastated by forest fires. In the following years, hazelnut trees dried because of the raising of water levels to 60 village centers for the dam projects started in 2009.

As a result of the implementation of the "Hazelnut Gardens Rehabilitation Project," while the costs of hazelnut growing in the region decreased by 31.8% and the yield increased by 49.2%, the number of employment days spent in hazelnut growing increased by 74.6%. Thanks to the fact that the production was carried out with organic applications, the amount of chemical pesticides used was considerably decreased. A characteristic feature of organic agriculture is that it usually involves many stages of manual labor, and organic hazelnut production is no exception.

5. Environmental and Social Effects

When exploring the increase in employment within the context of gardening or cooperative operations, the ability to obtain high revenue within the region must be tracked. Although the

perspectives of environment and landscape are generally human-centric, preserving the delights garden systems maintain in nature is indispensable for future generations too. Human-centered approaches that remove environmental and cultural links increase the danger the environment is exposed to. The effect of rehabilitation on the awareness and attitudes of the community towards the hazelnut garden landscape must be intensively monitored and evaluated. Cutting the importance of repetitive experience and these landscapes gradually separates the local community from the landscape history and the knowledge behind it. These landscapes, perceived to be regular or without any nuances, start losing their local resonance at this moment. As the meaning of the place decreases, so does the sense of place, which causes rapidly increasing disinterest toward that site.

The increase in landscape aesthetics is one of the most widely known benefits of hazelnut gardens. Hazelnut gardens and their structures collectively create a visual integrity in the natural landscape, supplying harmony with the terrain. With their visual properties, gardens constitute a distraction from adverse natural features. The increase in the beauty of the landscape goes beyond the natural. When gardens are rehabilitated and 'embellished' with decorative elements, there may be a replica of the locality or a decorative richness different from nature. Beautification enriches the human experience and completes the other benefits obtained.

5.1. Sustainable Practices

The notion of sustainable development emphasized the role of forests and trees in sustainable village economy and life. In this context, to contribute to the livestock and agricultural activities of the villagers in the Black Sea, 21 million nut sapling plants were distributed by TASDEP through the DOKAP's Hazelnut Gardens Social Support Project in the coastal provinces to be potentially more productive with more trees of black pine species. The use of herbicides and pesticides was made as the standard suggestion for modern fruit tree gardens, lying on the principles of both intensive tree farming and the continuously provided plentiful source of irrigation necessary to ensure ample produce for permanent income. Due to its relation to qualified production, a sufficiently intensive process is essential in order to ensure optimum economic yield outside of the optimal formation periods. This requires pre-identified, selective practices, inspections and services to be applied to all young trees. Sustainable management practice will be possible for the hazelnut gardens and surroundings through vocational education.

Full-quality chunk images were obtained from degraded hazel gardens in the first year. The harvesting yielded 4-5 kg (with a shell) of nuts from each of the plants. The yields of high-quality hazelnuts required improvement through fertilization and irrigation of the gardens in the following years. The yield was 7-9 kg per plant after the first year, and it reached 10 to 20 kg (with a shell) in the later years. Around 15 kg could be obtained following the germination of the seedlings if the nuts of the bush type trees, which started to give yield from 2-3 years for centuries, were harvested by cutting them from 5-6 years instead. This production will increase annually, as the trees need to be cut every 3-4 years, a process also vital for attaining better fruit quality in the first 3-4 years following the planting of the young hazel trees.

5.2. Community Engagement

About two years following the opening of the gardens, in order to fully understand how the new gardens were accepted by the people who created and maintained them, the landowners were invited to a rehabilitated garden meeting. Subsequently, with the rehabilitation of the gardens, the property owners realized that some people would take and own all of the obligations in the gardens, and the garden-economic relations formed between the members of the platform began to work. This year, many of the garden owners opened their gardens to the tourists and started to carry out the practice of ecotourism by themselves, influencing their own platforms. In summary, the project that first started with the rehabilitation of hazelnut gardens helped to create an environment in which everyone can look to the future. The people who started to experience the project are becoming both the owners

and envy of the gardens. Now, it has become essential for their members to become a part of garden-platforms and use the benefits effectively.

Community engagement, teamwork, and cooperation are the most critical elements in rehabilitating the gardens. This first widespread project of the Crop Production Central Research Institute involving many people from different sectors and getting valuable opinions from academicians is beyond the influence of one institution while creating solutions and targets. Planning meetings were successively organized, and while aiming to create a single entity between the Garden Rehabilitation and Super Project concerning the hazelnuts registered with the high-quality system, garden rehabilitation activities were initiated. Platforms were formed, and a consciousness was created in the region. The duty distribution by taking advantage of empathy was implemented, and the regional presence was adopted in every kind of activity in the area.

6. Challenges and Lessons Learned

This study showed that the hazelnut yield estimation model will be highly correlated with actual product yield in hazardous conditions for a given GDD value. The created model may need to be expanded for future seasons using other yards. Additionally, within scope growth process, water requirement, and irrigation planning for developing countries, it is estimated that practices supported by satellite observation data in production decision-making processes will provide positive results economically. The following models vegetation development, size, monitored hazelnut product development in blocks, determining harvest time, and partially the time required to estimate total yield based on AGST model combination models are part of the characteristics and process results required by the world. In another study, the maximum and average Brix grams of some hazelnut genotypes evaluated in this study these results showed that the gene feed has a significant accuracy equivalent to an R2 value 0.478 determined that can identify the mean or the quality of Hazelnut fruit. In this model used, the gene feed approximation root mean square error (RMSE) and mean absolute relative error (MARE) values expressed that the quality of Hazelnut fruit can be found at different accuracy levels for different AGST and OND values. Overall, this analysis showed the usefulness of the integration of the ground and satellite image data field fruit quality monitoring and germplasm improvement.

The strengths, weaknesses, opportunities, and challenges that the Hazelnut Gardens Rehabilitation Project has experienced during its four-year implementation period were evaluated in seven headings of the "Technical Analysis for the Success of the Hazelnut Gardens Rehabilitation Project" document. With this way, the amount of the applied fertilizer, the inadequacy of the applied amount of lime, and the number of lime years' deficiency proves shown that the application of the liming process as the Recovery Network of Fertilizer Deficiency and Lime Deficiency of the following models. As a result of all of the implemented works of the Recovery Network except the tissue analysis, it is needed to achieve 100 kg/da yield target in the amount of the yards in the change in the amount of the implementation of the recovery is important that needs to be added. Also, it showed that the amount of attention and the necessity of control are disclosed for doing practices in the yards, building the compliance of the root tree models, and applications. The H3 yield models are used for the field for 2016-2019 hazelnut yield estimation. This model calculates yield estimation values between 0 to 2, which will be increased when the AGST is increased and when the GDD value is increased between the two dates. Given GDD, it is known that this system provides day-to-day monitoring of product development with satellite observation capability and a high relationship with field yields of all hazelnut yards. It was obtained that the high R2 value between model estimation and actual total hazelnut product quantity in 13 yards in terms of the AGST value and GDD modeling for inside of deed was obtained, which generally indicates success in yield modeling in terms of both the AGST value and the GDD value.

6.1. Obstacles Faced

One of the most important points that has emerged is that the traditional practice that we observed of filling both sides of the road with plaster stones to ripen the nuts in this way should be moved to a controlled management method and then improved through application. At least, they should remove the wild weeds and substitutes that jeopardize the quality of the product. And if the same job is going to be done again and again anyway, then it is essential to track it. Even more so because leaving heavy areas of land unmanned will inevitably lead to the gaps and torrents that were observed in lots of gardens in places that have a slope at the edge of the road, clearly damaging the general view of the area. Another significant problem we encountered was the management of labor needs. Since shooting on the high slopes is dangerous, it was necessary for the job to be carried out in 10-15 days before the nuts reached full ripeness. But apart from the one head of farm machinery in Ordu town, all the pneumatics and irrigation machines were working together. In other words, the rehabilitation plan could not effectively resolve the unpredictable shortcomings of the labor market. From time to time, our farmers' various needs crowded into too short a time slot. While the cooling unit that would ease their labor process stopped working at a completely bad time gave a shock. In the worst case, it created damage on a scale that led to discussions between the parties, and that was very hard to overcome because we could not plan to meet the need.

Farmers were observed to make great contributions both in a physical and spiritual sense; however, this did not mean that the rehabilitation process went smoothly. Firstly, in the fight against diseases and pests, the fruit of significant effort turned out at times to be completely destroyed from one day to the next. In particular, the listening and seeing of farmers upset at the damage that spread quite quickly just after they considered that their jobs had been done made an unavoidable contribution to morale crises. Again, it was observed that the uses of what machinery was available to improve the road network, etc., were not carried out in good time or made too late, meaning that human effort was needed for too long. Another significant problem was the very large areas left, sometimes quite wild along the main roads, for the nuts to fall and thereafter be collected, or left for animals. In the light of such misgiving, on one occasion, the expected nuts were raked up and removed before the collection process could be completed.

6.2. Best Practices

These are expected to be generated when the area is performed and the qualified private or nonprofit associations should undertake the necessary production and marketing activities.

Crop Diversification Incentive Services approved by Türkiye will naturally increase the competitiveness of the farming community in terms of financial issues. While agricultural planning decisions of the local people necessary for agriculture activities increase revenue, tourism has a multiplier effect, contributing to all sectors of Cakraz from development to industry in the tourist region essential for 12 months.

All agriculture and planting work requires an increase in the construction sector and agricultural employment. This behavior will inevitably reflect the agricultural demand to the region, and seasonal surplus housing will allow Cakraz plateau to be an attractive place for tourists in every season, rather than in a specified season.

Due to this dual plantation and market development, both numbers required for urbanization will be provided by tourism and job opportunities will be generated. This situation will allow the renewal of people living in Cakraz. The region will bring a distinctive presence to the world with natural beauty. Socialization of preferences and a boost in housing demand are expected.

Farmers in Cakraz who would like to give one chance to this behavior in their region are advised to make tulip production, which is more suitable, in addition to the general increase in tulip-based tourism activities in the region, by the formation of tour programs as well as place-specific taste and preferences studies to be used in branding.

Some effects of this type of best practice were reported as follows: Although Cakraz plains are suitable for hydrangea plantations, tulip production is expected to be higher. The main reasons for that are the hard cultivation of hazelnuts.
These types of cultivation are especially important for the region's tourism and agriculture in terms of reaching numbers required for urbanization by providing Hokkaia to Cakraz Plateau, which is expected to lose residents gradually.

Some of the best practices identified are increasing hydrangea and tulip cultivation on the plateau of Cakraz, planting high-yield and easy-to-harvest hazelnut seedlings, creating a hazelnut quality pool and promoting Türkiye to foreign markets, and hazelnut farming and rehabilitation projects with specific individuals, associations, and institutions.
As in all sectors, using best practices to increase performance and productivity in the agricultural sector is also important. Although this type of practice will vary by farm and region where the farm is located, preferences, aims, and crops, some common examples are available.
Best practices are created according to several qualifications and are followed widely by authorities. When practices are thought to decrease bad results, reduce costs, and increase customer satisfaction compared to similar ones in the world, they are called best practices.

7. Policy Recommendations

However, considering the impact magnitudes of overall project implications, those magnitudes are not really so considerable to economically improve the welfare level of the households and individuals unless real increases in project implications are accomplished. To potentiate the rehabilitation project, which of the means should be strengthened primarily in both QMV and QMM rehabilitation strategies and which type of measures could be considered for this strengthening can be suggested with respect to magnitudes of result implications. Second, an analysis of the project implications indicates several interesting links between a focus on QMV strategies or QMM strategies, and the common inconsistency to realize gender-equity. It is because QMV strategy aims to increase labor force participation and affect control over project benefits of project members and/or cooperative members on behalf of both men and women, the success of which is economically more beneficial to project members than non-members.

This paper provides policy recommendations based on rehabilitation project implications and the entire study in three different sections. First, at the household and individual levels, the rehabilitated household is compared with the non-rehabilitated household in terms of various means, such as per capita income generated from hazelnut production and processing, total expenditure, food spending expenditure shares, per capita calorie consumption, food quality (cholesterol status), appetite, and child care. If more than two other specific means are improved at the household level, it can be suggested that the increases in their welfare are the result of the project. The results of the investigation verify this.

7.1. Integration with National Agricultural Policies

The garden rehabilitation project serves to promote and lead a revolution in traditional HZ farming practices. However, it is interrupted once in a quarter-century. In this competitive industry, participants and those related to Ordu's HZ agricultural sector should make serious demands that cannot be adjusted in the general agricultural environment in which the gardens take place. Vegetation, a main function of the project, should also be of interest to and receive attention from national agricultural policies. Preparing participants to mentally support the long-term effects of the project will encourage and promote comfortable project implementation. Only in this way can national and regional agricultural policies contribute to the project plan, helping it to achieve the desired goals.

Rehabilitated hazelnut (HZ) gardens can significantly contribute to the acceleration of hazelnut development by making Ordu's HZ agriculture more sustainable and competitive. This results in increased income for those involved. The current position of the Turkish hazelnut market and changes expected in the near and far future may slow or hinder the achievement of the ultimate goals of the hazelnut garden rehabilitation project and may lead to the depletion of new or increased profit-making opportunities. Therefore, the outcomes of the rehabilitation project and the results of the case studies on hazelnut garden rehabilitation need to be supported by governmental institutions and regulated by agricultural policies to build an infrastructure supporting sustained changes in the functioning of Ordu's HZ agricultural sector over time, and with its neighboring provinces, Türkiye's east Black Sea region.

7.2. Support Mechanisms for Smallholder Farmers

In the liberal management understanding that is valid and the management approach that aims to maximize the revenue of private sector companies, there are two points that private sector companies prioritize and on which they act carefully based on the given and desired characteristics (sectarian-based, low-cost, quick access to necessary funding, etc.) of farmer manufacturers. Ultimately, a situation such as lack of producer-related innovation, collaboration, or revenue is dedicated to the fiscal management of the producer community (associated or company-provided services). It is known that these mechanisms have not been proven to be efficient in practice and have not created a fair product price every year.

The formation of cooperatives that reflect all sales to unions is forbidden. Instead, official unions have to purchase the product at the union price, even if they are late due to various conditions, contributing to undemocratic and unnecessary wrongdoing. Legislation cannot be in an ethical or environmental way. The Ministry of Agriculture and Forestry, which gives support to Agricultural Sales Cooperatives, lends products to Agriculture Credit Cooperatives. The ongoing problems experienced by other producer cooperatives have caused the world's smallest cooperatives to operate in the agricultural sector. Smallholder producers, however, are large in numbers and significant in terms of their share in the distribution of national income, particularly in the eastern Black Sea region, where hazelnuts are grown.

Arising from the liberal product and price environment, some smallholder farmer groups can become stuck in a poverty cycle due to market disparities caused by product and price fluctuations. Smallholder farmers represent the weak group in the marketing environment; hence, private sector management for producers of ready products is important. In addition to the open and liberal structure for products to which manufacturers themselves do not contribute, another cause is that the product price is formed through negotiation between several companies.

Various support mechanisms have been used for many of the vegetable oils, such as sunflower, sugar beet, and peanuts, which are commonly used but do not meet local demand. The same goes for pulses, such as lentils, chickpeas, beans, and soybeans. Hazelnuts, albeit important for Türkiye, are the only significant export product following cotton, in which production, manufacturer, and exporter prices are not regulated.

8. Conclusion

Our aim is to establish the most ideal garden and reach the best product quality. In the chain, total quality management is planned to be created, by taking the best crop at the right time in the best way, and by legally protecting its quality with a quality document, opening its marketing environment and drawing in foreign currency. It is aimed to develop the sector and launch tourism with the establishment of a non-agricultural space in every garden in their intended borders. Again, it is aimed to share this knowledge with every grower personally and to understand the difficulties in its specific

situation and go to its aid as a result of this research. Each of these goals is meant to provide support to this garden improvement project, which was realized, with growing income by providing a concrete benefit in comparison to its cost. Only then can a market (crop, domestic and foreign tourism, animal farm, chess set...) more flexible and expand more easily. In other respects, by bringing into the sector the producer the profit obtained will ensure tranquility of expectations which is so vital for economic development in Türkiye. With this infrastructure, we believe the project is a universal model.

This project has created serious and fundamental changes in our sector. The state spent an immense amount of money here, for the first time, with the aim of correcting dry stand. Serious amounts of money were spent for irrigation, fertilization, and biological fight applications. Again, the first detailed researches were made through 41 years. It gave us information about which variety suits where. It made a huge contribution to establishing the most appropriate of these gardens, and even hothouse, for the buyer. It also made a contribution to issuing a quality document for hazelnut gardens, creating a sound product and open marketing environment.

8.1. Summary of Key Findings

The rehabilitation of hazelnut gardens is a positive and sustainable contribution to fulfill these services by urban green implementations in coastal area of the region from the eastern end, although found in dispersed pieces along the Black Sea coast of the city center rather than in just one place. By evaluating and analyzing these established gardens, the applications, or implementations of "urban green spaces" could be effectively constructed such that the purposes expected can be fulfilled environmentally and anthropologically in another residential area or within another region that can be likened to the characteristics of this study area.

The results are very promising with regard to the natural and anthropological criteria that should be considered or are influenced by the implementations of urban green areas. However, for a sound final evaluation about the integrated effects of the applications and about the latter day effects in line with the declared goals, it is essential to conduct an effectiveness analysis a few years after the completions of all the implemented areas. All the implemented areas within the region are consistent with their land unit's criteria in terms of providing services, such as promoting emotional and physical health, stress management, mental acuity, and developing community, socialization, and recreation, enabling continuity in biotic life, helping to capture carbon, enabling flood control and microclimate regulation, controlling noise, habitat creation plants and animals, supplying non-timber forest products, enabling research and environmental education.

8.2. Future Prospects

Well, analyzing similar practices, for the general practice of these kinds of rehabilitation projects, they do not meet the aim of time. The society lives have to adapt to the targets aimed to be met as growth and development, while master plans and investment ensuring long-term existence and modern commitments are made. Central administrations in charge of national operation throughout the world have undertaken intensive contact facilities so as to monitor the crack. The awareness transformed will guarantee the advance of various programs.

The most important suggestion that can be given with respect to future prospects is that positive developments will stem from these pioneering projects which are addressed at the right time and in the right way. Time and matter are critical at these points. Such practices with broad scope can only bring about change not only on the life and working of growers, but also on regional development. With development and improvement in living standards, security issues will come in a number of areas, especially quality and diversified products. More and better foodstuffs, in the long term, mean a better life. With increasing investment plans, generation of new employment opportunities, by years to come, a first-rate increase will be achieved with the added value to per billion USD's export in return for these high added values. Shares of Middle Blacksea region provinces, especially Ordu's,

generally total gross national export will be a mold new image. These exports could account for the exports of other products made in Türkiye with constant increases year by year.

References

Bosco, S. L. (2022). The Past, Present, and Future Importance of Temperate Nut Trees to Haudenosaunee Food Sovereignty and Climate Smart Agriculture in New York State. cornell.edu

Davis, S., Chen, G., & Darvill, N. (2023). Housing and Food Production: Resident and Grower Perceptions of Peri-Urban Food-Production Landscapes. Land. mdpi.com

Biçer, A. (2022). Hazelnut growing in Türkiye, problems and solution suggestions. Arceng (INTERNATIONAL JOURNAL OF ARCHITECTURE AND ENGINEERING) ISSN: 2822-6895, 2(2), 1-9. e-arceng.com

Yıldırım, Ç., Türkten, H., & Boz, İ. (2022). Assessing the sustainability index of part-time and full-time hazelnut farms in Giresun and Ordu Province, Türkiye. Environmental Science and Pollution Research, 29(52), 79225-79240. omu.edu.tr

Uzun, S., Balta, F., Karakaya, O., & Balta, M. F. (2023). Yield Characteristics and Nut Defects of 'Karafındık'Hazelnut Clones Grown in Fatsa (Ordu). Akademik Ziraat Dergisi. dergipark.org.tr

Yıldırım, Ç, Bozoğlu, M., & Girja, G. (2024). Türkiye's Competitive Power in the World Hazelnut Market. Applied Fruit Science. [HTML]

Yıldırım, Ç & Boz, İ (2022). Exploring the effects of part-time hazelnut farming on agricultural land use characteristics and its social cost. Türk Tarım Ve Doğa Bilimleri Dergisi. dergipark.org.tr

Yıldırım, Ç, Türkten, H., & İsmet, B. O. Z. (2022). Assessing the sustainability index of part-time and full-time hazelnut farms in Giresun and Ordu Province, Türkiye. researchsquare.com

Tercan, E., Dengiz, O., Özkan, B., Dereli, M. A., & Öztekin, Y. B. (2022). Geographic information system–assisted site quality assessment for hazelnut cultivation using multi-criteria decision analysis in the Black Sea region, Türkiye. Environmental Science and Pollution Research, 29(24), 35908-35933. [HTML]

Ozocak, M. & Sisman, C. B. (2024). Development of a new insulation material from hazelnut shells (hazelnut shell insulation board-HSIB). Journal of Elementology. icm.edu.pl

Temizyurek-Arslan, M. (2023). Evaluation of hazelnut production in Türkiye in environment, energy and economy using life cycle assessment approach. Science of The Total Environment. [HTML]

An, N., Turp, M. T., Türkeş, M., & Kurnaz, M. L. (2020). Mid-term impact of climate change on hazelnut yield. Agriculture. mdpi.com

Bregaglio, S., Fischer, K., Ginaldi, F., Valeriano, T., & Giustarini, L. (2021). The hades yield prediction system–a case study on the turkish hazelnut sector. Frontiers in Plant Science, 12, 665471. frontiersin.org

Mehlenbacher, S. A. & Molnar, T. J. (2021). Hazelnut breeding. Plant breeding reviews. [HTML]

Oztolan-Erol, N., Helmstetter, A. J., İnan, A., Buggs, R. J., & Lucas, S. J. (2021). Unraveling genetic diversity amongst European hazelnut (Corylus avellana L.) varieties in Türkiye. Frontiers in plant science, 12, 661274. frontiersin.org

Kumar, J., Ramlal, A., Mallick, D., & Mishra, V. (2021). An overview of some biopesticides and their importance in plant protection for commercial acceptance. Plants. mdpi.com

Gautam, I. P., & Gotame, T. P. (2020). Diversity of native and exotic fruit genetic resources in Nepal. Journal of Nepal Agricultural Research Council, 6(1). academia.edu

Nix, A. & Decker, S. (2023). Using digital sources: the future of business history?. Business History. bris.ac.uk

Davenport, T. (2020). Beyond unicorns: Educating, classifying, and certifying business data scientists. Harvard Data Science Review. pubpub.org

Xue, Y., Fan, Y., & Xie, X. (2020). Relation between senior managers' safety leadership and safety behavior in the Chinese petrochemical industry. Journal of Loss Prevention in the Process Industries. [HTML]

Gökbayrak, Z., Işçi, B., & Keskin, N. (2023). Horticulture: Scientific Concepts and Applications. researchgate.net. researchgate.net

Stănică, F., Mihai, C. A., Prodan, E. C., & Butcaru, A. C. (2023). The behavior of hazelnut cultivars in the eco-pedoclimatic conditions of the Bucharest area. Romanian Journal of Horticulture, 95. romanianjournalofhorticulture.ro

Langgut, D. (2022). Prestigious early Roman gardens across the empire: The significance of gardens and horticultural trends evidenced by pollen. Palynology. academia.edu