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## DESIGNING A RESEARCH CENTER USING SUSTAINABLE ARCHITECTURE APPROACH (CASE STUDY: QORVEH CITY OF KURDISTAN PROVINCE, IRAN)

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### ABSTRACT

*Sustainable development and architecture are said to consider environmental protection by changing their approach to nature, though solutions offered and what is today represented in a constructed environment underly an approach that disregards nature and is only aimed at protecting it for future generations. A review of definitions of architecture and building sustainability helps identify sustainable architecture as one with various environmental, economic, social, and technological aspects, which are most compatible with the environment, and cause the lowest level of damage. In the meantime, what we look for in this study, which also constitutes our study problem, is to design an agricultural research center by relying on training and research spaces. For this, the need to build a place to help society achieve its scientific agriculture and food security by informing farmers of sustainable farming, food security, etc., was felt urgent. As a result, the present descriptive-analytical study used some theoretical and practical methods to identify the needs proportionate to the site located in the city of Qorveh and to provide an appropriate design; also, by considering the significance of the subject of sustainability and public contribution by people like architects and designers, the design intended in this study was based on sustainable development.*

**Keywords:** *research, training, sustainable architecture, sustainable development*

### INTRODUCTION

The agricultural sector is one of the most important economic sectors of a country; for this, various new techniques and skills are required to develop this sector. Traditional agricultural ways are used to degrade and undermine soil through improper ways of cultivation and farming, which only cause soil erosion by means of wind and water [1]. Man has used various forms of cultivation and farming, as well as cutting down trees to eliminate their habitats, thus replacing them with other plants considered as relatively undesirable plants; for this, the best solution to prevent this is to use sustainable agriculture [2]. Sustainable agriculture refers to a kind of agriculture that benefits humans, creates greater efficiency for using resources, and is thus in balance with the environment. Given this, the need to build a place to help society achieve its scientific agriculture and food security by informing farmers of sustainable farming, food security, etc., was felt urgent [3].

Sustainable agriculture is aimed at increasing the diversity of activities at farmlands, together with increasing their processes and interrelationships. In sustainable agriculture, subsidiary products, along with waste resulting from activities, become an input for another activity. Since natural processes are increasingly replacing external inputs, they can reduce the effects of



external inputs on the environment [4]. The Organization for Agriculture Research and Training, as one of the most important bodies inspiring research projects in the country, has, up to now, played a major role in conducting applied research in the agricultural sector, and considering the formation of the Ministry of Agriculture Jihad, this role assumes more importance [5].

Doing research plans in the form of administering applied research projects in the agricultural sector and then transferring their results to an agricultural community has been one of the principal duties of the Organization for Agriculture Research and Training, as well as other affiliated research centers [6]. In this context, coordinating research plans, creating an appropriate space for expanding and developing scientific and technical development among research centers and agriculture workgroups, as well as providing applied training for farmers are critical issues to meet modern agriculture and food security [7].

In the province of Kurdistan, the Qorveh plain is a fertile land for agriculture, with grapes, oats, beetroot, summer vegetables, wheat, and alfalfa being the most important products there. This situation has prevented uncontrolled migration from this city and relevant villages, as the products constitute the main income sources of people in this province.

Also, because a large part of agricultural activities in this region is carried out by hard-working farmers, and unfortunately, traditional machinery and a considerable amount of underground water and soil nutrients are lost due to low-efficient techniques and failure to provide modern training to farmers have led to a loss of national water sources, soil nutrients, etc., it is thus pivotal to provide them with applied training and help introduce a passive defense to determine such factors as disease, pests, modern irrigation methods, farming, etc. For this, the key to meeting these goals is to set up an applied agricultural training research center for farmers; therefore, by managing and providing applied training to farmers at planting-to-harvesting stages, creating waste in large amounts can be effectively reduced.

Because agriculture in the Qorveh region constitutes a large portion of their economy, no sufficient attention has been directed at the sustainable development of the agricultural sector based on effective research by the provincial agricultural research center. However, sustainable development requires constructing sustainable buildings, and this is a subject less focused on when designing these buildings. As stated, this approach is principally provided for designing buildings for residential use. This study aimed to use the aforementioned issues and the said approach to eliminate the problems in this city. One of the main factors for the sustainability of these buildings is to appropriately use effective and modern construction techniques and methods and to provide appropriate design methods proportionate to the cultural, social, and historical needs of the design context. It is also clear to pay attention to the necessity of sustainable development and the use of modern technologies considering the twenty-year vision of the country, based on which Iran considers itself to be a developed nation in using advanced knowledge; meanwhile, this issue has also been focused in the third and fourth development plans. This study aims to use sustainability criteria to provide a model for designing and implementing a research center based on effective and modern technologies which are compatible with cultural, social, and historical contexts.

### **Theoretical Framework of the Study**



Sustainable development and architecture are said to consider environmental protection by changing their approach to nature, though solutions offered and what is today represented in a constructed environment underly an approach that disregards nature and is only aimed at protecting it for future generations. Although the principles of sustainable architecture include the use of the simplest-to-most complicated methods and technologies [8], the issue of method appropriateness and its correspondence with the cultural and social backgrounds of people and environmental users is key [9]. Under current conditions, organizations should learn like individuals, otherwise they fail; in other words, successful organizations are today the ones that learn faster and better than their competitors, and represent this learning in their working processes. Today, the higher Education System is expected to not only train researchers, promoters and producers of the agricultural sector but also to move in the direction of producing and disseminating modern knowledge and technologies in the agricultural sector, and to fulfil their training and research functions, as well as service capacities appropriately. If agricultural bodies aim to create sustainable interaction with other higher agricultural educational centers [10], they should be continuously investigated and reviewed to provide appropriate models and approaches to fight future challenges, including the increasing number of students, and the reduction of graduates' employment rates. As stated, designing this research center is expected to resolve these problems; this training is mainly aimed at reducing production costs through increasing insights and knowledge, increasing productivity skills, and creating greater levels of employment, because the results may create sustainable development [11].

Using analyses conducted at research centers designed in Iran and the world, some fixed principles were obtained for designing these centers that can be taken into account for ideas in the present study.

1. Considering sites, topography, and design ground [12]
2. Appropriate use of sunlight and lighting in interior spaces through appropriate directions and attention to translucent walls
3. Selecting ecological materials that meet the principles of design
4. The ability to tackle subsidiary programs and possible expansion
5. Transparency and permeability between construction and site [13]
6. Zoning administrative and research departments
7. Project camouflage on the site
8. Minimum negative impacts on the nature
9. Using modern technologies for buildings' smart use of sunlight, and controlling light by temporal sensors [14].

### **Study Method**

This study was an applied study from a goal perspective and fell under descriptive-analytical categories. This study also used theoretical and practical procedures. For completing theoretical basics and gathering scientific-applied data, library reviews were carried out. Then, to gather the data and to use new and modern sources, searches on credible scientific sites were made. In the final stage, and after gathering theoretical basics, field surveys were conducted to understand the design context and to appropriately locate the design site.

To meet the project's goals, it is important to conduct fundamental studies about the significance of the project and to evaluate the problem's dimensions, carry out climatic and local studies, provide studies on structures and modern technologies, conduct social studies on how to relate



the issue to people, examine the available samples across the world, provide documentary and historical studies on the relationship between Iranian people and modern technologies, and measure their views on those techniques for establishing such complexes. After meeting the theoretical basics, some desirable solutions about designing the intended project were made available. In the end, the same solutions were used to design a complex with the above-mentioned characteristics. In the theoretical section, the theoretical basics of the design, i.e., planning, was determined. Desirable criteria and indicators were identified, and finally, the design plan was carried out. In the practical section, the design of the building itself was discussed based on architectural principles using micro-climate models, i.e., the building's form was considered as a training context for pre-construction and a structure for saving energy, which was an indication of proper compatibility with technology, nature and humans.

### **Geographical Characteristics of Qorveh**

Qorveh City is located in southeastern Kurdistan, Iran, and consists of some central and Yaylaght (summer) regions, which include the villages of Panje Ali, Delbaran, Badr, Lak, Ghaslan, Western Chahar Doli, Eastern Chahar Doli, Southern Yaylagh, Dehgolan suburbs, and Ghouri-Chai. Qorveh City is the regional capital of the city with this name. It lies 322 km from Tehran and 90 km from Sanandaj and is 1790 m above the sea level. Qorveh is bordered by the city of Bijar to the north, by the cities of Kaboudar Ahang and Hamedan to the East, by the city of Asad Abad to the southeast, by the city of Sanghor to the south, and by the city of Sanandaj to the west. Qorveh is a highland and a semi-mountainous city the more it approaches the southwest, the more mountains grow in height. The city' height from the seal level is 1900 m, and the average annual rainfall is 466 mm. The highest rain comes in February and March, and the lowest in June and July. Qorveh City covers a land of 4268 sq km, lying between longitude 47,81,0 East, and latitude 35,01, 51 North. From a climatic point of view, it enjoys mild summers and cold or very cold winters.



**Figure 1: Location of Qorveh City in the province of Kurdistan, Iran**

## Analyzing the site for design

### Site's location in the city

The deployment of each urban element in a special structural-spatial location in a city follows special principles, rules, and mechanism, which if met, the element's functional efficiency and success will be greater. Therefore, the main goal of planners is to achieve balance in the spatial distribution of resources and services. In planning, balanced distribution involves locating resources and facilities in a way that people can easily benefit from relevant services. Qorveh is situated in a wide plain northwest of Hamedan along the Sanandaj-to-Hamedan Road, with the Sarab Kosar River flowing in a three-kilometer distance south of this city. The water of this river originates from various springs that exist in the riverbed, and it is now regarded to be one of the major water and boating tourism destinations of this city.



**Figure 2: Site's location**

**Area:** The site intended is 1900 m above sea level and has an area of 350000 sq m, 70000 sq m of which is covered by pool water, and 7000 sq m is allotted for a small island laid inside the site.

**Topographic examination:** The slope and topography of the site's earth are zero and fully flat and, thus, have no embankment problem; this can also help increase maneuverability in the site's design.

### Indicators and criteria affecting the location and selection of the site:

There are various indicators and factors that are effective in locating this center and which should be analyzed in planning studies and implemented in designing the project. Below are the main indicators and criteria:

- Communication networks and accessibility
- The region's need for setting up a center
- The population covered in the region
- Adjacency and the principle of neighborhood
- Infrastructure and key installations underlying economic indicators and the principle of cost calculation



- Cultural, social and psychological indicators
- Geographical situation and climatic characteristics (micro-climate properties)
- Territory's structural features
- Ground area and dimensions
- Ground geometry
- Types of pollution

**Access routes to the site:** The access network of a city forms the main body and structure of each city; in other words, one of the major factors determining the form of each city is its network of accessibility. It is thus clear that each network has its special characteristics and involves special advantages and limitations. Accordingly, the identity of cities and a comparison of their forms can, at the first stage, be made through their access networks. To reach the project's site, there are two access routes, which are of the same level in terms of communication values; one of these routes leads to the site from north of the site next to the farmlands and gardens surrounding the site, while the other goes through the fish farm on the East, and connects to the Azad University and Rezvan Park.



**Figure 3: Access routes to the site**

**Neighborhood control:** Prior to designing and constructing each complex, both small or large, studies should include some parts to controlling neighborhoods and land uses around project sites, which greatly contribute to future operations. In the north of the site lay gardens separated from the site by roads, and provide good visibility. In the East of the site are farmlands; in the west of the site are also farmlands, mountains, and mines, while the south of the site is surrounded by farmlands.



**Figure 4: Site analysis**

**Examining wind:** Most cities in the province of Kurdistan are located in highlands, with vast plains spreading across the northern and northeastern parts of the province which provide ground for severe winds. The location of these plains in the adjacency of this high and mountainous land helps generate severe winds across the province. The average speed of these winds in the province is 4 m/s. As given in the table below, in nine months of the year, the prevailing winds have blown from west to East; in two months of the year, they have blown from East to west, and in one month of the year, the direction has been from southwest to northwest. In general, the direction of the prevailing wind is, in the entire year, from west to east.



**Figure 5: Prevailing winds**

**Effects of climatic factors on the design structure (texture):** Considering climatic characteristics of Qorveh, the most appropriate building direction is the one which receives maximum solar energy in cold times, and minimum solar energy in hot times. Furthermore, building direction

should be within the ineffective or half-effective sphere of prevailing winter winds. In terms of receiving entire solar energy in cold times of the year, the 15° eastern is suitable. In this state, however, the northwestern view is not a suitable direction for receiving solar energy. In hot times of the year, there are no balanced and equal conditions for various building views in terms of balanced reception of minimum energy. According to data available, the 5-50° E directions are generally suitable for construction (Qorveh's Meteorological Organization).

### **Strength points and existing potentials**

The site was located by considering potentials in the site spheres which provide opportunities and facilities as follow:

- Ease of access to the main site streets
- Enjoying desirable perspectives, such as broad view of the mountains, rivers, and surrounding gardens

### **Analysis based on sustainable architecture and design process**

**Inspiration by nature as a way towards sustainability:** Nature can be a useful guide for building design in different forms. Nature has used models and systems that can be useful for building designs. Ecological design is a measure to make these systems linear. Learning from nature helps understand the interaction between energy sources, water, materials used waste, pollution, and pollutants. There is virtually an architectural ecosystem or a potentiality of the waste recycling process in nature to be learned from. Using natural models for configuration is useful because ecological structures have been tested out in undesirable and unsuitable environments. The forms of configurations, combinations and materials used in nature are durable and sustainable. For this, nature can be a pleasurable touchable and audio-visual source. The efficiency of the work done in the internal nature of a building can be increased by creating a natural environment in a building.

**Inside-to-outside view:** To design a research center, it is highly important to consider both view and landscape. On this ground, the main landscape is considered to face a natural river and a green space. As stated, the river is located east of the site and provides the good potential of view and landscape, as organizing the outskirts of the river and lighting it can create beautiful scenery at nights there.

### **Design characteristics**

- The presence of two access points to the site, and consequently, creation of two independent entrances on either side of the site, one for a pedestrian and the other, on the west side, for drivers.
- The location of the parking lot west of the site for preventing the entry of vehicles into the site's compound
- Designing the portico and distinct entry elements for ease of routing and creating distinct entrances.
- Designing spaces for rest and conversation inside the site for visitors' welfare
- Expanding scientific and research activities
- Creating mass tree spaces in all corners



- Using curved walls to direct winds and air currents towards the surrounding of the building and to prevent the disturbing winds inside the building.

#### **Attitudes about the site**

In designing the agricultural center, measures take into account regional potentials and deficiencies to meet the following goals:

- Employment and creating new job opportunities
- Design based on functional, executive, and aesthetic alternatives
- Conducting research in the agricultural sector, together with simultaneous training for sustainable modern agricultural development
- Improving quality and also properly managing resources for securing society's food needs
- Utilizing the latest training and research methods and facilities, together with exploring modern agricultural methods
- Creating a link between the agricultural sector and state-run academic and research centers
- Encouragement to create small companies to develop agricultural sector by relying on advanced technologies and reducing the time needed for the commercialization process, and helping the economy
- Creating an effective and dynamic place that demonstrates science, technology and research in the agricultural sector.

#### **Design idea and process**

Various methods are involved in designing a complex; however, these methods are commonly characterized by full knowledge of a site; this knowledge is obtained from available maps and visual observation, as well as the site's photos. Here, in the design of the agricultural research center in the west of the country, the sustainable development approach was used to analyze the situation and meet the goals of designing the complex. Then, the exterior phase of the site, surrounding areas, urban routes, entries and their locations in the site, and regional potentials were investigated. The main route of the design was inspired by trees and types of plants, as the presence of fluid and curved forms along the various interconnected axes, in compatibility with forms, has led to forming fluid and readable relations, which can be easily found by people on their way. Accordingly, the design's architectural structure was formed, with other form elements combined with other elements, which led to the creation spaces of the complex.

#### **Design advantages**

The present building is especially diverse and attractive in terms of forms and architecture. Using nature-inspired curves to create forms is needed to help create a kind of dynamism in the complex both physically and visually.

#### **General scenarios of the architectural space**

The spaces of this complex should enjoy simple and logical permeability, as this complex should have higher permeability rate due to its diverse functions (e.g., research, promotion, and training, and high visitors' use of it).

The complex should be so designed to reach a space through various routes.

For this, a logical relationship between designed spaces is critical.



**Analyzing research values**

In general, the following issues are key for quantitative and qualitative growth, and in general, comprehensive development in the agricultural sector:

- Large-scale research into agricultural areas to meet advanced technologies in this industry
- Training and guidance to develop farmers' knowledge and training young generation
- Removing existing obstacles and limitations to provide financial grants, in the form of long-term loans to farmers, especially trained young people
- Setting up annual fairs to better identify agricultural achievements and creating healthy competitions to quantitatively and qualitatively improve farm products; providing specialized laboratories and libraries for society's young people, and establishing communications with agricultural centers abroad.

As stated above, creating agricultural training and development research center can be considered a long stride to meet the goals mentioned.

However, what create a complex or a building are, in fact, the needs, communication, circulation, and functions of a building, and what gives it reality and identifies it is the science and art of architecture, provided in the form of an architectural design with logical principles, and proper relations for an attractive and artistic representation.

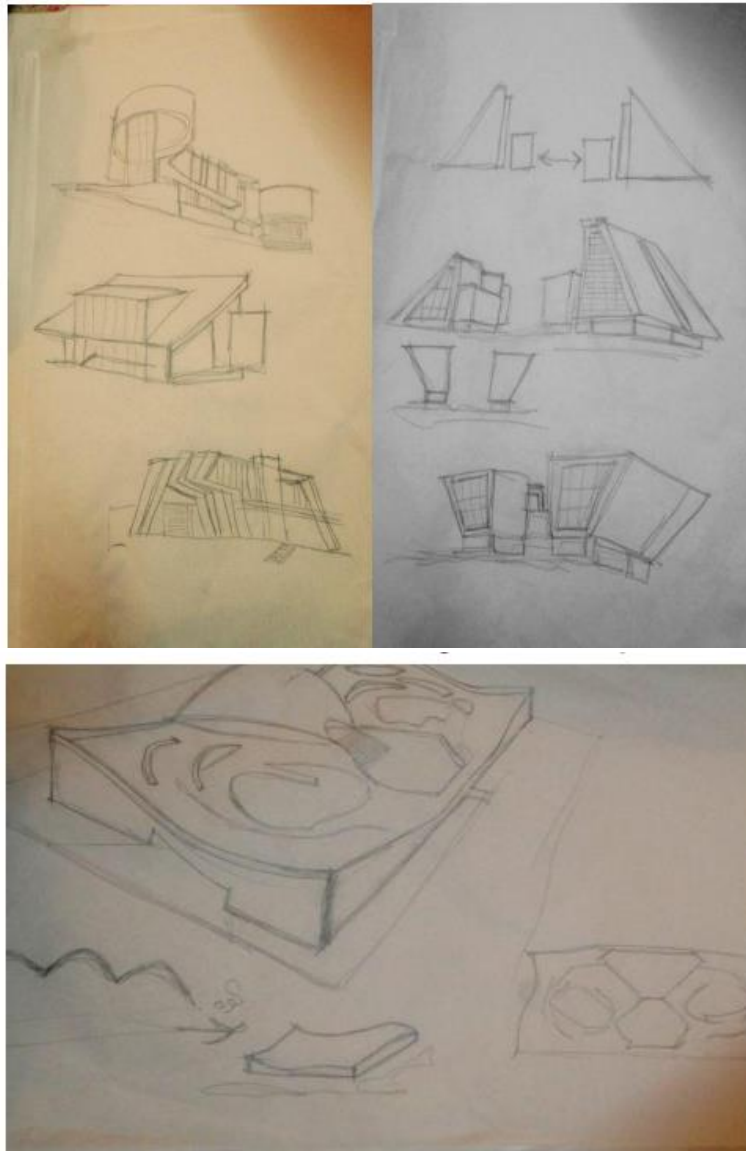
**Initial idea behind the design**

Architecture is a technical and artistic activity for increasing a living space, as combining these two activities is not also the same. To achieve the best phenomena, architecture never considers the most basic or simplest forms while constantly seeking to achieve ideal forms and to create various spaces using maximum natural energies in nature. In other words, the process of creating innovative and optimal forms for architectural spaces never ends.

**Designing alternative prototypes**

Here, attention to building forms was first considered when designing alternatives. In this design, because the site is located on a plain, the surrounding mountains were adopted to provide the design and to have the primary idea.





**Figure 6: Alternative prototypes**

In later designs, volumetric ideas extracted paved the way for a higher rank. In other words, the volume of this complex should demonstrate an upward movement, i.e., a stepwise movement upwards.



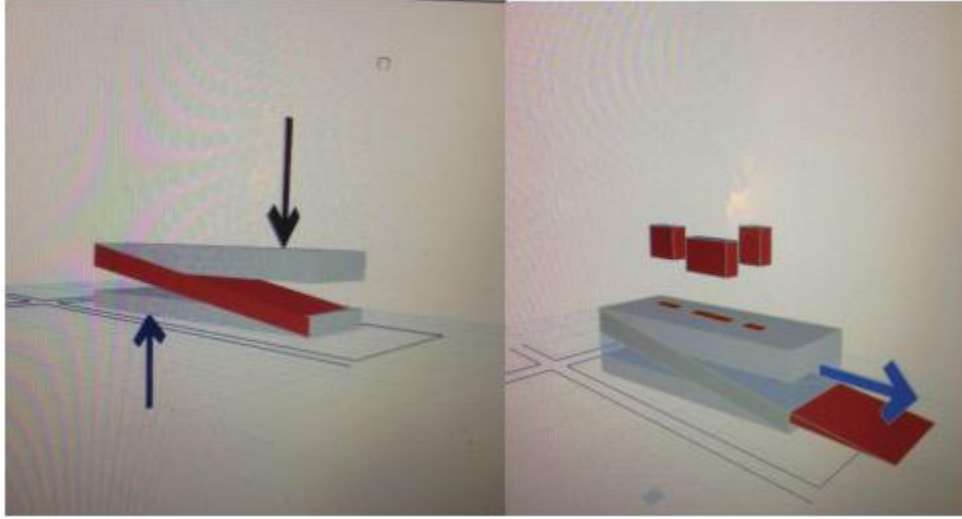
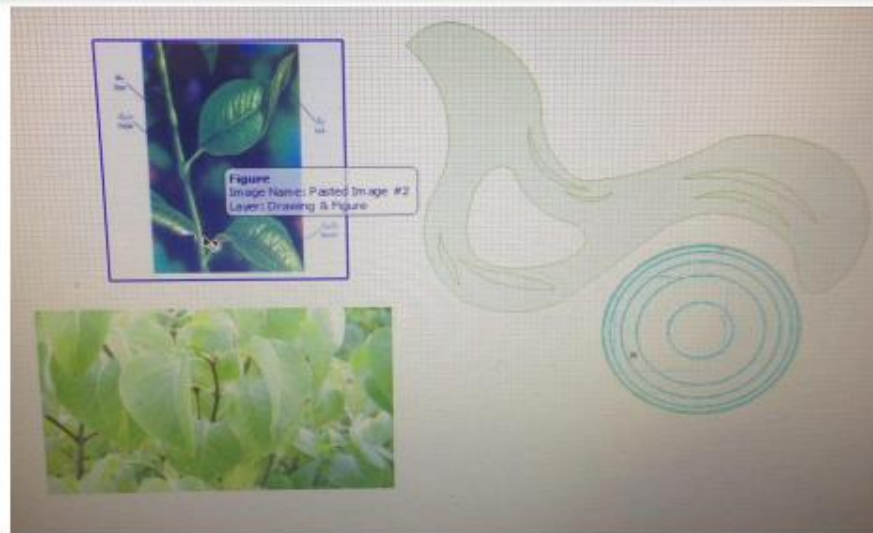


Figure 7: Two-dimensional design

### The main design idea

In designing a research and training center in the Qorveh climate, the concepts of sustainability and sustainable elements, derived from the basics of research done in the second chapter, were used. In this design, attempts were made to adopt the initial design concept, which is a tree leaf, as this chapter is mainly about agriculture. Here, the initial concept involves the function objective form that helps arrive at the intended volume.



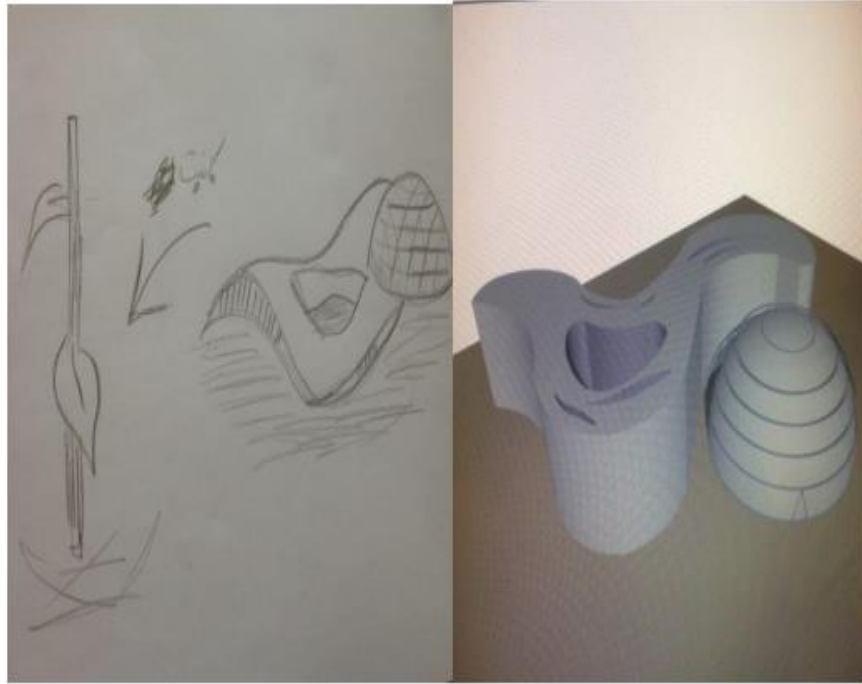


Figure 8: Initial concept and volume

#### Design form and direction

In the site, the building direction can determine the sunlight absorption level. Building designers can calculate the radiative solar charge for different hours of the day and different days of the year, when the location and angle of solar radiation vary, to select the building direction in a way that the absorbed sunlight can prevent the excessive heating of the building. In cold areas, the building direction is determined to receive the highest solar energy absorption, with the building length designed to extend in an eastern-western direction. Thus, for using maximum winter sun, the most appropriate solution is to construct buildings in accordance with Sanandaj's climate, i.e., at 30° SE and between 15 to 45 ° SE (Sajjadzadeh, 2015). As stated, the building direction is eastern-western, with greenhouses laid on its southern front that can best use the southern light.

**Structure design:** In this design, materials of sustainable architecture, including Cobiax technology, and environmental-friendly green concrete, are used, and in the energy sector, photovoltaic systems are used for saving.

#### Figure 9: General design of the applied agricultural research center in the city of Qorveh

##### Conclusion

In general, studies done in the agricultural training and research sector were most theoretical and descriptive, and few practical and applied studies have been undertaken to use economic techniques and procedures to explain the role and significance of training and research in the agricultural sector. Also, in existing centers, there is a lack of a logical relationship between spaces and disproportionate design procedures with functions. For this, studies have demonstrated that although training, research, and improvement are complementary elements, they virtually function separately in different spaces. Another issue is using renewables, which in addition to producing and supplying energy in excess of world demands, can provide energy at much lower costs. For this, using these types of energies in architecture can convert buildings



into ones with higher qualities and low energy consumption, which provide not only physiological comfort but also provide mental convenience in architectural spaces. Thus, combining techniques and architecture and forming architecture based on energy requirements can help develop sustainability and create architecture that is in harmony with the environment and natural potential.

It is hoped that this complex can provide suitable training equipment and facilities for graduates to acquire scientific and technical principles in the near future and work as committed experts in training and execute agricultural plans based on those principles. It should be mentioned that advancements in science and technology without research will be futile. In sum, this study aimed to take a step, albeit small, to help develop research in the field of sustainability.

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#### References

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- Rezaei, A; Leghai, H.A.; Abarghouei, H.& Mikaeili-Tabrizi, AR. (2015). Sustainable design of the environment and landscape in the urban suburban park of Yazd City. *Science and Technology Quarterly* (17): 159-169
  - Kheiruddin, A.; Ghasemi Naqib-Dehi, M. & Dehghan, M. (2010). Comparing and investigating the characteristics of U-boot hollow slabs compared to solid ones and their design. The 5th National Congress of Civil Engineering. Mashhad Ferdowsi University. Page 12
  - Eliaszadeh Moghadam, N.; Aghvami-Moghadam, A. A collection of measures by Iran's Supreme Council of Urban Development and Planning from the beginning of its establishment to the end in 2010. Revision and regulation by the Ministry of Roads and Urban Development, Directorate of Urban Development and Architecture. Bureau of Physical Plans, Secretariat of Iran's Supreme Council of Urban Planning and Architecture. Tehran. Study and research center and urban planning and architecture.: 978-600-5392-20-3, page 123
  - Gumus, AlevTaskin, 2009, Evaluation of hazardous waste transportation firms by Using a Step fuzzy- AHP and TOPSIS methodology, *Expert Systems With Applications Journal*, VOL 36, 551
  - Bab al-Hawaej, F. & Khaledi, N. (2008). Challenges facing collaborative listing in the Internet environment (Case study: libraries affiliated to the Agricultural Research, Education and Extension Organization, *Agricultural Extension Journal* (25):11-22

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- Moral Uğur,E. (2006) GünesPillerininYapıKabukElemanlarıileButunleştirilmelerineYonelikBirAraştırma,Mast e r Thesis, Istanbul Technical University. Pp. 65
  - Munier, Nolberto (2005), Introduction to Sustainability: Road to a Better Future, The Netherlands: Springer.
  - Picard, Q. (2011) Architecture handbook, Trans. by Kourosh Mahmoudi, Deh Biglo, Tehran: 3rd edition
  - Zare', N. & Mehrabi-Basharabadi, H. (2017). Calculating water demand in producing alfalfa (case study of Qorveh and Dehgolan cities). Iran's water research. Page 29-31
  - Jadzadeh, H. Gholami, F. & Ghutbzadeh, J. (2015). Understanding and investigating green walls to reduce energy loss in buildings. National Conference on Civil Engineering and Architecture with the approach of sustainable development in Hamadan. P. 5
  - Zahedi, Shamsalsadat (2010), 'Green management an effective approach toward sustainable development', Innovators and Coastal Tourism Symposium, Rethinking Coastal Tourism Development: The Importance of Innovators in Times of Climate Change & Economic Crisis, Stanford University, USA. page 110-115
  - Swamy RN, Mehmod HB. (2006). Mix proportions and strength characteristics of concrete containing 553 low calcium fly ash. In: Malhotra VM, editor. Proceedings of the second international congress on fly ash, silica fume, slag and national pozzolanas in concretes, Madrid, ACJ SP 23 , vol. 3 ; 3216 . p.32-33
  - Shams, M. & Khodakarmi, M. (2010) Architecture compatible with cold climate (case study: Sanandaj City). Geographical Quarterly of Environmental Studies. (10):23-28
  - Mahboobi, M.R. & Sharifzadeh, A. (2009). An Assessment of the Effectiveness of on Farm Agriculture Training Course: Case of Agricultural Collage, Gorgan University of Agricultural Sciences and Natural Resources. Iranian Journal of Agricultural Economics and Development Research, 40-2(4), 109-118. (In Farsi).

