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Medicinal Plants for Sustainable Economic Development in the Jordanian Countryside

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Abstract
Despite the arid environment, rich medicinal plants are available in Jordan, it has great economic value for community development, but it needs sustainable development and management. There is a great importance for medicinal plants through preserving the biodiversity of wild medicinal plants, protecting the environment, and maximizing the organic cultivation of medicinal plants. Also, medical plants play a vital role in in achieving the goals of sustainable development through optimal utilization of dry lands, in addition to preserving water sources, because medicinal plants consume little amount of water, in addition to its economic and developmental importance in creating a source of income for many residents of rural areas if investment and training conditions are created for local communities. This study aimed to review the efforts made to maximize the role of medicinal plants in Jordan for sustainable rural development The study found that there are local and international efforts made to achieve this goal and the opportunities are now more positive in order to maximize the benefits of medicinal plants for local communities and the local economy.
Keywords: Medical plants, arid land, Jordan, herbal medicine
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1. Introduction:

The Hashemite Kingdom of Jordan, located in the Middle East, is bordered by Iraq, Saudi Arabia, Syria and the West Bank, Jordan is a medium human development country with unemployment rate stood at 23.3% in 2022 (World bank, 2022) . Jordan is surrounded by complex political environments and faces an internally fragile economic situation. Annual gross domestic product (GDP) growth rates fell from 10% to 2.2% between the1980s and 2021 (World Bank, 2021). Unemployment is also a serious problem, varies between 14% to more than 30% in some of the poverty pockets. Providing job opportunities for the increasing number of young workers is a challenge. Recent reports rank Jordan relatively low in global food security based on the availability, affordability, quality, and safety of food, and many Jordanians face uncertain access to food (MoA, 2021). In addition to these issues, refugees from neighboring conflicts represent a significant challenge for the country. Since 1948, Jordan has received refugees from Palestine, Iraq, and Syria: more than 2millionPalestinian refugees fled to Jordan as result of 1967 Arab-Israeli war (UNRWA, 2013), and approximately 450,000 Iraqi refugees fled to Jordan in 2003 (UNHCR, 2006), and the official numbers released by the government said that more than 1,3 million Syrian refugees in Jordan till the preparing of this report.

After COVID-19, Jordan faces an internally fragile economic situation. The country has an estimated population of 10 million, about 48% women and a high percentage of youth about 63% under the age of 30. An estimated 1.4 million of the country's population will be between the ages of 15 and 25 by 2022 (DoS, 2021). Unemployment among youth reached nearly 50% with low women's labor force participation rate at 14% (World bank, 2022).

Unsustainable resource use at both the local and global scale for the purpose of community economic development, especially in developing countries, has led to a decline in environmental resources quality (Stephen , et al., 2019) (Dietza & Adger, 2003). In particular, excessive grazing pressure and sporadic periods of drought have interacted to cause the loss of desirable returning grasses and shrubs including HMP in most of areas in Jordan. In part, this degradation has been facilitated by improper resource-management schemes and insulated from change by the perception that environmental regulatory practices will inherently pose trade-offs for local community livelihoods.

Jordan, is one of the most-water scarce places in the world. Eighty percent of the country is considered *badia*, an administrative denomination which implies an either arid or semi-arid climate, most of which receives less than 200 mm/year of rainfall (Al-Tabini & Al-Khalidi, 2022) (Abuamoud 2013).

Medicinal plants have great importance for medical and economic purposes, as about three-quarters of the population of developing countries depend on medicinal plants for treatment (Shen, Yu, & Wang, 2021). Jordan is a country with a rich natural diversity of herbal and medicinal plant life. "Over 76 medicinal herbal species have been identified within the Jordanian borders, 39 of which are considered indigenous. The broad categories of uses for these plants range from plants consumed as vegetables or in salads (such as: Allium sativum L., Cichorium intybus L., Eruca Sativa), those grown as ornamentals in home gardens (such as: Jasminium

officinalis L., Lavendula officinalis Mill, and Myrtus communis L.), and lastly plants utilized as spices or medicinal remedies (such as: Coriandrum sativum L., Cumincum cyminum L., and matricaria chmomilla L.)." This market is if particular importance to the members of Jordan's rural poor communities as many of these plants can be farmed and harvested year round, providing a supplemental source of income for those who rely heavily on seasonal sources of income. "The Karim Corporation in 2002 found that rural people, livestock herders, villagers and retired people, predominantly, women, were the collectors of medicinal plants, herbs, and aromatic plant material from the wild. This same group of villagers and herders (again, mostly women) are also widely responsible for maintaining knowledge of this traditional means of supplemental financing (Phondani, et al., 2016). With the decline in grazing lands and herd size, and the increased demand for herbal and medicinal plants both domestically, and internationally: a project seeking to develop and sustain a stronger herbal and medicinal plant sector could be highly beneficial to the rural poor populations of herders and seasonal farmers in Jordan.

The economy of Jordan's rural regions has, for generations, bent at the behest of its shrill climate. Despite the harsh environment of the most of Jordan, especially in the Badia, the fragile ecosystem has, until recently, provided local people with precious services, such as desert plants of high medicinal value (Al-Tabini & Al-Khalidi, 2022) (Al-Tabini, Al-Khalid, & Al-Shudifat, 2012). The rural region also plays a greater, national roll in Jordan's economy by providing forage for livestock, and acting as a watershed for Jordan's groundwater supply, which is used throughout the country. Aside from the environmental issues that have been affecting the Medicinal Plant Sector, issues are also arising in production, supply, and distribution. Currently, we are seeing not only an increased reliance on medicinal plant life by the residents of Rural Jordan, but a simultaneous decrease in their availability due to overgrazing, and faults within the economic structure of the Medicinal Plant sector's value chain. Literature Consulted and Reviewed: Planting, Marketing, & Consumption (Al-Tabini & Al-Khalidi, 2022).

2. Literature Review

This section focusing on some publications on the area of HMP in Jordan. A study investigates the traditional and local knowledge of Bedouin (Badu) communities in the Badia region of the Hashemite Kingdom of Jordan with regard to livestock production, medicinal plant use and rangeland management, and examines how such knowledge has changed over time. Badu customs and practices from the last 50 years are compared with current realities in order to get a clear picture of how modernization, social change and environmental factors have negatively affected the land, the people, livestock and plant biodiversity in the Badia. The findings indicate that the rangeland environment has become severely degraded, herd sizes have decreased, plant species are in danger, and traditional Bedouin lifestyles have changed radically, due to unrelenting pressure on the land, water scarcity, manufactured livestock feed, government intervention, artificial borders, and the abandonment of natural water harvesting and hima practices (Al-Tabini & Al-Khalidi, 2022) (Al-Tabini, Al-Khalid, & Al-Shudifat, 2012).

In herbalists' shops in Jordan, medicinal herbs are sold to customers either upon the request of the patient or as recommended by the herbalist. Our observations indicated that many herbalists promote the herbs they have in their shops regardless of the appropriateness of the illness(Ekor, 2014). In some cases, the herb is recommended to the patient by another patient who had a previous experience with it. An additional observation was that unsuitable storage conditions for the plant materials exist in some herbalist shops. In a few cases, plant materials were stored in inadequately ventilated stores, with poor sanitary conditions where they are liable to rodent attack and some plant material could be noticed as rotted or attacked by insects. Other herbalists apply insecticides—mainly pyrethroids— on the stored plants in order to prevent the attack of the insects (Degu, et al., 2020). Although many herbalists claimed their expertise in folk medicine, none of them was licensed as an herbalist, and many are not well-educated in this field. An interesting observation is that over 70% of the interviewed herbalists do not have a high school degree, and a considerable percent- age had no schooling at all. Hence, the scientific background of the herbalists is surely not sufficient for the diagnosis or understanding the etiology of the diseases, and prescription of the herbal medication (Pranskuniene, Balciunaite , Simaitiene , & Bernatoniene , 2022). Our findings indicate a level of illiteracy in handling of herbal medicine. In certain mild conditions, herbal medicine could be useful, independent of diagnosis, but this is unlikely in the majority of cases, which require history of the patient, thorough physical examination and proper laboratory data for correct diagnosis and adequate treatment (Abu-Irmaileh & Afifi, 2003)

Medicinal plants in the Middle Eastern region and worldwide are becoming increasingly rare due to the ongoing destruction of their natural habitat, overharvesting of wild species, and detrimental climatic and environmental changes (Al-Asmari, Abbasmanthiri, Nasreddien , & Al-Asmari , 2020) (Hassan, Bashar , Khalil, & Said, 2006).As a result, it is predicted that in semi-arid regions such as the Middle East, a number of species will disappear within the next 10 years, particularly in desert or dry areas where almost a third of native plants are found. This gives an added sense of urgency to the task of recording their identity and uses, and initiating programs of preservation of the genetic resource of medicinal plants of the region (NN, 2015).

2.1 Review of Previous efforts on HMP

This part reviews the most important efforts made by national and international organizations in order to study medicinal plants and their uses in Jordan.

2.1.1 Jordan: Conservation of Medicinal and Herbal Plants Environmental Assessment and Environmental Management

Funded by the World Bank, the project targeted the Wadi Mujib Nature Reserve, and the Northern Badia.The first objective of the project is to improve the livelihood and health of rural communities through the conservation, management and sustainable use of medicinal and herbal (M/H) plants for human and livestock needs. The following key development issues have been addressed in the project (World bank, 2022). The project aims at improve production and export through establish pilot projects for production and exporting fresh HMP with cooperation with 8 farmers under the umbrella of the Jordan co-op of fruit and vegetable producers in the highland and Ghour, in order to achieve this goal, a training has been provided to the participants, and the has been sent to field trips and meeting to Danish, Netherland, Sypris, Israel, Syria, and Egypt. Also they met with importers from the UK, Germany, and Romania. The farmers have been provided with planting and agricultural equipment, seeds, and extension to help them improve their production in this field Help horticultures with the experience needed to improve their planting skills. The achievements were production of fresh HMP increased for local consumption and export, improve quality of the product and marketing, Expansion of planting capacity and quantity, Improve the ability to produce most of local market needs of fresh HMP, and Introducing organic MP to the market.

The project helps in establish "alternative income-generating activities" in collaboration with local communities surrounding the targeted area, as a result of this, the project worked with 10 co-ops in nine governorates in the country and providing them with the means of production (4 greenhouses), drying area, Mills, and distillation units, and help the co-ops with the marketing by linking them with marketing outlets for domestic and international marketing. For awareness, and as a result of the project, the project introduced the concepts of medicinal and aromatic plants and the importance of it to the schools' curricula, and about500 persons have been trained through workshops and field trips in the North and the Southern part of Jordan. The project produced number of publication (brochures, leaflets and articles and media messages) about the production, manufacture and use of medicinal plants.

2.1.2 Medicinal Herbs Project by King Hussein Foundation

Phase One of the Medicinal Herbs Project was launched in 1989 in six villages in the North of Jordan with the objective of enabling women to turn their home gardens and unused land into market gardens for aromatic and medicinal herbs such as thyme, sage and camomile. The objectives of the project are to integrate and enhance the participation of women in rural development; create job opportunities and increase families' income in rural areas; empower women to become decision-makers in their families and communities; provide technical agricultural skills, entrepreneurship training, and credit for women in rural villages; and, use local resources to introduce a model project for replication in different parts of Jordan.

Products obtained during one year of training were equivalent to 10% of Jordan's import of thyme and sage. The project expanded over the years, and in the process products were distributed for sale to cooperatives and farmers throughout Jordan. The foundation provided financial support for all stages of production.

2.1.3 The Jordan Badia Research Program (BRP)

The Jordan Badia Research Program (BRP) was initiated in 1991 as a joint activity between the Higher Council for Science and Technology (HCST) and the Royal Geographical Society in the UK. Durham University has managed the UK side of the program on behalf of RGS. Initially the emphasis was on multi-disciplinary research but in recent years there has been an equal emphasis on "action research" – field testing ideas to improve the livelihoods of the people of the Badia. BRP worked with several national and international organizations with cooperation with local communities on initiating community based projects with emphasis of using local knowledge and resources such as HMP in the Badia region.

2.1.4 The Royal Botanical Garden (RBG)

In 2005, over 180 hectares of land at Tell Ar-Rumman, 25km to the north of the capital Amman, were donated from the government to establish the RBG. One of the RBG's goals is to be a center for public education, scientific research, and conservation efforts in Jordan (RBG, 2011). One of its important missions in this domain is to educate local/regional herders about proper range and conservation management. RBG understand the essential to achieve both economic development and biodiversity conservation goals in Jordan (Abuamoud, A-Tabini, Al-Khaldi, & Sudaifat, 2013).

3. Value Chain and Marketing Characteristics of the HMP sector:

Over the past 50 years, grazing practices have been altered as a result of the adaptive lifestyle of the Bedouin people. Initially, herders paid no attention to artificial political borders- allowing them to venture into Syria, Saudi Arabia, and even areas along the Iraqi border. This migration practice was in place in order to allow for

the regeneration of forage and plant resources within their own locale. However, now Bedouin herders have been confined to smaller, less abundant areas within the lines of international borders, and their current practices are becoming detrimental to the already thin availability of plant life. With all of the Badu now residing permanently in Jordan, 71% raise their livestock in the northern Badia region, with 56% in the northeastern Badia and 15% in the northwestern Badia. Now, we are seeing a shift to non-migratory grazing, which in turn adds more stress on the land, and does not allow enough time for proper regeneration.

In conjunction with the lack of arid land due to overgrazing, we are also facing an issue with cataloguing knowledge, and implementing basic educational standards for those who seek to produce, sell, preserve, and prescribe medicinal plants. According to a study in the Journal of ethno-pharmacology, herbalists in Jordan generally promote the herbs they have in their shops, or sell them based on the request of the customer regardless of whether or not the plant is appropriate to treat a proposed illness. In the same study, "many herbalists claimed their expertise in folk medicine, none of them was licensed as a herbalist, and many are not well-educated in this field. An interesting observation is that over 70% of the interviewed herbalists do not have a high school degree, and a considerable percent- age had no schooling at all. Hence, the scientific background of the herbalists is surely not sufficient for the diagnosis or understanding the etiology of the diseases, and prescription of the herbal medication. Our findings indicate a level of illiteracy in handling of herbal medicine." A second study published by the oxford University Press claims that recent surveys have found ethnopharmocologists in the Middle East to be increasingly distanced from the knowledge of their predecessors, further claiming that "this is largely because such knowledge is not written, and also because ethnopharmocologists do not directly collect the herbs from nature".

Although herbal medicine could be useful in milder cases of ailment, it is unlikely they will yield any real results independent of professional medical diagnosis, and bereft of the medical history of the patient, physical examination, and laboratory testing. This lack of adequate treatment and diagnosis has the potential to be an immediate threat to public health. According to IFAD reports on the commodity chains of the herbal and medicinal plant sector, the main problems with marketing exist in post-harvest management. Unsuitable storage conditions for herbal remedies exist in many herbalist shops, making them susceptible to unsanitary and unsafe conditions that could drastically affect the end user. "In a few cases, plant materials were stored in inadequately ventilated stores, with poor sanitary conditions where they are liable to rodent attack and some plant material could be noticed as rotted or attacked by insects. Other herbalists apply insecticides—mainly pyrethroids— on the stored plants in order to prevent the attack of the insects." However, the practice of proper decontamination and storage in local herbal and medicinal plant shops is hard to come by.

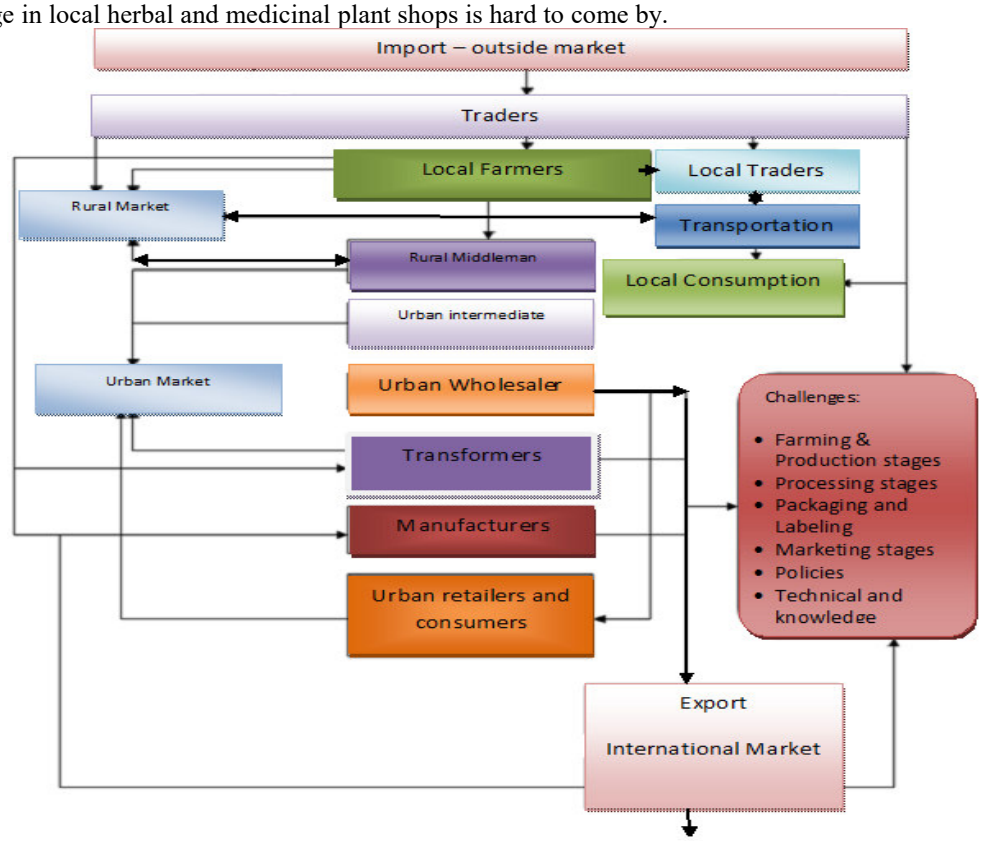

Figure 7: Marketing chain for HMP

4. Recommendations for HMP

Based on the above information and additional research, it is recommended that a few small changes be made to the current industry, and other small medicinal plant projects, in order to help it become more prosperous. Currently, Jordan can offer a competitive price for the EU market demand of herbal and medicinal plants due to its lower cost of labor, and current free trade agreement with the United States. There are also a variety of crops that can be grown year round due to the variable agro-eco-systems in the country. With 20-30% of the population relying directly or indirectly on agriculture as a source of income and survival: the investment is well worth making.

Already, steps have been taken to promote Medicinal and Herbal plant sector. Studies have been conducted to determine a socio-economic baseline, and specific training has been given to certain beneficiaries (Appendixes 1, 2). However, the main constraints we are dealing with are still the same: a lack of specific knowledge by growers and sellers of medicinal plants who have little, to no awareness about the current market standard. This is also in an issue when it comes to proper storage and distribution of medicinal plants. Therefore, studies conducted in the region also suggest that "additional research emphasis in the field of medicinal plants is required in the future on issues of safety, toxicity, proper dosages, contamination and potential interactions with synthetic and other natural drugs.It is also recommended that botanical gardens and education centers in the Middle East should create a system of exchanging knowledge, and that they develop a regulatory framework on a regional scale in order to revive and catalogue previous knowledge of medicinal and herbal plant life.

References

Abuamoud, I., A-Tabini, R., Al-Khaldi, K., & Sudaifat, M. (2013). Economic Development and Biodiversity Gain with Local Community Cooperation. *Journal of Economic and Sustainable Development.*

Abu-Irmaileh, B., & Afifi, F. (2003). Herbal medicine in Jordan with special emphasis on commonly used herbs. *Journal of Ethnopharmacology, 39*(2-3). doi:https://doi.org/10.1016/S0378-8741(03)002836.

Al-Asmari, A., Abbasmanthiri, R., Nasreddien , M., & Al-Asmari , B. (2020). Endangered Saudi Arabian plants having ethnobotanical evidence as antidotes for scorpion envenoming. *Clin Phytosci, 6*(53). doi:https://doi.org/10.1186/s40816-020-00196-7.

Al-Tabini, R., & Khalidi, K. (2022). Rangeland Management Between Science, Local knowledge and application. Jordan National Library, ISBN 9789923001677.

Al-Tabini, R., Al-Khalid, K., & Al-Shudifat, M. (2012). Livestock, Medicinal Plants and Rangeland Viability in Jordan's Badia, through the Lens of Traditional and Local Knowledge. *Pastoralism* , 2-16.

Brink, P. (1998). Heritage Tourism in the U.S.A.: Grassroots Efforts to Combine Preservation and Tourism. *APT Bulletin, 29*(3/4), 59-63.

Degu, S., Berihun, A., Muluye, R., Gemeda, H., Debebe, E., & Amano, A. (2020). Medicinal plants that used as repellent, insecticide and larvicide in Ethiopia. *Pharmacy & Pharmacology International Journal, 8*(5). doi:DOI: 10.15406/ppij.2020.08.00306.

Dietza, S., & Adger, N. (2003). Economic growth, biodiversity loss and conservation effort. *Journal of Environmental Management, 68*, 23–35.

DoS. (2021). Estimated Population of the Kingdom. Amman. Retrieved from https://portal.jordan.gov.jo/wps/portal/Home/OpenDataMain/OpenDataUser/?lang=en&isFromLangChange=yes#/manageDataSets.

Ekor, M. (2014). The growing use of herbal medicines: issues relating to adverse reactions and challenges in monitoring safety. *Frontiers in pharmacology, 4*(177). doi:https://doi.org/10.3389/fphar.2013.00177.

Geoffrey, C., Harmen, O., & Twan, H. (2007). Discretionary Expenditure and Tourism Consumption: Insights from a Choice Experiment. *Journal of Travel Research , 45*, 247-258.

GREEN-TAS. (2008). *GREEN-TAS - Development of methods and tools for the establishment of good environmental performance in the tourist accomodation sector in Jordan* -. Layman report.

Hassan, A., Bashar, S., Khalil, K., & Said, O. (2006). The State of the Art of Traditional Arab Herbal Medicine in the Eastern Region of the Mediterranean: A Review. *Evidence-based complementary and alternative medicine: eCAM*, 231-235. doi:10.1093/ecam/nel034.

Khammash, T., & Alkhas, Z. (2009). *Tourism Sector Report.* Amman: ABC Investment. Retrieved from http://www.jordanecb.org/library/634448694037466250.pdf.

Lazrak, F., Nijkamp, P., & Rietveld, P. (2009). *Cultural Heritage: Hedonic Prices for Non-Market Values.* Retrieved 2 22, 2010, from http://www.feweb.vu.nl.

Lee, C., & Han, S.-Y. (2002, October). Estimating the use and preservation values of national parks' tourism resources using a contingent valuation method. *Tourism Managment, 23*(5), 531-540.

Majcher, A., Ben Slimène, T., & Ben Slimène, O. (2009). *WOMEN AND WORK IN JORDAN CASE STUDY OF TOURISM AND ICT SECTORS.* European Training Foundation.

María, L., Marín, Y., & Mart, T. (2003, May). Competing for Meadows: A Case Study on Tourism and

Livestock Farming in the Spanish Pyrenees. *23*(2), 169-176.

MoA. (2021). *The National Food Security Strategy.* Amman: Minister of Agriculture. Retrieved 11 25, 2022, from https://jordan.un.org/sites/default/files/2022-10/Document%202%20-%20The%20National%20Food%20Security%20Strategy.pdf.

MoT. (2005). *Third Tourism Development Project: Secondary Cities Revitalization Study.* Amman: MoT.

MoT. (2011). *Jourdan tourism strategy.* Amman: Ministry of tourism.

NN, A. (2015). A Review on the Extraction Methods Use in Medicinal Plants, Principle,Strength and Limitation. *Medicinal & Aromatic Plants, 4*(3).

Phondani, P., Bhatt, I., Negi, V., Kothyari, B., Bhatt, A., & Maikhuri, R. (2016). Promoting medicinal plants cultivation as a tool for biodiversity conservation and livelihood enhancement in Indian Himalaya. *Journal of Asia-Pacific Biodiversity, 9*, 39-46. Retrieved 11 27, 2022, from https://core.ac.uk/download/pdf/82568622.pdf

Pranskuniene, Z., Balciunaite, R., Simaitiene , Z., & Bernatoniene , J. (2022). Herbal Medicine Uses for Respiratory System Disorders and Possible Trends in New Herbal Medicinal Recipes during COVID-19 in Pasvalys District, Lithuania. *International Journal of Environmental Research and Public Health, 19*(15). doi:https://doi.org/10.3390/ijerph19158905/.

RBG. (2011). *Royal Botanical Garden.* Retrieved February 2012, from http://royalbotanicgarden.org/page/overview/.

Shen, T., Yu, H., & Wang, Y.-Z. (2021). Assessing the impacts of climate change and habitat suitability on the distribution and quality of medicinal plant using multiple information integration: Take Gentiana rigescens as an example. *Ecological Indicators, 123*. doi:https://doi.org/10.1016/j.ecolind.2021.107376/.

Stephen , P., Klingc, C., Levin, S., Carpenter, S., Daily, G., Ehrlich, P., . . . Lubchenco, J. (2019). Role of economics in analyzing the environment and sustainable development. *PNAS, 116*(12), 5233–5238. Retrieved 11 27, 2022, from https://www.pnas.org/doi/pdf/10.1073/pnas.1901616116/.

UNHCR. (2006). *Refugees and displaced persons.* UNHCR. Retrieved June 18, 2013, from www.unhcr.org: www.unhcr.org/.

WEF. (2013). *The Travel & Toursim Competitiveness Report 2013.* World Economic Forum. Retrieved from http://www3.weforum.org/docs/TTCR/2013/Jordan.pdf

World Bank. (2021). *GDP growth (annual %) - Jordan.* WB. Retrieved 11 25, 2022, from https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=JO/

World bank. (2022). Retrieved 11 25, 2022, from https://www.worldbank.org/en/country/jordan/overview/.