LARGE-SCALE IRRIGATION PROJECTS IN AFRICA

Irrigation is the artificial supply of water to support plant growth in areas which have insufficient rainfall. Irrigation is either permanent or temporary, and it is carried in areas of insufficient rainfall and where flooding is common.

Under irrigation, the extra amount of water needed depends much on the type of crops grown, the prevailing temperature and humidity, the kind of soil and other conditions in the area.

Advantages of irrigation

a) The supply of water by irrigation is regular and reliable, where as rainfall is often seasonal or unpredictable.
b) Irrigation water supplied by rivers during flood times carries much silt which adds to soil fertility and hence increasing crop yields.
c) Under irrigation, cultivation can be done all year round and not only during the rainy season.
d) In desert areas the constant flow of irrigation water through the soil helps to reduce the salinity of the soil.
e) Modern multi-purpose dams not only support irrigation but also help to control floods, generate power, and improve the navigability of rivers.

Irrigation is majorly in the semi-desert or desert areas of Sub-Saharan Africa.

Examples of major irrigation schemes in Africa include:

- Gezira irrigation scheme in Sudan
- Richard toll scheme in Senegal
- Awash valley authority in Ethiopia.
- Irrigation on Niger river

GEZIRA IRRIGATION SCHEME IN SUDAN

The Gezira scheme is located between the Blue Nile and the White Nile, north of Sennar dam but south of Khartoum in Sudan. The region receives low and unreliable rainfall less than 500mm per annum. There was need for irrigation in order to grow crops. The Sennar dam was built in 1925 in order control water and various canals leading water to the fields were constructed.

The Gezira scheme was started in 1911 by the British and Sudan government nationalized later and set up the Sudan Gezira board to manage it up to date. The Gezira scheme was earlier set up. Later in 1962, the Managil extension was completed and farmland increased. There are main canals from which thousands of kilometers of smaller channels developed on rectangular system carrying water throughout the whole scheme.

A sketch map showing the location of Gezira irrigation scheme

Organization of the Gezira scheme

The Sudan government and the Gezira board jointly own the Gezira scheme. The Sudan government provides the land and is responsible for its irrigation. The tenants (over 10,000 today) work on the land and produce crops **especiallycotton**. They use the land rent-free only to work satisfactorily. There are also grow other crops for food as well as cash. These crops include: groundnuts, Dura, maize, lubia (a bean for food and cattle fodder), rice, sorghum, and sugarcane.

The Sudan Gezira board manages the processing and selling of crops, supplies seeds, fertilizers and gives advice to farmers. It also looks after the light railway system, farm machinery and distribution of profits. The income depends on the price of cotton.

Objectives of the Gezira irrigation scheme

- To open up more land for both settlement and farming
- To provide water for irrigation all year round.
- To modernize the economy from pastoral nomadism to settled agriculture
- To diversify the agricultural sector(to grow food crops in addition to cotton)
- To control flooding from the blue Nile.
- To encourage economic development of Sudan.

Factors which have favoured the establishment and development of Gezira irrigation scheme in Sudan

1. Availability of ready water supply for irrigation from the Blue Nile and White Nile throughout the year for growing of cotton,maize,rice,lubia, groundnuts.
2. The gently sloping landscape from the Blue Nile towards the White Nile, and therefore both irrigation and drainage can be done using gravity flow, hence low irrigation costs, and thus large-scale production.
3. The gently sloping landscape has also favoured the construction of transport network and mechanization of farming made possible such as the use of tractors.
4. Availability of vast/extensive land due to sparse population and hence a large expanse of land was put under irrigation farming.
5. Presence of fertile alluvial soils (dark brown clay soil rich in minerals) of the Gezira plain from seasonal flooding of the Nile favouring the growth of crops. However today artificial fertilizers are applied to maximize production.
6. The soils have high clay content and hence impervious to water sinking away and this saved the construction of water-proof lining (concrete channel) when canals were filled with water.
7. The land is well above the water table and so water-logging never occurs.
8. The arid climate of the area also favoured irrigation farming because there was no expensive clearing of bush/forests. (The arid climate necessitated use of irrigation so as to make the fertile land productive by supplementing the little unreliable rainfall for supporting the growing of crops like cotton).
9. Availability of cheap labour in the area to work is irrigation farming because people were already in the area cultivating poor cereals (on the mercy of rains) and herders with skinny cattle such as nomadic Dinka and Nuer.
10. Presence of skilled labour initially provided by the British and Egyptian experts who were used in the construction of the dams, canals, operation of machinery, grading, textile industries and ginneries.
11. Availability of adequate capital provided by the government and the British to set up the Gezira scheme, purchase of agricultural machinery like tractors , irrigation systems , payment of research personnel and establishment ofthe required infrastructure.
12. Availability of large supply of electricity especially hydro-electric power generated by Sennar dam and Jabel Aulia dam(Roseires dam) for pumping water from the reservoirs into the canals / fields and running machines in the ginneries and textiles.
13. Presence of improved transport infrastructure such as the railwayand triangular road network to connect ginneries and also moving inputs into the fields.
14. The introduction of modern technology such as caterpillars and tractors for digging channels and large scale cultivation; multiple seed drills for large scale planting ; also gravity flow irrigation, over-head irrigation, and tank irrigation.
15. Availability of ready market for crops grown both local and foreign. There are ginneries and textile industries at Khartoum, Hasa Heisa, and export markets in Germany, Italy, UK, Japan, and India.
16. Supportive/ favourable government policy such as by setting up the scheme to allow people to settle down to produce food and cash crops for economic development of Sudan and establishing the necessary infrastructure.

Contribution of the Gezira irrigation scheme to the economy of Sudan

1. Promotes agricultural modernization within the Gezira plains and throughout Sudan by enhancing highly mechanized scientific farming based on irrigation, application of fertilizers and pesticides on a large scale.

2. Increased production of both food and cash crops by the farmers such as cotton, lubia, maize, dura, and thus increased incomes to the farmers leading to a higher standard of living.
3. The scheme has promoted education and training for the people in the area such as training centres, adult education benefiting the local people to enhance farming and also improve the general welfare.
4. Generation of employment opportunities to many people on the scheme both the skilled and the unskilled labourforce such as managers, extension offcers, hence improving the standards of living.
5. Promoted development of social services such as sporting and leisure facilities, educational facilities, health facilities, piped water in many areas such as Sennar, Wadi Medani, Kosti. These have resulted from the revenue accruing from the Gezira scheme.
6. Promoted development of the industrial sector for example the high quality cotton produced has promoted the growth of ginneries and textile industries, grain milling and fertilizer industries
7. The Gezira scheme generates foreign exchange to Sudan through the export of crops particularly cotton to the outside countries like Germany, Italy, UK, Japan, and India.
8. The scheme has promoted the growth of urban centres in the Gezira plains such as Wadi Medani, Kosti, Sennar, Hasa Heisa, and Al Husa Ayhisah by attracting a large population.
9. The Gezira scheme has also emphasized the planting of forests of eucalyptus trees and the afforestation program carries a number of benefits such as providing building wood/poles, natural beauty.
10. The scheme has promoted cooperation among the tenants and therefore cooperatives have been introduced for marketing the produce and advising farmers.
11. Promoted international cooperation between Sudan and the countries which import the products, which promotes international harmony and peace.
12. Diversification of the economy hence reducing over dependence on a few sectors like mining.
13. Promotion of the tourism sector due to irrigation canals and farmlands, hence generating foreign currency.

Shortcomings of the Gezira irrigation scheme

1. Silting of the irrigation canals since irrigation water deposits its suspension material in them and regular dredging is quite costly.
2. Salination due to the high rates of evaporation in the Gezira scheme and this has limited plant root growth, reducing yields of crops like cotton and sugarcane.
3. The reservoirs are shallow leading to flooding of farmlands and this has increased the spread of pests and diseases such as Bilharzia.
4. Displacement of people as land was being set aside for the scheme such as Dinka and Nuer nomads who used to graze their animals in the area.
5. The Gezira scheme was very expensive to undertake such as high costs of establishing farmlands, irrigation channels, dams, plus high costs of maintaining the irrigation scheme.
6. Industrial—related problems such as pollution from the ginneries, textiles, grain milling at Omdurman, Khartoum, and Wadi Medani.
7. The growth of urban centres is associated with many problems such as slum growth, alcoholism, robbery.

Problems facing the Gezira irrigation scheme

1. Silting of the irrigation canals and man-made lakes, leading to the flooding of farmlands. Reservoirs are shallow resulting into the flooding of crop fields.
2. Excessive evaporation due to hot temperatures leading to increased soil salinity in the central valley and thus poor yields.
3. It has encouraged the spread of waterborne diseases such as bilharzia in the central valley due to stagnant water.
4. Soil exhaustion due to over cropping leading to low land productivity.
5. Over use of farm chemicals fertilizers and pesticides leads to pollution of rivers and thus creating health problems.
6. Irrigation farming encourages the spread of water weeds such as rhizomes which compete with the crops and thus low yields.

7. High costs of production / maintaining the irrigation projects such as constant dredging of the canals; and this reduces the profit levels.
8. Fluctuations in water flow along the rivers during the dry season which leads to low yields.
9. Growth of weeds such as rygenis which compete with the crops and thus reducing yields / increases the costs of production.
10. Shortage of labour on the irrigation farmlands, which limits the agricultural activities.
11. Fluctuations in the prices of the crops grown on the world market, leading to fluctuations in incomes.

Note: Other irrigation schemes in Sudan include:

- Kenana sugar scheme (south of Sennar)
- The Rahad river scheme (for mainly cotton, grounds nuts , dura, maize and vegetables)
- Danazin scheme.

IRRIGATION FARMING IN EGYPT

More than 90% of Egypt is desert, which is divided into two by the NileRiver. The Nile Valley and delta are main centres of settlement and cultivation. Less than 10% of the land area is suitable for cultivation and hence the need for irrigation.

A sketch map of Egypt showing irrigated areas

Conditions favouring irrigation farming in Egypt

1. The area is arid/ receives low and unreliable rainfall necessitating irrigation farming. More than 90 % of Egypt receives less than 250mm of rainfall.
2. Presence of extensive/ large/ vast and cheap land to establish the irrigation farms due to the low population.
3. Low incidence of pests and diseases due to hot temperatures which supports growth of crops.
4. Relatively flat landscape/ gently sloping landscape in the central valley which allows the use of machines like tractors on the farms and allowing irrigation under gravity flow.
5. Large/ constant supply of water for irrigation from the Nile river and the large oases such as Baharia, Farafra, Dakhla ; and lagoons especially in the Nile delta.
6. Presence of well-drained and fertile alluvial soils deposited duringflooding to support the growing of crops.
7. Large supply of skilled labour to work on the irrigation farms such as drivers, harvesters and managers.
8. Modern technology employed on the farms such as refrigerated trucks, cold rooms, construction of canals.
9. Presence of modern transport network by railway, road, air, foe easy marketing and distribution of crops to market centres.
10. Large sums of capital to invest in irrigation farming such as purchasing farm machinery, chemicals, and fertilizers.
11. Large/Ready market for farm produce within the urban centres of Egypt and other countries.
12. Supportive/ positive government policy towards irrigation farming through giving tax incentives and encouraging farm research.
13. Formation of various cooperatives which reduce the costs of production such as through collective buying of farm inputs.

Steps taken to improve irrigation farming in Egypt

1. Construction of water reservoirs to supply water for irrigation.
2. Reclaiming of dry land for crop farming to increase production.
3. Extension of canals and aqueducts to transfer water to the farms.
4. Practicing mixed farming to encourage interdependence between crops and livestock.
5. Specialization of farming activities and thus increase in the quality of output.
6. Constant dredging of canals to allow efficient flow of water for irrigation.
7. Carrying out market research / international cooperation to widen the export market for farm output.
8. Increasing research into better yielding, fast maturing and disease resistant varieties.
9. Hiring labour during the peak periods such as harvesting.
10. Formation/ strengthening of cooperatives to easily acquire loans to expand the farms.
11. Controlling weeds using herbicides and thus increasing the farm yields.
12. Intensive cultivation to increase the yields and thus offset the high costs of irrigation.

IRRIGATION FARMING IN SENEGAL

River Senegal forms the boundary between Mauritania and Senegal, which are West African, countries bordering the Atlantic coast. In this area, annual rainfall is about 400mm or less. However, most of the northern areas are in a desert. Therefore because of river, there was need to establish irrigation schemes to increase food production. The major schemes are the Richard toll scheme and the delta scheme. The major crops grown are maize, tomatoes, sorghum, sweet potatoes, sugar canes, millet, rice, cucurbits, and beans.

A sketch map of the Richard Toll irrigation scheme in Senegal

Conditions favouring irrigation farming in Senegal

1) The area is semi-arid/ receives low and unreliable rainfall necessitating irrigation farming.
2) Presence of extensive/ large/ vast andcheap land in the area to establish the large irrigation farms.
3) Low incidence of pests and diseases due to hot temperatures which supports growth of crops.
4) Relatively flat landscape/ gently sloping landscape which allows the use of machines like tractors on the farms and also allowing irrigation under gravity flow.
5) Large/ constant supply of water for irrigation from river Senegal and its tributaries like Doue, and Taoue
6) Presence of fertile alluvial and silt soils deposited in the area due to annual flooding to support the growing of crops.
7) Availability of large sums of capital provided by the government to construct canals, pumping stations and crop farms.
8) Large supply of skilled labour to work on the irrigation farms such as drivers, harvesters and managers.
9) Modern technology employed on the farms such as use of tractors for farming, construction of canals.
10) Presence of modern transport network by railway, road, air, foe easy marketing and distribution of crops to market centres.
11) Large sums of capital to invest in irrigation farming such as purchasing farm machinery, chemicals, and fertilizers.
12) Presence of a large market for farm produce within the urban centres of Senegal, and other countries like Gambia, Mauritania among others.
13) Supportive/ positive government policy towards irrigation farming through giving tax reductions and encouraging farm research.