



**HEALTH
POLICY
PROJECT**



RAPID

The Change We Seek



November, 2013

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1. Abbreviations

ASFR	Age Specific Fertility Rate
DOS	Department of Statistics
FP	Family Planning
GOJ	Government of Jordan
GDP	Gross Domestic Product
HPC	Higher Population Council
HPI	Health Policy Initiative
HPP	Health Policy Project
JD	Jordanian Dinar
MENA	Middle East and North Africa
MOA	Ministry of Agriculture
MOE	Ministry of Environment
MOMA	Ministry of Municipal Affairs
MT	Metric Tons
RAPID	Resources for the Awareness of Population Impacts on Development
RH	Reproductive Health
TFR	Total Fertility Rate
UNFPA	United Nations Fund for Population
USAID	United States Agency for International Development

2. Executive Summary

Jordan resources are limited, especially energy, water resources and arable land. The population has increased in the last sixty years to more than twelve-fold, from 0.59 million in 1952 to about 6.4 million in 2012, and this has increased the pressure on services, natural resources and on land use due to the increased need for food and housing.

In response to this, the Higher Population Council has increased its efforts to raise awareness about the impacts of population growth and age distribution on development, in order to gain the support of decision makers for population related issues. Included in these efforts is the development of advocacy studies and presentations focusing on vital sectors in Jordan; health, education, water, energy and land use. This document was developed to specifically support the presentation for land use.

Land is used to meet basic human needs and it is related to population size and growth. An increase in population leads to an increase in the need for land to produce food and construct houses, commercial establishments, recreational facilities, schools, health facilities, roads, mosques and other services. This causes a burden on the environment and could be measured by the Ecological Footprint. The Ecological Footprint calculates the amount of land a country needs to fulfill the production and consumption needs of its population in different categories. Footprint values are categorized for Carbon, Food, Housing, and Goods and Services as well as the land area needed to sustain the world's population at that level of consumption. This resource measurement is similar to life cycle analysis wherein the consumption of energy, biomass (food, fiber), based on this building materials, water and other resources are converted into a normalized measure of land area called global hectares (gha).

Per capita ecological footprint (EF), or ecological footprint analysis (EFA), is a means of comparing consumption and lifestyles, and checking this against nature's ability to provide for this consumption. The tool can inform policy by examining to what extent a nation uses more (or less) than what is available within its territory, or to what extent the nation's lifestyle would be replicable worldwide. The footprint can also be a useful tool to educate people about stamina and over-consumption, with the aim of altering personal behavior. Ecological footprints may be used to argue that many current lifestyles are not sustainable. Such a global comparison also clearly shows the inequalities of resource use on this planet at the beginning of the twenty-first century.

The Resources for the Awareness of Population Impact on Development (RAPID) study, including the resulting presentation, is one of the most useful advocacy tools for engaging the support of policy and decision makers, and it was adopted by the Higher Population Council (HPC) to enhance multi-sectoral engagement in addressing the urgent population issue. This document provides an overview of the RAPID study that was developed for land use in Jordan, demonstrating its importance as an advocacy tool. It also describes the methodology that was used in its preparation, and the recommendations and conclusions that were provided through the engagement of the national entities, such as the Higher Population Council, the Department of Statistics, and the Ministry of Agriculture. It utilizes two main Total Fertility Rate (TFR) scenarios, the constant TFR scenario and the reduced TFR scenario, and demonstrates how these two scenarios impact land use differently. It will also illustrates the main

benefits the Government of Jordan (GOJ) can gain from the achievement of the reduced TFR. Finally, this document emphasizes the most important tool for achieving the target TFR and gaining the associated benefits that is Family Planning.

In 2013, the Health Policy Project (HPP), in collaboration with the Higher Population Council (HPC) and Department of Statistics (DOS), worked on developing the Land Use RAPID study. The Health Policy Project (HPP) technical team had collected the necessary data from their reliable sources, then used the SPECTRUM model to develop population projections. It was agreed to define two TFR scenarios and any related population assumptions, including life expectancy and international migration. Afterward, the HPP discussed requested changes on population projections with HPC, such as TFR, ASFR, sex ratio at birth, life expectancy, model life table and international migration. Specific indicators were chosen based on importance and impact, and the study and presentation were developed based on these indicators, emphasizing the benefits gained by adopting the reduced TFR scenario between the years 2012 and 2035.

In light of the agreed upon scenarios for the TFR, the main results were:

1. Assuming constant consumption per capita, the annual wheat will increase from 900,000 MTs in the year 2012 to 1.6 million MTs by 2040 in the current fertility rate scenario. With lower fertility, the amount of wheat will decrease to 1.4 million MTs in 2040.
2. As a result of lower fertility, 600 million JD will be saved between 2012–2040 on importing wheat to cover population needs.
3. If the current fertility pattern continues, the number of global hectares required to support Jordan's population would increase from 11.3 million in 2010 to 23.1 million by 2040. 16% fewer million global hectares would be required as a result of reduced fertility.

The main actions that need to be taken include:

- Appropriate zoning codes to be developed
- These zoning codes need to be enforced
- More effective and efficient use of current land needs to be encouraged
- Implementation of a regular reforestation program
- Strict enforcement of logging laws and regulations
- Implementing innovative policies to meet future housing needs (building up, not out)

Reduction in population is important, and we have identified four major actions that can be taken to help reduce population growth.

- **First**, there needs to be public support of population policies and programs by high-level officials. Not only do these high-level officials decide on policies that affect population growth, but they also send an important message to everyone that reducing population growth is beneficial to everybody and all sectors – it is an essential part of the health and well-being of families and the country.

- **Second**, it is critical that all ministries consider population in their plans. This does not mean that the ministries need to merely 'account' for population growth, but they also need to recognize that population growth is variable and can be influenced through their advocacy efforts.
- **Third**, it is essential that adequate funds are provided to implement plans and actions required to reduce population growth.
- **Finally**, governmental and non-governmental organizations and affiliations must be able to work together to bring about the necessary actions required to reduce population growth.

3. Introduction

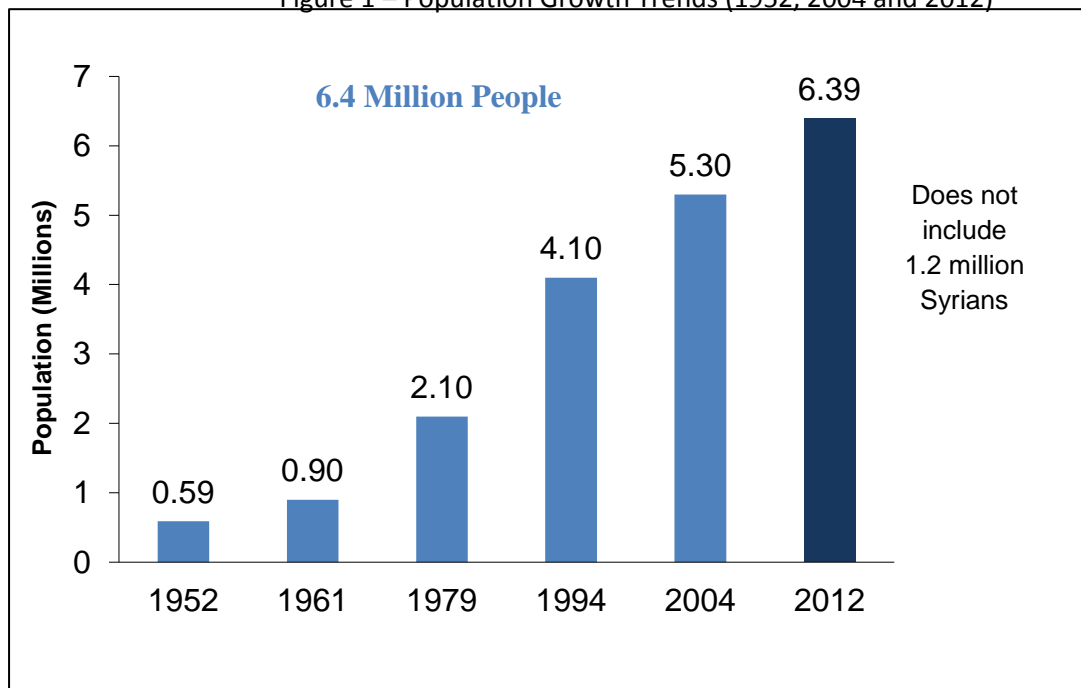
3.1 Summary of Jordan’s population characteristics

Jordan is a country with limited resources as in arable lands. Due to the effect of rapid growth in population, an increasing demand for food and housing, and based on the directions of his Majesty King Abdullah II; in 2004 the Higher Population Council (HPC) enhanced its efforts and coordination with other government and non-government entities to increase policy and decision makers’ awareness regarding the importance of population issues, and the need to develop policies and programs necessary to address this issue.

During the last sixty years, Jordan’s population has increased dramatically. If we review the current characteristics of population in the 2012, we find that that the population is 6.4 million, in addition there are 1.2 million Syrian refugees living in Jordan as per the latest statement of the prime minister of Jordan. On the national level, the Jordanian woman gives birth to 3.5 children. The crude birth rate is 27 and crude birth rate is 7 per thousand, and thus the average natural increase of 2%. This high rate is attributed to the difference between the crude birth rate and the crude death rate.

According to Jordan’s five censuses and the 2012 estimates, the population of Jordan has increased substantially over the last 60 years – increasing more than 10 times between 1952 and 2012 from 0.6 million in 1952 to around 6.4 million in 2012. Adding the Syrian refugees, the 2012 figure increases to 7.6 million (Figure 1).

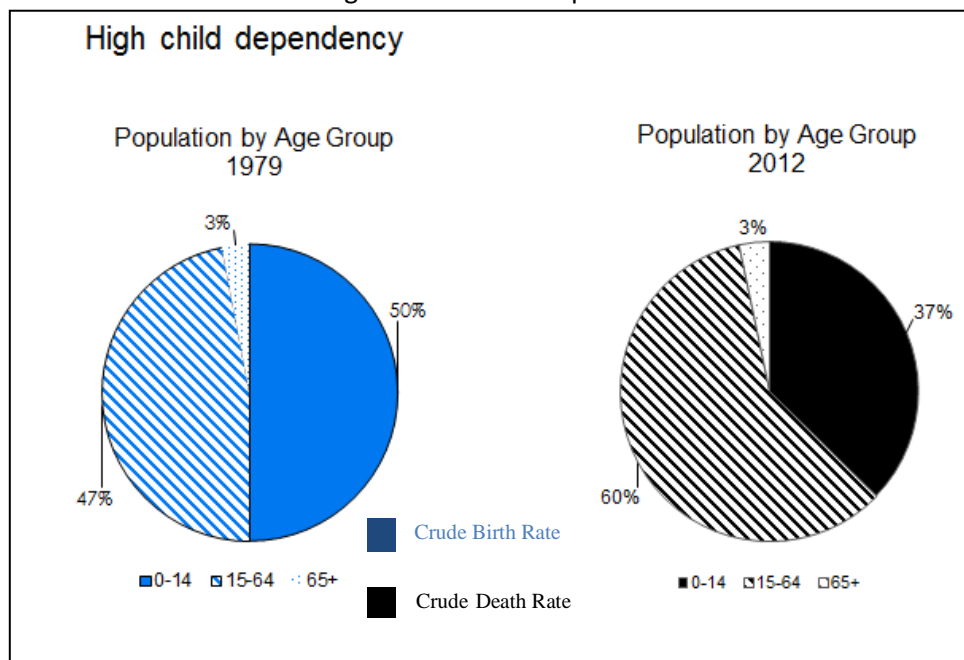
Figure 1 – Population Growth Trends (1952, 2004 and 2012)



Sources: Jordan Censuses, 2012 DOS Estimates

The population age structure also witnessed changes in the past three decades. The most important feature of this change has been the decline in the percent of children (individuals under the age of 15 years) as well as the increasing proportion of the working age population group (15-64 years). However, in spite of the change in the population age structure, the Jordanian society is still characterized by a youthful status, where more than one-third (about 37%) are children under the age of fifteen. In fact, even though the proportion of children in Jordan has declined by 13 percentage points over the last thirty years, the total number of children doubled during that time from about 1.1 to 2.4 million. With the currently high proportion of children, the population and labor force growth will to remain high and the dependency ratios in the future will also continue to remain high (Figure 2).

Figure 2- Historic Population



Source: 1979 Census and 2012 DHS

As mentioned, the crude birth rate was 27.2 per thousand in 2012. The Total Fertility Rate, defined as the average number of births a woman would have during her lifetime if she followed the current age specific fertility rates throughout the course of her reproductive years (15-49), has also historically been high. In 1976, the TFR in Jordan was extremely high at 7.4 births per woman. During the last thirty years, the TFR decreased substantially to 3.7 in 2002, and remained nearly constant afterwards, hovering at 3.5 in 2012.

These indicators and others, such as life expectancy, which increased from 68 for males and 71 for females in 2002 to 72 and 74 years in 2012 respectively, indicated a marked enhancement in the health sector in Jordan. However, these improvements in addition to the political situation in the region that have caused large consecutive migrations have also exerted increasing pressure on the socio-economic

sectors and natural resources such as land, water and energy. This pressure, as well as the plateauing of TFR and the continuous increase in population, encouraged related entities to increase their efforts and improve programs to decrease TFR and population growth.

3.2 Historical background and literature review

The Health Policy Initiative (HPI) and the Policy projects, implemented by Futures Group and funded by the United States Agency for International Development (USAID), developed the SPECTRUM module which consists of the DemProj and RAPID applications. These two applications are used in the development of population and socio-economic sector projections.

DemProj is the base module in SPECTRUM. It consists of the main demographic and population data that all projections are built on. It is characterized by ease of use and adaptability to other WINDOWS programs. In DemProj, the user should provide the population by sex for the base year, TFR, ASFR, sex ratio at birth, life expectancy, a model life table, and international migration data. This information, in addition to the base year and projected years, builds the base for the developed population projections, which in turn are used in Land Use RAPID.

Indicators in Land Use sector, its costs and the impact of population growth on the demand for food were calculated and a RAPID presentation was developed. The RAPID study and presentation are important advocacy tools for engaging the support of policy and decision makers in reducing the population growth and its impact on land use and wheat consumption, through estimating the needs and consumption expected according to the current and the reduced population growth (Current Total Fertility Rate and Reduced Total Fertility Rate).

3.3 Importance of the RAPID study to Jordan

The RAPID study is important for many reasons, including:

1. Jordan is one of the countries that has limited resources and still faces a high population growth rate. This puts higher pressure on national entities to provide high quality services and products to the growing population. The study shows the effect of population growth on the development sectors in a clear way that enables policy makers to understand their role in this issue more clearly and meet the needs from energy, water and lands for housing and farming.
2. The study is intended to be presented to decision and policy makers in the country. Accordingly, it addresses the issues that these officials are interested in and demonstrates the impact population growth will have on those issues, encouraging them to consider the necessary actions.
3. The study has been used in many other countries that faced the same issues as Jordan, and played a major role in shifting and changing their policies.
4. The study advocates for a multi-sectoral approach to address the population issue. Since addressing this issue cannot be resolved by one ministry, engaging all development sectors in Jordan helps create the commitment required to bring about policy change.

5. Finally, this study provides direct and clear recommendations and required actions to mitigate the challenges associated with population growth, providing decision-makers the option to adopt one or more suitable actions for application.

3.4 Why land use was chosen to develop the RAPID Study

The RAPID Study is a vital tool for gaining the support of decision and policy makers of various vital sectors. As mentioned earlier, natural resources in Jordan are scarce, especially arable land. Therefore, the Higher Population Council (HPC) and Health Policy Project (HPP) had cooperated to attract and engage stakeholders related to land use in population issues, as the growth in population would lead to an increase in demand for food, housing and governmental subsidies for wheat and food.

The ecological footprint analysis (EFA) for Jordan, which is considered as a means for comparing consumption and lifestyles, and verifying nature's ability to provide for this consumption, represents an important indicator of how the increase in population impacts the environment and the ability of the land to cope with this increase and provides the needed arable and grazing lands to secure food and enough land for building houses and other public services such as hospitals and schools. The EFA can inform policy about the impact of population growth by examining to what extent a nation uses more (or less) than what is available within its territory.

4. Methodology

4.1 Identifying the main variables in the area of land use

Land is used for many purposes, such as:

- Food production
 - Growing crops
 - Grazing animals
- Housing
- Recreation
- Services/Facilities (schools, hospitals, mosques)
- Businesses
- Roads and highways
- Mining and quarrying

Productive land in Jordan is very limited. Only 11% of the total land area can be considered as agricultural land, of which less than 2 % is arable and the rest is ranges and forests.

A set of indicators related to wheat production and import were calculated, as well as the Jordan Ecological Footprint. The ecological footprint is a measure of human demand on the Earth's ecosystems. It is a standardized measure of demand for natural capital that may be contrasted with the planet's ecological capacity to regenerate. It represents the amount of biologically productive land and sea area necessary to supply the resources a human population consumes, and to assimilate associated waste. Using this assessment, it is possible to estimate how much land area it would take to support human life if everybody followed a given lifestyle. For 2007, humanity's total ecological footprint was estimated at 1.5 of planet Earth; that is, humans use ecological services 1.5 times as quickly as Earth can renew them. Every year, this number is recalculated to incorporate the three-year lag due to the time it takes for the UN to collect and publish statistics and relevant research.

The Ecological Footprint calculates the amount of land a country needs to fulfill the production and consumption needs of its population in different categories. Footprint values are categorized for Carbon, Food, Housing, and Goods and Services as well as the land area needed. This resource measure is similar to life cycle analysis wherein the consumption of energy, biomass (food, fiber), and based on that the building material, water and other resources are converted into a measure of land area called global hectares (gha). The Ecological Footprint for Jordan has been developed using the information collected by the Global Footprint Network, which has calculated footprints for most countries in the world. As for the indicators that were mentioned in the documented study results, mainly two criteria were chosen; the extent of availability of the required data to calculate the indicator and the extent it affects the growth of the population.

4.2 Data collection

Land is an important element in all economic, developmental, agricultural and housing plans. The base for the RAPID presentation is accurate and up-to-date data, collected from reputable sources, with the year 2012 as the baseline. The technical team worked on collecting the population and land data using relevant sources; Department of Statistics and Ministry of Agriculture. In addition to direct contact with the ministries and concerned sectors, the team continuously reviewed the studies, surveys, reports and official websites that provided the required data. The team kept an accurate record of the gathered data, and ensured the main sources were identified.

The study is divided into five parts:

- Population Characteristics
- Population Projections
- Past and Current Land Use
- Population Growth Impacts on Land Use
- Actions Required

4.3 Defining TFR scenarios and population assumptions

The first step in developing a RAPID study was to define the alternative fertility scenarios. Best practices in countries show that it is most effective to identify two or three scenarios. Using many scenarios may distract the decision maker from the main objective of decreasing the Total Fertility Rate (TFR). The team decided to use two scenarios; one showing what would happen if fertility continued at its current levels and the second showing the impact of reduced fertility consistent with the goals of the National Agenda. For example, the National Agenda and the Demographic Opportunity Document projected the need to decrease the TFR to 3.0 children per woman in 2017 and to achieve a TFR of 2.1 children per woman by the year 2030.

The second step was to define the TFR milestones. These are usually found at the national level and in accepted policies (as mentioned earlier). The user of the RAPID module enters the baseline and milestone information for these scenarios into the SPECTRUM model and interpolates between them in order to define the projected TFR for all the years of the projection.

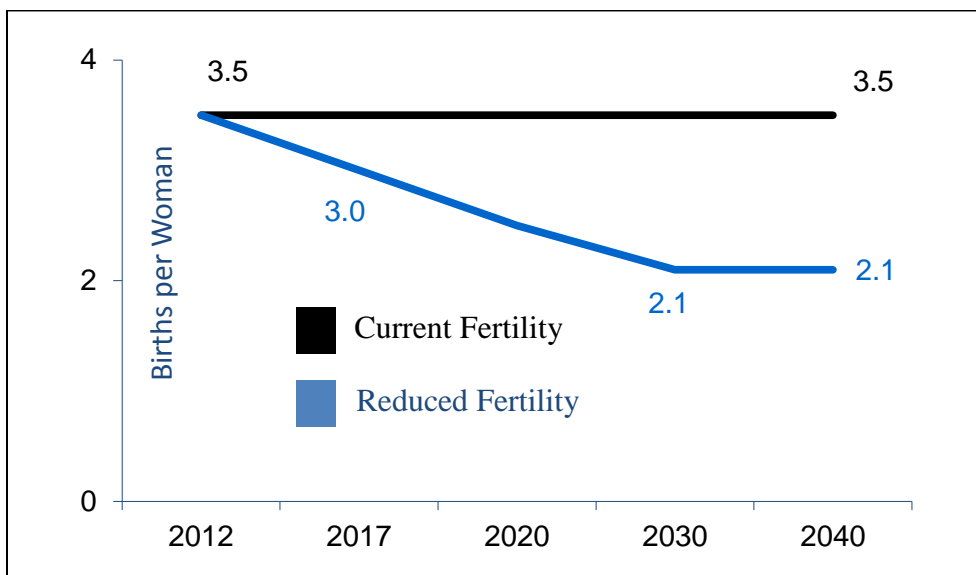
The RAPID presentation prepared two future scenarios based on alternative TFR assumptions:

Scenario 1 - The TFR remains constant at its current level in 2012

Scenario 2 – The TFR declines to reflect the goals of the National Agenda

According to the first scenario, the TFR remains constant at its current rate at 3.5 children per woman. Under the second scenario, the TFR is reduced from 3.5 children per woman in the base year (2012) to reach 3.0 in 2017 and 2.1 in 2030 according to the above mentioned documents. Afterwards, the TFR remains constant (Figure 3).

Figure 3 – Total Fertility Rate (TFR) Scenarios



Source: The National Agenda, the Demographic Opportunity Document, and the Energy RAPID Technical Team

In addition to defining the scenarios and TFR assumptions, the team in collaboration with the DOS, agreed upon the following demographic assumptions:

- 1- Life expectancy for males and females
Total life expectancy was projected to increase to 75 in 2017 and remain constant afterwards. These assumptions were based on the data and studies received from DOS
- 2- Net migration
In light of the lack of accurate and up-to-date data the team decided to estimate the net migration to be zero.

4.4 Population projections :

Upon initiating the population projections, the RAPID module requires the identification of the base year, and the last year of projection. In order to obtain the best results, the span of the time period for estimation should not exceed 50 years. Longer projection periods of time tend to dilute the effectiveness of the results obtained, as policy makers are oftentimes more concerned with short-term, rather than long-term impacts.

Once the base year is identified, the user of the module (DemPorj) enters population information based on:

- 1- Sex (male and female)
- 2- Five years groups (0-4, 5-9, 10-14, ..., 65+)

These data are taken from the latest DOS studies and surveys. In addition, the user enters the following information:

- 1- The TFR (based on the defined scenarios)
- 2- The ASFR (Age Specific Fertility Rate) – in this section the user can choose between manual entry of data or one of the model tables most suitable to the situation in Jordan. Based on the data received from HPC and DOS, the land use RAPID was built on the UN Average model table.
- 3- Sex ratio at birth – this identifies the number of male births per 100 female births. Based on the data received from DOS, sex ratio at birth was identified as 105.
- 4- Life expectancy – this is identified as the average number of years a newborn can expect to live based on mortality conditions at the base year. This is identified for both males and females, and has been increasing in Jordan due to the enhancement of the health sector. Based on the data from DOS, males in Jordan are expected to live for 72 years, and females for 74 years. As mentioned earlier, the technical team and DOS projected total life expectancy to increase to 75 in 2017, and to remain constant afterwards.

- 5- Model life table – these tables relate to the survivorship of the population in a country over a period of time. The RAPID module identifies 10 model life tables to choose from. The technical team identified Coale-Demeny East life table as the most appropriate for Jordan.
- 6- International migration – as mentioned earlier, international migration was identified at zero due to the lack of accurate and up-to-date data.

These data, in addition to the population information for the base year, are the main data to be entered in the DemProj module, which calculates the population projections for the defined period of time (2012 – 2040) for the Jordan National RAPID.

Based on the above, the population projections for Jordan were calculated for the years 2012 – 2040 according to the constant and declining TFR scenarios on a 1 year and 5 year basis.

4.5 Defining land use assumptions

The next step in developing the RAPID study was to identify the assumptions used regarding land use, which are:

- Per capita consumption of wheat remains constant over the projection period
- Constant production of wheat per dunum
- Constant international price of wheat as 226 JD per ton

Results could be directed toward the impact of population growth and not any other factors.

4.6 Identifying important variables and calculating projections

Usually decisions on land use are controversial, as land use is a term that is used to describe the many ways for using land resources, such as agriculture, mining, construction, and grazing. Land-use decisions are usually made by those people who own and control the land, but these options are limited to the physical and biological characteristics of the land, such as climate, soil and geography. Land with rich soil is more suitable for farming, while lands exposed to floods are less suitable for housing than the ones located at higher altitudes. Economic factors also affect decisions related to land use. For example, if construction on a land is very expensive due to its location on a slope, it could be used for another purpose. Globally, the complexity of the choices regarding the use of the land is limited by institutional factors, but in Jordan it is related to factors at the level of the governorate and country. Analysis of the land and the earth's crust have become easier in the past few decades due to the availability of new technology, such as Geographic Information System (GIS), making it possible to integrate the natural characteristics of the land with population and economic data, and any other needed information.

The team identified the necessary indicators for land use and which most reflect the effect of population growth on land use whether for the purpose of agriculture or housing. This will lead to developing the necessary advocacy tool to be utilized to influence decision makers with regards to population issues.

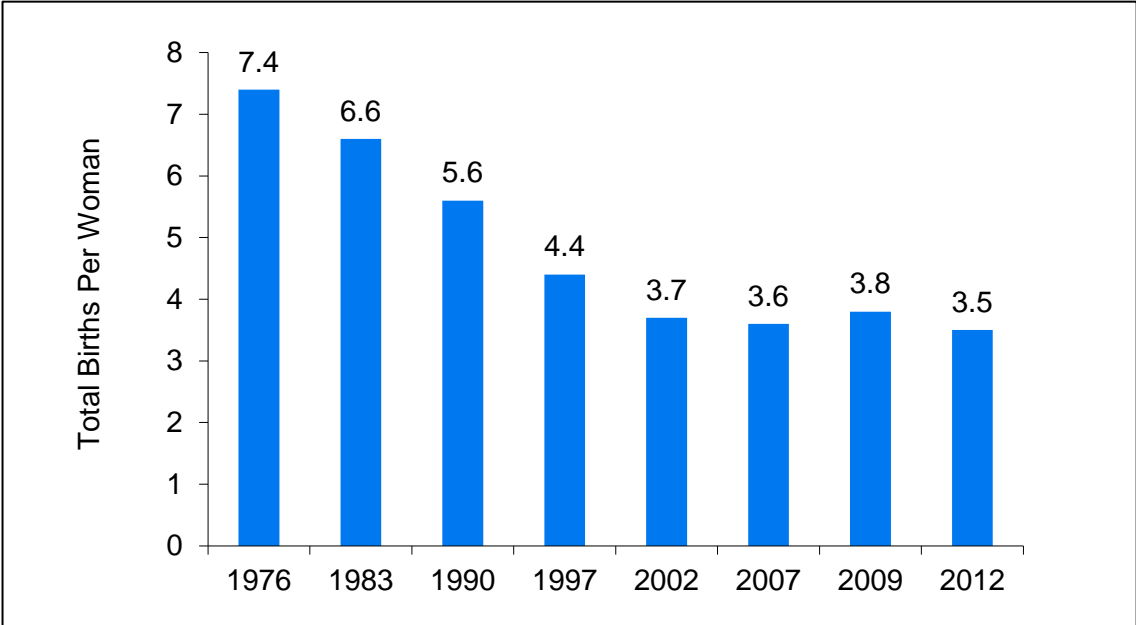
The data were collected for each of these indicators and the formulas that were needed to calculate the projections were entered into the excel sheets (attached CD). Once these indicators were calculated, only indicators with the most importance and impact were chosen for inclusion in the final RAPID study on the effects of population growth on development; specifically on land use.

5. Results

5.1 Population Characteristics

In this section, the main population characteristics of Jordan are provided, including the base year (2012) population data, crude birth rate, crude death rate, the rate of natural increase, and the life expectancy for males and females and the evolvement of the age structure of the Jordanian population during 1979-2012, where the population became more youthful. In addition, the figures show the trend in population growth, and crude birth and death rates, as well as the rate of natural increase during the last fifty years. Also illustrated are the national level changes in TFR since 1976, a decrease from 7.4 children per woman to 3.5 in 2012 (Figure 4).

Figure 4 – Total Fertility Rate (TFR) Trends



Source: DOS, Jordan Demographic and Health Surveys

The data for this section have been gathered from Jordan censuses; the Jordan Population and Family Health Surveys; DOS estimates, studies and reports; the Demographic Opportunity document; and the projections developed by HPP.

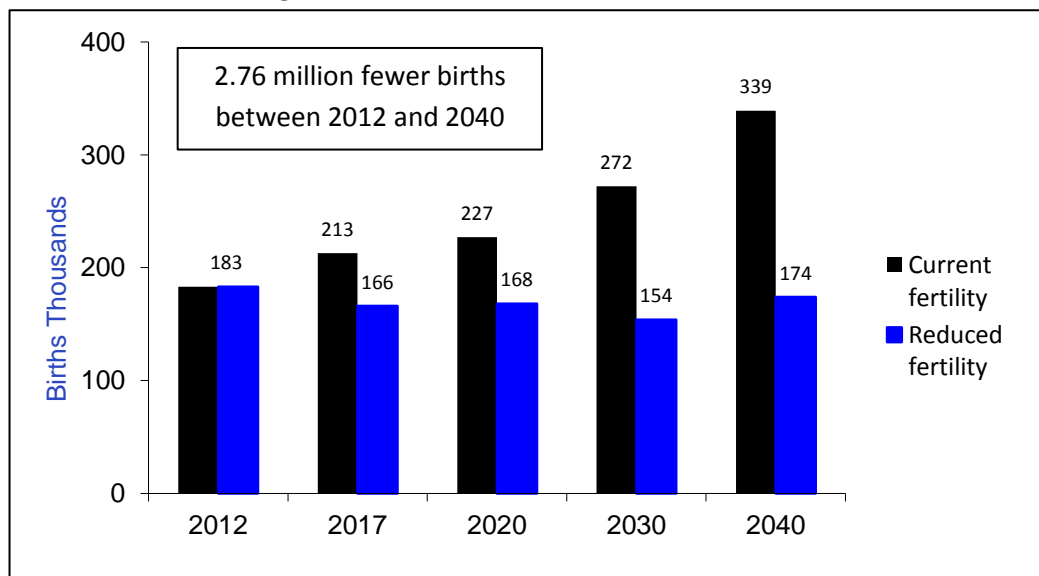
5.2 Population Projections

This section illustrates the effect of population growth on land use in Jordan. This was based on the population projections that were prepared based on the two scenarios of the Total Fertility Rate that were agreed upon. The team decided to use two scenarios as mentioned earlier:

- Constant TFR scenario
- Declining TFR scenario

The section defined the details for each scenario and how they were differentiated in the study. The team decided to use the black color for the first scenario, while blue was used for the second scenario. In addition, the section defined all other population assumptions that were used. The next step was to show the change in the projected annual births and population under the two scenarios. The calculated projections demonstrated that constant TFR does not necessarily mean a constant number of annual births, due to the youthful Jordanian age structure and the large number of women in their reproductive years (15-64). As such, even if fertility remained constant, the annual number of births would still increase, as progressively larger cohorts of females reach reproductive age. In 2012, there were approximately 183 thousand births in Jordan. The projections showed that under the constant TFR scenario, the annual number of births would increase during the next thirty years to 339 thousand by 2040. However, under the reduced TFR the annual number of births would decrease to 174 thousand by 2040 (Figure 5). Overtime, this is equivalent to a difference of 2.76 million fewer births between 2012 and 2040.

Figure 5 – Annual Births (2009-2040)

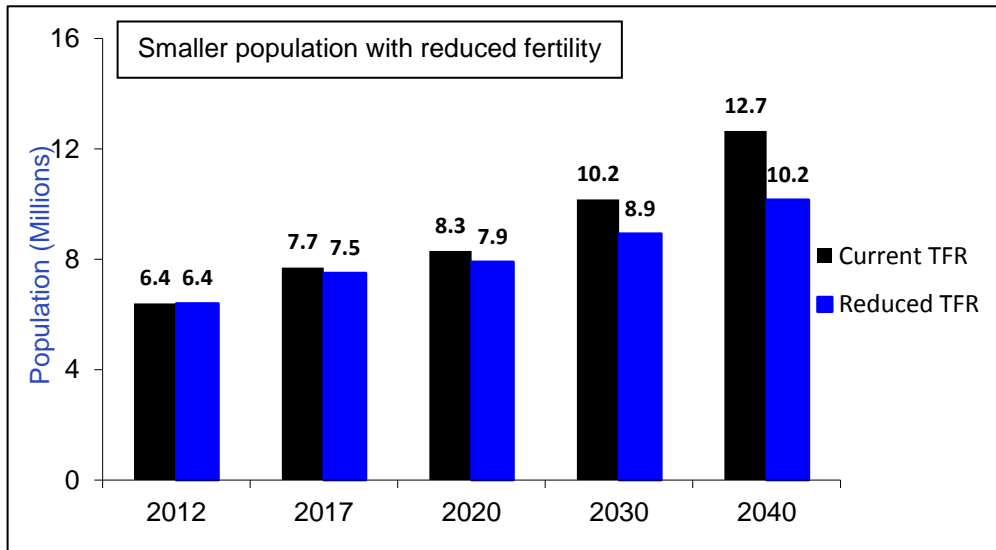


Source: DOS Data and Projections, 2011

Population growth is directly affected by the annual number of births. In 2012, Jordan's population stood at about 6.4 million. If the constant fertility continued and TFR did not decrease, the population

projections predict a substantial increase in the total population, reaching 10.2 million in 2030, and more than doubling to 12.7 million by 2040. Even under the reduced TFR scenario, the population would continue to grow, although at a slower rate, increasing to 8.9 million in 2030 and 10.2 million by 2040 (Figure 6).

Figure 6 – Total Population Growth (2012-2040)



Source: DOS Data and Projections, 2011

The team ensured that for the presentation, each slide contained the source of the data and the assumptions used in calculating the projections as a footnote.

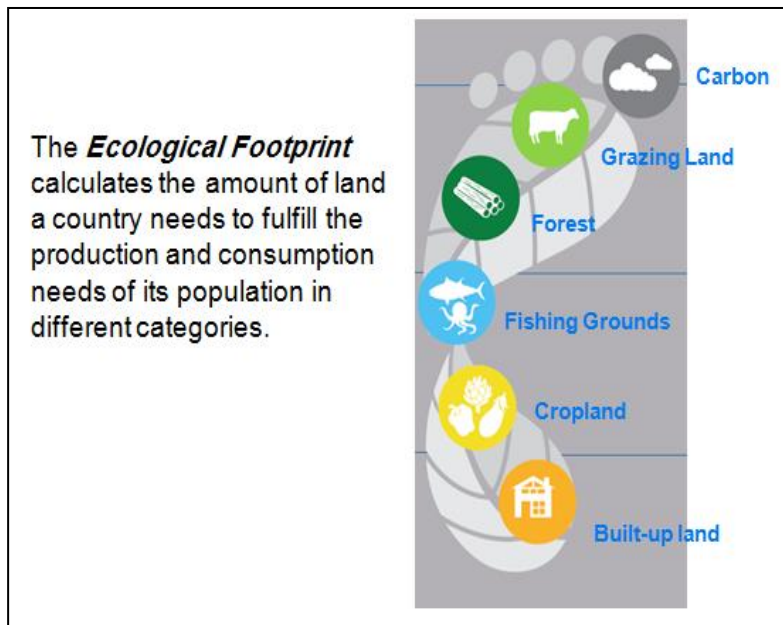
5.3 Land Use Status

Jordan occupies 8.8 million hectares, in the year 2006, 83,000 hectares were classified as forestland, 276,000 hectares were cropland, 742,000 hectares were grazing land and 199,000 hectares supported the country's built infrastructure. Jordan is adjacent to the Gulf of Aqaba, and has 8 thousand hectares of necrotic zone. The agricultural land crops and forests in Jordan are higher than the global average, while the fisheries are at a minimum. In general, Jordan's total bio-capacity is 1.5 million global hectares, which is much lower than its ecological footprint consumption of 11.7 million global hectares. Jordan was susceptible to ecological deficit before 1961, as it's biological productive ability "excluding carbon" was 1.4 million global hectares which was compatible with its local biological burden for its population at that time, suggesting that Jordan probably did not start yet consuming from its natural capital. As previously mentioned the term ecological footprint is widely used, it represents an accounting system for biocapacity and how much biocapacity people use (Figure 7).

Jordan's average ecological footprint per person is 2.1gha [global hectares], less than the global average footprint is 2.7gha. Compared to the rest of the world, the average footprint of an inhabitant in Jordan is small. Footprint values are categorized for Carbon, Food, Housing, and Goods and Services as well as the total footprint number of land area needed to sustain the world's population at that level of consumption. This resource measure is similar to life cycle analysis wherein the consumption of energy, biomass (food, fiber), and based on that building material, water and other resources are converted into a normalized measure of land area called global hectares (gha).

The Global Footprint Network, a scientific institution, performs studies and reports on countries natural resources and measures their ecological footprint. The Ecological Footprint measures the amount of ecological assets (productive land and sea area) that a population needs to produce the goods and services it consumes. Different goods and services require different amounts of land use and thus put pressure on the country's ecological assets.

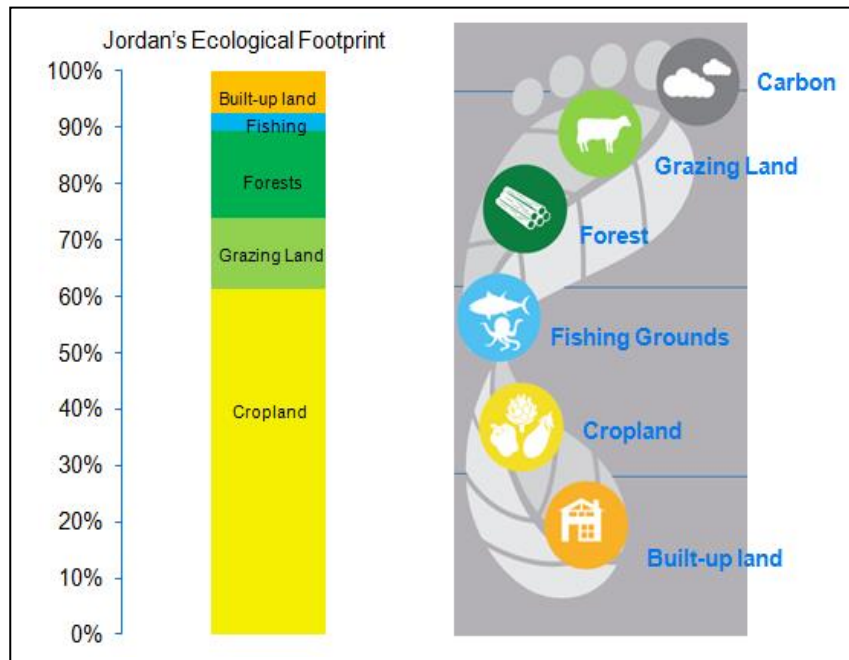
Figure 7: Ecological Footprint



Source: Global Footprint Network, Mediterranean Ecological Footprint Trends

A country's footprint can exceed its capacity by either drawing down upon its assets (e.g. land degradation) or by importing goods and services from other countries, thus using their resources. The biggest component of Jordan's footprint, more than 70%, is related to food consumption as shown in the bar chart. However, Jordan's food security is far from being achieved (Figure 8).

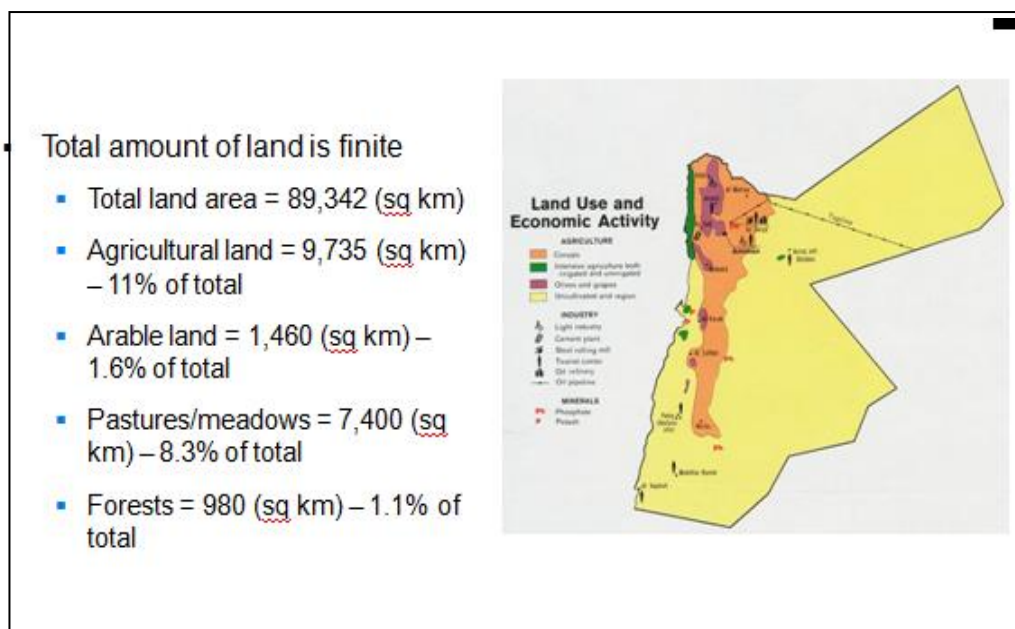
Figure 8- Components of Jordan's footprint



Source: Global Footprint Network, Mediterranean Ecological Footprint Trends

As for the current land use, (Figure 9), the productive land in Jordan is very limited. Only 11% of the total land area can be considered as agricultural land, of which less than 2 % is arable and the rest is ranges and forests.

Figure 9- Current Land Use in Jordan

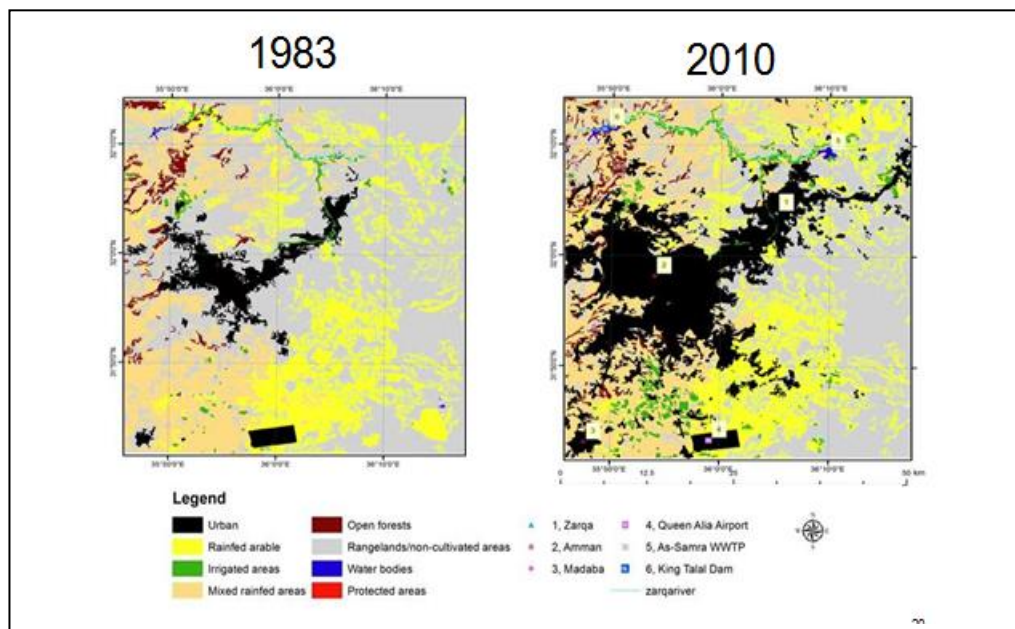


Source: Global Footprint Network, Mediterranean Ecological Footprint Trends

For further clarification, we will use Amman and Zarqa governorates as an example (Figure 10). In the last 25 years and as shown in the map, scarce productive lands in Jordan (in yellow) were used to absorb the urban spill over (in black) of the two rapidly growing cities (Amman and Zarqa), resulting in the loss of agricultural lands in the west, north and south area of Amman. A similar trend has also taken place in Irbid in the north of Jordan.

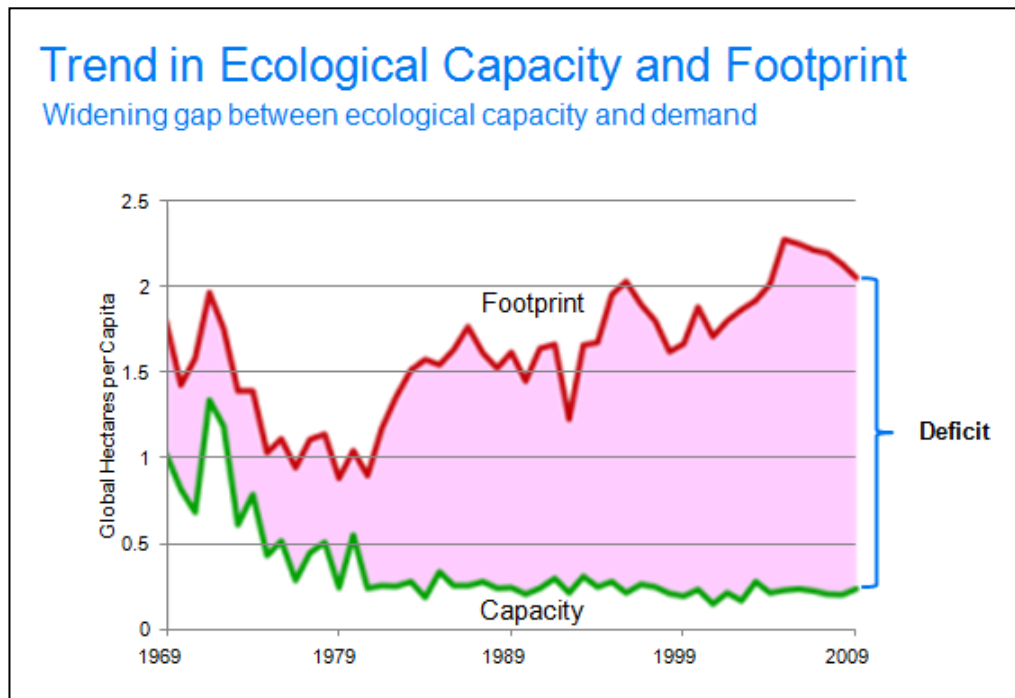
As previously mentioned, the total population has been increasing over the past several years. Since 1990, the total population of Jordan has increased from about 3.5 million to its current level of about 6.4 million – an increase of almost 3 million people. As a result, the number of households has also been increasing. To accommodate housing increases, more land has to be used to build housing units, meaning that more land must be taken from agricultural land, grazing land or forest – and lack of adequate zoning ordinances has meant that this land has come from potentially productive agricultural lands. Compounding this issue is the fact that much of the building has been taking place on lands which are suitable for growing crops based on rainfall. By building on these lands, the amount of land that can be supported with rainfall – as opposed to requiring irrigation - has been declining, whereas the irrigated land has increased. Since 1999, the amount of rainfed growing land has decreased from about 2.2 million dunums to 1.4 million dunums in 2011 – a decrease of 36%. In efforts to compensate for the loss of this rainfed land, more land has been brought into production through irrigation. The amount of irrigated lands have increased from about 800,000 dunums in 1999 to about 1 million dunums in 2011, coming at a large expense to the government. If these trends were to continue in the future, the amount of irrigated land would surpass the rainfed land within 5 years, by 2018.

Figure 10- Change in Amman and Zarqa Land Area 1983-2010



Jordan’s continued economic development and concomitant population growth is putting increased pressure on natural resources and the environment. In this section, we briefly examine the implications of these changes through the lens of a framework called the “Ecological Footprint” that has been developed by the Global Footprint Network which has calculated footprints for most countries in the world, including Jordan (Figure 11).

Figure 11- Jordan’s Ecological Footprint 1969-2009



Source: Global Footprint Network, Mediterranean Ecological Footprint Trends

Over the past 40+ years, the gap between the ecological footprint and the local capacity has grown. This deficit has largely been made up for by importing goods, especially food and energy, from abroad. The ecological capacity of Jordan has been largely constant and if anything has decreased and is likely to decrease in the future due to overuse of arable land, water shortages and climate change. The ecological deficit poses threats in several areas. Increased reliance on imports for energy and food pose security threats; increased air and water pollution pose public health threats to the population. (For example air pollution has been linked to increased morbidities of asthma and cancer). Water shortage and land degradation are also problems. The threats to Jordan of the ecological deficit could be summed up in the following:

- Increased reliance on imports threatens economic security
- Food insecurity with less agricultural land and more dependence on imports
- Increased air and water pollution pose public health threats

- Water shortages
- Land degradation

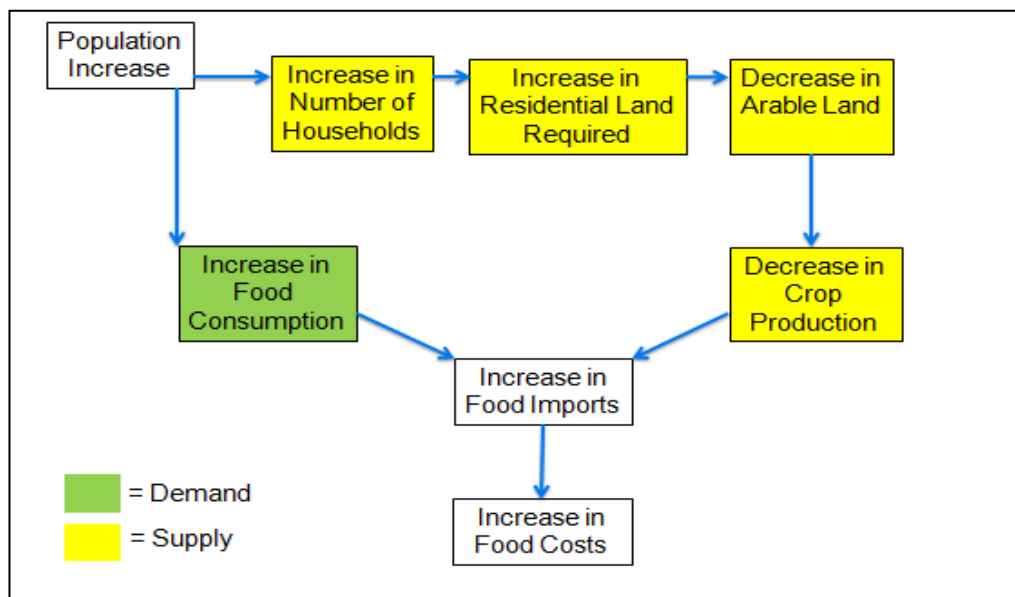
The latest data issued in Statistical Yearbook (2012) for the Department of Statistics indicates:

- Area cultivated with field crops (thousand dunum): 1155.3
- Area cultivated with vegetables (Thousand Dunum): 422.9
- Area planted with fruit trees (Thousand Dunum): 858.6
- Total number of sheep (in thousands): 2234
- Total number of goats (in thousands): 792
- Total number of cows (in thousands): 68.5

5.4 Population Growth Impacts on Land Use

Population growth affects the amount of food that must be imported, its' cost, and the demand and supply for food products. Population growth results in an increase in the amount of food that is consumed, while at the same time, results in a decrease in the amount of food that is produced. On the consumption side, population increases result directly in increases in consumption as more people need to be fed, assuming that the average consumption of an individual for any food item remains constant over time. On the production side, the population increase will result in increases in the number of households, resulting in increases in the amount of land that is needed for housing, resulting in a decrease in the amount of land that can be used to grow food, finally resulting in decreased crop production (Figure 12).

Figure 12- Impacts of Population Growth on Land Use Framework



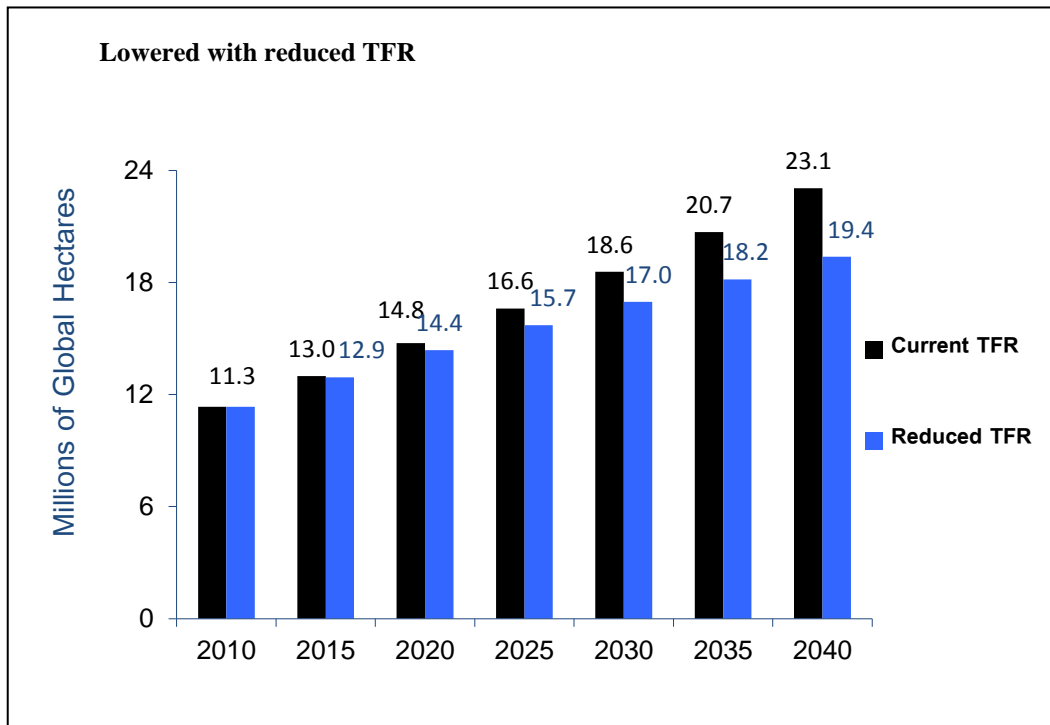
Population growth is one of the main factors that accounts for the increasing ecological deficit in Jordan. Using the per capita footprint and per capita ecological capacity estimates prepared by the Global Footprint Network, and using our two population scenarios, we will find that lowering population growth will lower the deficit. Also there will be an increase in demand for land used for housing. Assuming that the average area per housing unit remains at today's levels – about 100 square meters per housing unit, the annual amount of the new land areas that would be needed to accommodate the increase in the number of housing units under current fertility will continued to increase from about 3 million square meters per year today to about 3.7 million square meters per year in 2030 and to 4.4 million square meters per year in 2040. With reduced fertility, the amount of annual new land areas that would be required to accommodate the new housing units would be 2.2 million square meters per year in 2030 and about the same in 2040. Over the 2012-2040 period, about 94 million new square meters of housing area would need to be created to meet the increasing number of housing units with current fertility continued. With reduced fertility, about 61 million new square meters would need to be created for new housing units over the 2012-2040 period – or 33 million fewer square meters would be needed for housing units.

If we assume that the average number of people per household remains constant, the number of new housing units that will be required between now and 2040 will be approximately 1 million with current fertility continued. With reduced fertility, only about 670 thousand new housing units will be required, or 2/3 of those required with current fertility continued. The land required for these new housing units would need to come from existing agricultural land (land currently used to grow crops, graze animals or contain forests).

Indicator 1- Ecological Deficit

As mentioned above, population growth is one of the main factors that accounts for the increasing ecological deficit in Jordan. Using the per capita footprint and per capita ecological capacity estimates prepared by the Global Footprint Network, and using the two population scenarios, we see in this graph that lowering population growth will lower the deficit. If the current fertility rate continues, the number of global hectares required to support Jordan's population would increase from 11.3 million in 2010 to 23.1 million by 2040. With reduced fertility, the number of global hectares would increase to 19.4 million by 2040. In 2040, 16% fewer million global hectares would be required as a result of reduced fertility (Figure 13).

Figure 13- Estimates of the Ecological Deficit 2010-2040

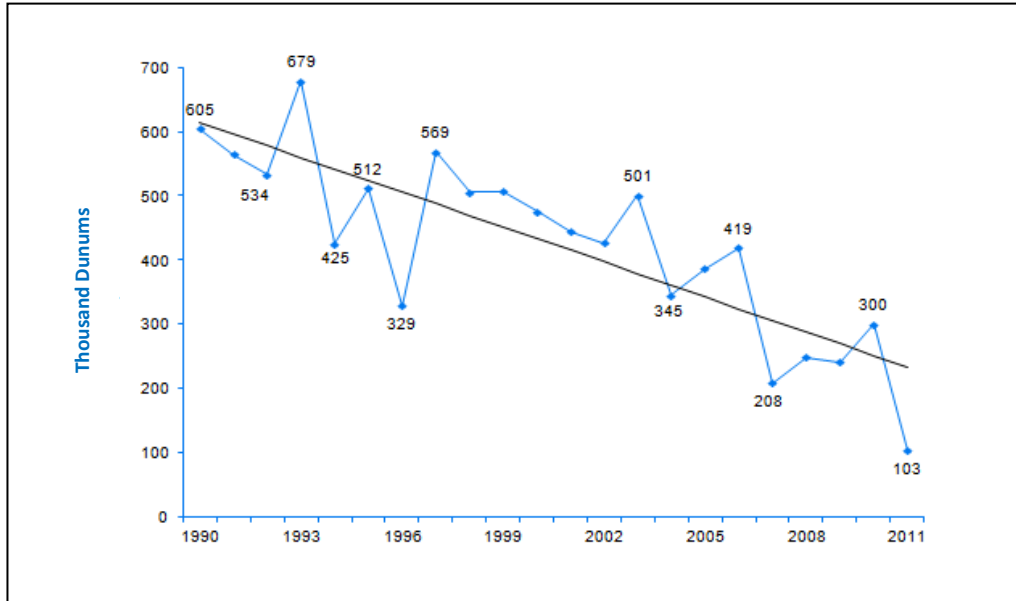


Indicator 2- Impact of Population Growth on Food Supply and Demand and on Land Use

Population growth also affects the amount of land that is available to grow food. As the population increases and more land is required to provide housing and facilities (such as schools, hospitals, mosques, etc.), the amount of land available to produce food is taken out of production. While zoning laws help reduce the impact of transitioning land from agricultural to residential use, these laws are not universally applied throughout Jordan and are not always 100% effective.

Using wheat as an example, we can see that the area planted with wheat has decreased significantly over the past two decades. In 1990, 605 thousand dunums were planted in wheat. By 2011, as increasing amounts of land previously used for wheat production were being used for other purposes, the number of dunums planted with wheat fell to 103,000 dunums. If this trend continues, domestic production of wheat would disappear by 2024 – 11 years from today (Figure 14).

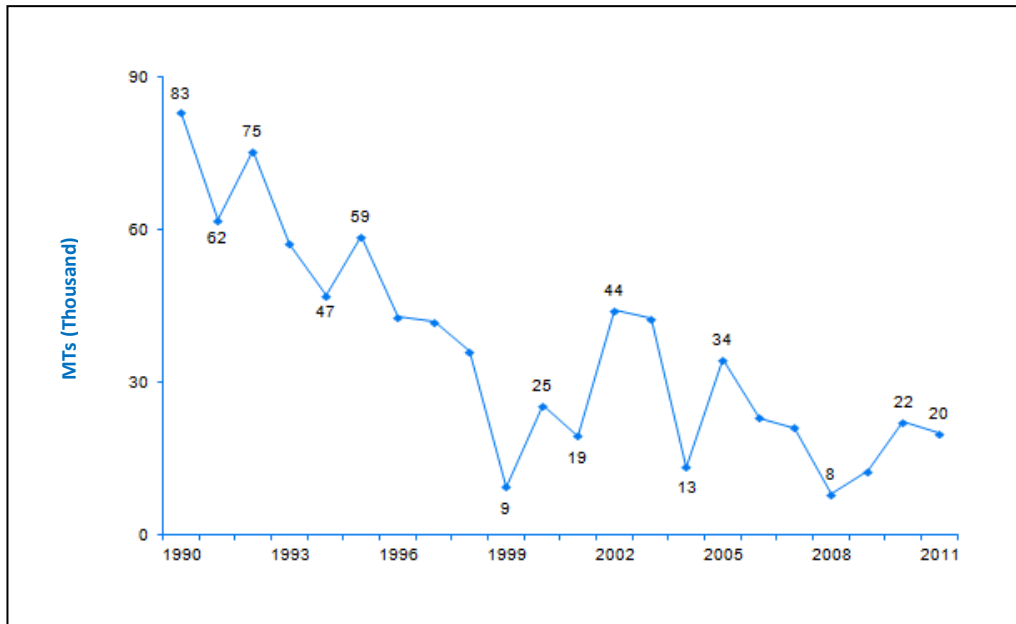
Figure 14- Area Planted in Wheat (1990–2011)



Source: Department of Statistics, Jordan Statistical Yearbook 2011

The declining area planted with wheat has led to a decrease in the amount of wheat produced. As we can see from the graph, wheat production fell from a high of about 83,000 MTs in 1990 to about 20,000 MTs in 2011. Jordan's self-sufficiency in wheat dropped from 12% ; to 2.7% for those two years (Figure 15).

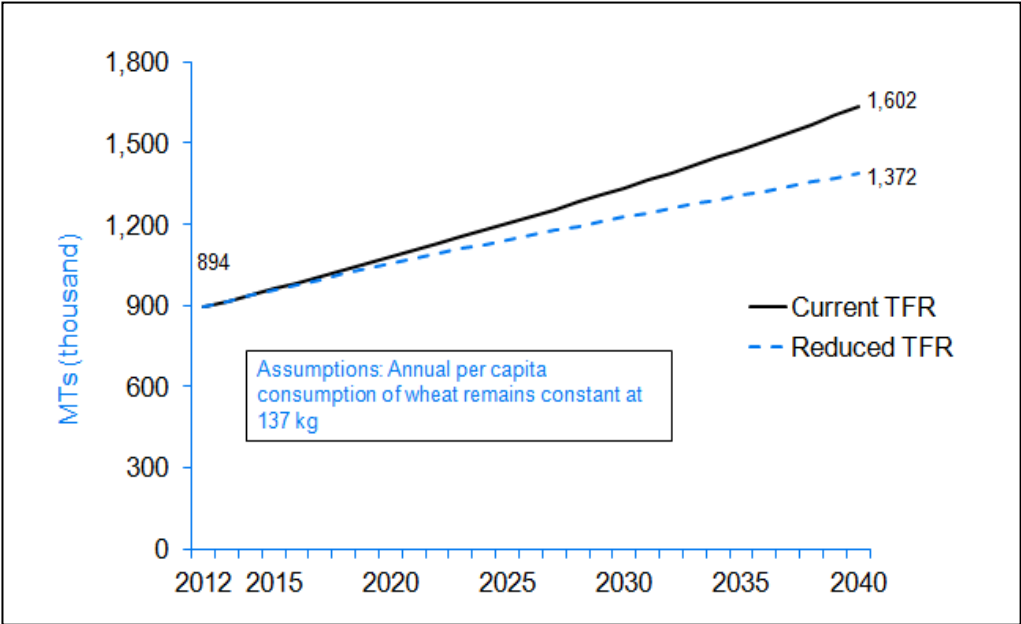
Figure 15- Wheat Production (1990–2011)



Source: Department of Statistics, Jordan Statistical Yearbook 2011

At the same time that wheat production was declining, the consumption of wheat was increasing. Given population growth, this trend will continue in the future. Assuming that current per capita consumption of wheat remains constant (137 KG per year), total wheat consumption would increase from about 894,000 MTs in 2012 to 1.6 million MTs by 2040. With reduced fertility, total wheat consumption would increase to 1.4 million MTs in 2040 (Figure 16).

Figure 16- Total Wheat Consumption 2012-2015

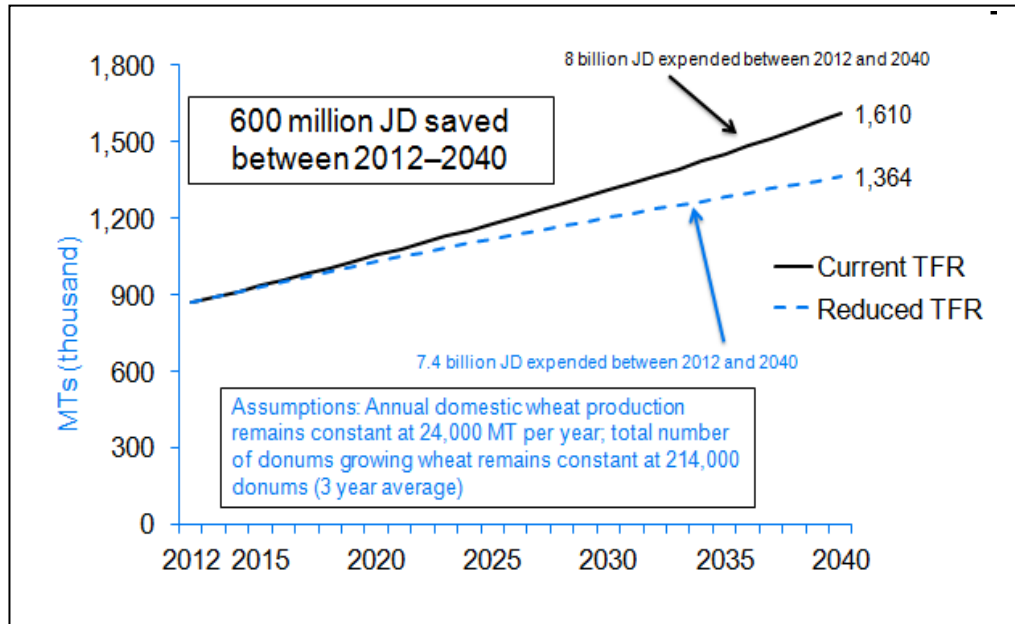


Source: Department of Statistics, Jordan Statistical Yearbook 2011 and SPECTRUM projections

Even if the number of dunums devoted to growing wheat remained constant, which would be optimistic given that existing lands may be used to accommodate building needs of the growing population, wheat imports and the amount spent on importing wheat would increase in the future because of the increased consumption due to population growth.

Again, assuming the optimistic scenario that no more land will be taken away from producing wheat, the amount of wheat that would need to be imported if the current fertility continued would increase from 870,000 MTs today to 1.6 million MTs by 2040. With lower fertility, the amount of wheat imported would still be high, but would only be 1.36 MTs in 2040, - about 240,000 MTs less than with continued high fertility (Figure 17).

Figure 17- Projected Annual Wheat Imports 2012-2040



Source: Department of Statistics, Jordan Statistical Yearbook 2011 and SPECTRUM projections

6. Conclusions and Recommendations

Main results:

In light of the agreed upon scenarios for the TFR, the main results were:

1. Assuming constant consumption per capita, the annual wheat will increase from 900,000 MTs in the year 2012 to 1.6 million MTs by 2040 in the current fertility rate scenario. With lower fertility, the amount of wheat will decrease to 1.4 million MTs in 2040,
2. As a result of lower fertility, 600 million JD will be saved between 2012–2040 on importing wheat to cover population needs.
3. With current fertility continued, the number of global hectares required to support Jordan's population would increase from 11.3 million in 2010 to 23.1 million by 2040. 16% fewer million global hectares would be required as a result of reduced fertility.

Recommendations:

To address the land use challenges that are currently facing Jordan, the Government of Jordan has developed a long-term strategy to preserve its current land resources so future population and development needs can be met. The main actions that need to be taken include:

- Increase self-sufficiency in food (proportion of self-sufficiency)
- Adopt the principal of economic efficiency in managing and using factors of agricultural production (water, agricultural land, capital, labor force) while protecting the environment and sustaining long-term production
- Increase income and profits from agriculture and improve the living standards of farmers and others living on agriculture-related activities
- Direct agricultural production to meet the needs of local, regional and international markets and be competitive in terms of quality and price
- Maximize the value-added of agricultural activities to GDP
- Increase the contribution of agricultural exports to improve the trade balance
- Achieve social and economic equity between agriculture and other economic sectors and within the agricultural sector itself
- Achieve complementarity of agricultural activities with Arab countries and seek cooperation with countries in the region and production and exchange of agricultural goods and foods on a balanced exchange of benefit basis for all parties

Also the following should be considered:

- ✓ Appropriate zoning codes to be developed
- ✓ These zoning codes need to be enforced
- ✓ More effective and efficient use of current land needs to be encouraged
- ✓ Innovative approaches to housing need to be developed (building up, not out)

In addition to those steps listed above, encroachment by the population on agricultural land needs to be reduced – which is dependent on population. If Jordan is to preserve its agricultural and forested lands, the overall population growth rates need to be reduced. This reduction can, in large part, be addressed by reducing the level of fertility and slowing the growth rate of the population. The following are some ways to bring about reduced population growth.

In addition to those steps listed above, encroachment by the population on agricultural land needs to be reduced. If Jordan is to preserve its agricultural and forested lands, there is a need to reduce the expansion of population needs. This reduction can, in a large part, be addressed by reducing the Total Fertility Rate (TFR) and slowing the growth rate of the population. The following are some ways to bring about reduced population growth.

- **First**, there needs to be public support of population policies and programs by high-level officials. Not only do these high-level officials decide on policies that affect population growth, but they also send an important message to everyone that reducing population growth is beneficial to everybody and all sectors – it is an essential part of the health and well-being of families and the country.
- **Second**, it is critical that all ministries consider population in their plans. This does not mean that the ministries need to merely ‘account’ for population growth, but they also need to recognize that population growth is variable and can be influenced through their advocacy efforts.
- **Third**, it is essential that adequate funds are provided to implement plans and actions required to reduce population growth.
- **Finally**, governmental and non-governmental organizations and affiliations must be able to work together to bring about the necessary actions required to reduce population growth.

Family planning can directly affect population growth, which in turn will affect the future demand for food and land. Providing high quality family planning services, family planning counseling and contraceptives will influence the level of family planning usage but all this requires financial resources. It is critical that sufficient funds are provided to support these efforts.

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