An-Najah National University
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Urban Agriculture As Tool For City Planning
Nablus City As A case Study

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This thesis is dedicated to my proud parents

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List of acronyms and Abbreviations

ARIJ	Agriculture Research Institute – Jerusalem
AVRDC	World Vegetables Center
CBO	Community Based Organizations
CE	Centaury
CFP	Good Farming Practicies
CGIAR	Consultative Group on International Agriculture Research
Cº	Degree Centigrade
COAG	Coordinadora de Organizaciones de Agricultores y Ganaderos
EIA	Environmental Impact Assessment
EPA	Environment Protection Agency
FAO	Food and Agriculture Organization of the United Nations
GATE	German Appropriate Technology Exchange
GIS	Geographic Information System
GS	Gaza Strip
GTZ	German Agency for Technical Cooperation
hr	Hour
ICRC	International Consultancy and Research Center
IDRC	International Development Research Center
IFPRI	International Food Policy Research Institute
IIRR	International Institute of Rural Reconstruction
KfW	German Development Bank
Kg	Kilogram
Km	Kilo meters
KV	Kilo Volt
l/c/d	Litter per capita per day
MCM	Million Cubic Meters
mm	Millimeter
MoA	Ministry of Agriculture
MSW	Municipal Solid Wastes
NGO	Non- Governmental Organization
NIS	New Israeli Shakels
NORAD	Norwegian Agency for Development Cooperation
OCHA	Office for the Coordination of Humanitarian Affairs
oPt	Occupied Palestinian Territories
PARC	Palestinian Agriculture Relief Committees
PCBS	Palestinian Central Bureau of Statistics
RUAF	Resources on Urban Agriculture and Food security
SKAT	Swiss Resources Center and Consultancies for Development
SW	Solid Wastes
TUAN	Technical Urban Agriculture Network

TUAN	Transferring Urban Agriculture Network
UA	Urban Agriculture
UA	Urban Agriculture
UfW	Uncounted for Water (water losses)
UNCED	United Nations Conference on Environment and Development
UNCHS	United Nations Center for Human Settlement
UNEP	United Nations Environment Program
UNU	United Nations University
UP	Urban Planning
USD	United Sates Dollars
SWOT	Strengthen, Weakness, Opportunity and Threats analysis approach
V	Volt
WB	West Bank
WFP	World Food Program
WHO	World Health Organization
WRI	World Resources Institute
WW	Waste Water

URBAN AGRICULTURE AS A TOOL FOR CITY PLANNING: NABLUS CITY AS A CASE STUDY

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ABSTRACT

Urbanization is one of the major issues facing mankind today and is in its extent unique in world history. Neither international government bodies nor national or local governments are well prepared to deal appropriately with this development but none of them can afford to ignore this phenomenon.

It is expected that by 2020, 40-45% of the poor in the Palestinian territories will be concentrated in towns and cities such as Nablus. The population projections showed that more 424,400 inhabitants will be served by the Metropolitan Nablus municipality in the year 2025. The rapid increase of population almost accompanying with the increase demand on food, space , water, job opportunities and renewable resources.

The huge estimated quantities of consumed food by Nablus dwellers estimated in year 2000 at 38,584 tons will defiantly increase making the situation more complicated for the city planner to secure the city from the food consumption point of view, construction of suitable roads, storage facilities, lands for cultivation, and preserving enough water for irrigation.

However, in the light of water scarcity which jumped from – 1,322 m^3 per year in 2005 into -30,697 m^3 per day in year 2025, and the decrease of the per capita available land from 150 m^2 in year 1989 to 78 m^2 in year 2000 in the light of high percentage of unemployed inhabitants, will complicate the problems of city planning.

This research which aimed at introducing urban agriculture as a tool for city planning have had investigated the impact and methods of such and as appropriate mitigation measure against major city problems in the city planning have a huge important conclusions leading to multiple scenarios to mitigate the problems of immigration of rural people to the city center and against the environmental hazards associated with urbanization such as the increase of solid wastes amounts, untreated waste water and many others.

It is important to involve the multiple stakeholders in urban development utilizing urban agriculture as a tool for city planning due to its significant capabilities in preserving the environment, reforming the land use, mitigate random immigration, offering job opportunities. Representatives including municipal departments, NGO's, local leaders, village councils, private sector, academic or research and interested institutions must be involved in the planning processes is essential in order to address the needs and priorities of the different stakeholders involved, as well as the specific socio-economic and political-institutional context in each locality in order to allow better quality decision finding and making, improving likelihood of implementation and give the process a higher credibility for implementation.

The local, provincial and national governments play a key role, ensuring the availability and secure tenure of land and water, access to public services, approval of regulations and standards, at the different levels of government are already engaged in many areas of service provision and regulation, such as urban planning, water treatment, waste collection, management of green spaces, which have direct interactions with urban agriculture.

Finally, the methodological approach adopted during the preparation of this vital research was including the data gathering and analysis using SWOT analysis techniques and many other calculations using the basic computer software packages. The basic data was collected from different and wide sources of information including newspapers, reports, books, magazines, articles and many others.

CHAPTER ONE

GENERAL INTRODUCTION

1.1 Introduction

Many approaches and efforts have been made and continuously taking place in Palestine to handle appropriate applications toward achieving a sustainable and realistic city planning (UNDP, 1999). However, city planning in Palestine is rarely addressed the urban and peri-urban agriculture and its vital role and impact on the city environment.

Recently, many international development agencies and research institutes have begun to emphasise the need for innovative and integrated strategies in urban land use mapping and planning, taking into account environmental and social questions with a special mention in order to stimulating small scale economic activities by the urban population in the area of food production within the city boundary (Shukla, V., 1996). The latter is known as urban agriculture which considered as one of the most effective mitigation approach against urban poverty, food insecurity, and environmental challenges (FAO, 2000).

The term urban agriculture can be defined in its simplist meaning as the growing of plants and the raising of animals within and around cities and distinguished from rural agriculture by its abilities to be integrated into the urban economic and ecological system. Such integration is including: (i) the use of urban residents as labors, (ii) the use of typical urban resources

(like organic waste as compost and urban wastewater for irrigation), (iii) the direct links with urban consumers, (iv) the direct impacts on urban ecology (positive and negative) and, (v) being part of the urban food system which also competing for land with other urban functions (UNHABITAT, 1996).

According to United Nations in 1987, urban agriculture is not a reflict of the past that will fade away (urban agriculture increases when the city grows) nor brought to the city by rural immigrants that will loose their rural habits over time and therefore it is an integral part of the urban system and worth to be investigated as a tool for city planning.

1.2. Scope and significant:

The rapid urbanization that is taking place goes together with a rapid increase in urban poverty and urban food insecurity. By 2020 the developing countries of Africa, Asia, and Latin America will be home to some 75% of all urban dwellers, and to eight of the anticipated nine mega-cities with populations in excess of 20 million. It is expected that by 2020, 85% of the poor in Latin America, and about 40-45% of the poor in Africa and Asia will be concentrated in towns and cities (IDRC, 1999).

By 2025, Nablus city population is projected to reach 261900 inhabitants (Nablus Municipality population projection, 2006) and expected to have great difficulties to cope with this development or to create sufficient formal employment opportunities mainly for the poor. Therefore, using urban agriculture as a tool for the city planning will provide: (i) a

complementary strategy to reduce urban poverty and food insecurity, (ii) enhancement on the aspect of environmental management, (iii) enhancement on the aspect of urban food security (UNCED - Agenda 21).

In other words, the integration of urban agriculture concepts into the city planning tools will also contribute to the local economic development, poverty alleviation and social inclusion of the urban poor and women in particular, as well as to the greening of the city and the productive reuse of urban wastes (www.fao.org). In general, the significance of this vital research could be summarized but not limited to the following aspects:

1.2.1. The aspect of food security and insecurity conditions:

Based on the World Bank poverty threshold (for West Bank) of 2.3 US$ per person per day where Nablus households fall well below the poverty line in their cash income and therefore they are unable to meet either basic or food needs. (ICRC report, 2006 & OCHA report 2005). The enhancement of urban agriculture within the city bounders assumed to improve food security conditions for the city households, taking into consideration the fact that 37.38% of Nablus residents are food insecure, 11.24% vulnerable, 21.24% are marginally secure, while only 30.14% are food secure (FAO report,2007)

The contribution of urban agriculture to food security and healthy nutrition is probably its most important asset. Food production in the city is in many cases a response of the urban poor to inadequate, unreliable and irregular access to food, and the lack of purchasing power.

Most cities in developing countries are not able to generate sufficient (formal or informal) income opportunities for the rapidly growing population. The World Bank (2000) estimates that approximately 50% of the poor live in urban areas (25% in 1988). In urban settings, lack of income translates more directly into lack of food than in a rural setting (cash is needed). The costs of supplying and distributing food from rural areas to the urban areas or to import food for the cities are rising continuously, and it is expected that urban food insecurity will increase (Argenti 2000).

Urban agriculture may improve both food intake (improved access to a cheap source of proteins) and the quality of the food may improve (poor urban families involved in farming eat more fresh vegetables than other families in the same income category). For example, in Harare, sixty percent of food consumed by low-income groups was self-produced (Bowyer-Bower and Drakakis-Smith, 1996). In Kampala, children aged five years or less in low-income farming households were found to be significantly better-off nutritionally (less stunted) than counterparts in non-farming households (Maxwell, Levin and Csete 1998). Urban producers obtained 40 to 60 percent or more of their household food needs from their own urban garden (Maxwell and Zziwa 1992). In Cagayan de Oro, urban farmers generally eat more vegetables than non-urban farmers of the same wealth class, and also more than consumers from a higher wealth class (who consume more meat) (Potutan et al.1999). In addition to production

for their own consumption needs, large amounts of food are produced for other categories of the population.

It has been estimated by UNDP and FAO that 200 million urban residents provide food for the market and 800 million urban dwellers are actively engaged in urban agriculture in one way or another. A global estimate (data 1993) is that 15-20% of the world's food is produced in urban areas (Margaret Armar-Klemesu 2000).

1.2.2. Economical aspect:

Growing own food saves household expenditures on food; poor people in poor countries generally spend a substantial part of their income (50 – 70%) on food. Growing0……..

the relatively expensive vegetables therefore saves money as well as on bartering of produce. Selling produce (fresh or processed) brings in cash (René van Veenhuizen (2006).

Besides the economic benefits for the urban agricultural producers, urban agriculture stimulates the development of related micro-enterprises: the production of necessary agricultural inputs and the processing, packaging and marketing of outputs. The activities or services rendered by these enterprises may owe their existence in part or wholly to urban agriculture. Other services may also be rendered by independent families and groups (RUAF).

Input production and delivery may include activities like the collection and composting of urban wastes, production of organic pesticides, fabrication of tools, delivery of water, buying and bringing of chemical fertilizers, etc. (Argenti 2000). Transformation of foodstuffs may include the making of yoghurt from milk, or the frying of plantains or yams, chicken or eggs, etc. This might be done at the household level, to sell at the farm gate or in a local shop or market, and larger units to sell in supermarkets or even for export (www.fao.org).

Special attention is needed for the strengthening of the linkages between the various types of enterprises in clusters or chains. The municipality and sectoral organizations can play a crucial role in stimulating micro-enterprise development related to urban agriculture.

1.2.3. Social aspect:

Urban agriculture may function as an important strategy for poverty alleviation and social integration. Several examples exist of municipalities or NGOs that have initiated urban agriculture projects that involve disadvantaged groups such as orphans, disabled people, women, recent immigrants without jobs, or elderly people, with the aim to integrate them more strongly into the urban network and to provide them with a decent livelihood. The participants in the project may feel enriched by the possibility of working constructively, building their community, working together and in addition producing food and other products for consumption and for sale (IDRC).

In more developed cities, urban agriculture may be undertaken for the physical and/or psychological relaxation it provides, rather than for food production. Also, urban and peri-urban farms may take on an important role in providing recreational opportunities for citizens (recreational routes, food buying and meals on the farm, visiting facilities) or having educational functions (bringing youth in contact with animals, teaching about ecology, etc.) (www.fao.org).

1.2.4. The aspect of urban ecology:

Urban agriculture is part of the urban ecological system and can play an important role in the urban environmental management system.

Firstly, a growing city will produce more and more wastewater and organic wastes. For the city of Nabuls the disposal of wastes has become a serious problem. Urban agriculture can help to solve such problems by turning urban wastes into a productive resource. The city municipality initiatives exist to collect household waste and organic refuse from vegetable markets and agro-industries in order to produce compost or animal feed, but one can also find urban farmers who use fresh organic waste (NORAD: IEA for Urban development, 1996).

Quality compost is an important input that can fetch a good price, as the example compost allows an urban farmer to use less chemical fertilizers and by doing so preventing problems related to the contamination of groundwater. In addition, compost-making initiatives create employment and provide income for the urban poor (UNU: cities & environment: 1999).

Farmers may use wastewater for irrigating their farms when they lack access to other sources of water or because of its high price. The use of fresh (untreated) wastewater has the additional advantage for poor urban farmers that it contains a lot of nutrients (although often not in the proportions required by their soils and crops). However, without proper guidance, the use of wastewater may lead to health and environmental problems. Farmers need to be trained in self- protection during handling of the wastewater, proper crop selection and adequate irrigation methods, among other things. Technologies such as hydroponics or organoponics, drip irrigation, zero tillage etc. substantially reduce water needs and health risks (FAO: Better farming series 32).

The treatment and reuse of more urban wastewater in agriculture also needs to be ensured. This necessitates special decentralized treatment facilities and low cost (preferably bio-) technologies. In many cases, partial treatment will be optimal for agricultural reuse. More and more experience is being gained in public-private initiatives involving private enterprises and/or civic organizations in the development and management of municipal wastewater treatment plants. However, in Nablus the Municipality has developed many plans for waste-water treatment which when implemented, the treatment capacity will be far lower than what is needed for many years to come, and farmers will continue to use raw wastewater. The municipality therefore should urge along with other actors to take proper accompanying measures (FAO: Better farming series 32, 2003).

Secondly, urban agriculture may also positively impact upon the greening and cleaning of the city by turning derelict open spaces into green zones and maintaining buffer and reserve zones free of housing, with positive impacts on the micro-climate (shade, temperature, sequestration of CO2) (WHO,1996: Healthy cities)..

Degraded open spaces and vacant land are often used as informal waste dumpsites and are a source of crime and health problems. When such zones are turned into productive green spaces, not only an unhealthy situation is cleared, but also the neighbors will passively or actively enjoy the green area.

1. 3. Research Problem and Objectives:

Urbanization is one of the major issues facing mankind today and is in its extent unique in world history. Neither international government bodies nor national or local governments are well prepared to deal appropriately with this development but none of them can afford to ignore this phenomenon. Recently, poverty is shifting to urban areas, making food insecurity and malnutrition urban problems, and environmental hazard.

Many rationales indicate the need for effective cities planning based on safe food supply without any harm to city environment including natural and physical resources, that urbanization will keep increasing and with this urban poverty will also increase, land and water have become more difficult for the poor to access due to competition from more urban use (residential, industrial) and due to inefficient distribution, and privatization

schemes. Therefore, increase competition for natural resources can squeeze out the lands available for agriculture production within the city boundaries (which offer both food and green view), thus environmental sustainability will be insecure.

The continuous migration of rural people to cities and population natural growth will result in huge number of unemployed individuals which could break down of basic civil services (water supply, food supply, housing, health care, schools, transport, market facilities, and waste management), so as causing lack of food. This phenomenon is less a sudden development, but more a "permanent crisis".

In addition to the points discussed above, specific problems could be addressed more in detail such as inadequate, unreliable and irregular access to food supplies, due to either a lack of availability or a lack of purchasing power, inadequate access to formal employment opportunities, due to deteriorating national economies, the desire for a better habitat e.g. leisure/ personal satisfaction or green cities (e.g. maintaining open spaces), waste management, composting (overall vision). Increasing farming activities in cities are closely linked to economic decline and increasing poverty in urban centers.

This research is aiming at investigating the possibilities of activating or/and integrating urban agriculture as a tool for cities planning considering the city of Nablus as a case study (study area), through studying the

impacts of the required preconditions for the existence of urban agriculture in the city of Nablus. The immediate objectives of this research are:

1- Investigate the natural and environmental conditions in the city of Nablus regarding urban agriculture.

2- Investigate the physical conditions including infrastructure and accessibility for food and water.

3- Investigate the socio-cultural conditions and job opportunities could be saved by implementing appropriate urban agriculture concepts.

4- Investigate the conditions and readiness of institutions to adopt, enhance and collaborate in urban agriculture.

5- Investigate the economic impacts of urban agriculture.

6- Preparing action plan for urban agriculture as a tool for city planning.

1. 4. Methodology and Data Sources:

The methodological approach adopted during the preparation of this research was based on data collection and data analysis. During data collection phase, information on urban planning, urban agriculture and Nablus city (the study area) was gathered and then classified to fit with the research objectives and expected out-puts. In more specific, detailed information was collected in regard with Nablus city expansion, the quantities of solid and water wastes, land use, population growth, food

security and insecurity conditions. Many articles, books, web-sites, literatures, magazines and reports were reviewed for this purpose. Three main digitalized libraries were used during the preparation of this research which is: FAO digitalized libraries, the International Information Center library (Humanity Development library) and the Environment Protection Agency library (Environmental library). Many socio-economic and climatic data on Nablus city was obtained from the Palestinian Central Bureau of Statistics (PCBS), Ministry of Agriculture and Nablus municipality.

During the analysis stage, calculations were made (using MS-Excel) in order to gather more relevant indicators related to research objective as the first analytical step. The generated indicators as a result of the calculation process were used to investigate: (i) the pre-conditions required for the existence of urban agriculture in Nablus city (the case study area), (ii) the economical, social, environmental, and physical impacts of introducing urban agriculture concepts to the overall city planning context. During this stage, many GIS maps, satellite images and figures were used to clarify the research context. In some cases, GIS maps and satellite images were modified using MS- Paint, MS Power Point and Photoshop programs.

The second analytical stage was based on the formulation of SWOT matrix (strengths, weaknesses, Opportunities and Threats). The strong points and the opportunities of introducing urban agriculture as a tool for city planning were analyzed. As a result, more relevant indicators were generated on how to integrate urban agriculture context within the overall

urban planning approach. However, the analyzed weaknesses and threats were used to set-up both conclusion and recommendation sections as well as the formulation of the action plan.

1.5. Defentions of urban and peri-urban agriculture:

Urban agriculture was addressed by UNDP in 1996 as an activity that produces processes, and markets food and other products, on land and water in urban and peri-urban areas, applying intensive production methods, and (re) using natural resources and urban wastes, to yield a diversity of crops and livestock".

Accounting for the broader needs of the urban population, FAO-COAG (1999) states that: "Urban and Peri-Urban Agriculture are agriculture practices within and around cities which compete for resources (land, water, and energy, labor) that could also serve other purposes to satisfy the requirements of the urban population. Important sectors of Urban and Peri-Urban Agriculture include horticulture, livestock, fodder and milk production, aquaculture, and forestry."

A more integrated definition is given by Mougeot (1999): "Urban Agriculture is an industry located within (intra-urban) or on the fringe (peri-urban) of a town, an urban centre, a city or metropolis, which grows or raises, processes and distributes a diversity of food and non-food products, reusing mainly human and material resources, products and services found in and around that urban area, and in turn supplying human and material resources, products and services largely to that urban area".

A broad understanding of urban agriculture must take into account the various activities of households to achieve food security, and to create income. Urban food production is more than food related. Community-based and individual food production in cities meets further needs of the urban population like sustainable urban development and environmental protection (FAO-COAG 1999, IFPRI 1998, TUAN 1994).

According to FAO, "Peri-urban" agriculture refers to farm units close to town which operate intensive semi- or fully commercial farms to grow vegetables and other horticulture, raise chickens and other livestock, and produce milk and eggs.

Urban and peri-urban agriculture occurs within and surrounding the boundaries of cities throughout the world and includes products from crop and livestock agriculture, fisheries and forestry in the urban and peri-urban area. It also includes non-wood forest products, as well as ecological services provided by agriculture, fisheries and forestry. Often multiple farming and gardening systems exist in and near a single city (www.fao.org).

The territory included within official city boundaries varies enormously across countries and can be more or less built-up; likewise the "peri-urban" area around cities ranges from densely to sparsely populated. The distinction between "urban" and "peri-urban" depends on the density, types, and patterns of land uses, which determine the constraints and opportunities for agriculture (FAO, 1999 & RUAF, 2000). However, the

urban farmers are women and men coming from all income groups, but the majority of them are low-medium income earners, who grow food for self-consumption or as income generation. Most of the cultivation is informal with little if any support (FAO-COAG 1999). Women tend to dominate certain components of urban cultivation (backyard gardening, small scale animal husbandry). Because women involvement in the formal sector of urban economy still disadvantage, they are found involved in small- and micro-scale production. Urban food production offers opportunities to be integrated into other household activities and women uphold the responsibility for household food security (Smith. Jac, Annu Ratta and Joe Nasr. 1996). Men tend to dominate the commercial urban food production. In some countries children are involved mainly in weeding and watering. Different urban farmers engaged in different production systems co-operate with one another: they may use each others plots for different purposes at different times and they exchange wastes or products (Mougeot 1999).

1.6. CONTENTS:

This research is composed of six chapters. The first chapter is the introductory one which discusses the scope and significant of the research and its importance mainly on the aspects of Food security, social, economical and ecological ones. The research problems, objectives and the description of the methodological approach adopted during the preparation of this research is also illustrated in this chapter. Definitions for urban and peri-urban agriculture are also discussed.

The second chapter describes the conceptual and theoretical background as well as the future of integrating urban agriculture within urban planning frames. A comprehensive comparison between urban planning and urban agriculture was discussed in the light of the possible areas for the integration of urban agriculture as a significant intervention. The means required for urban agriculture existence were also discussed.

Nablus city profile (the case study area) was discussed in the third chapter. Comprehensive information was gathered on the city location, area, expansion, land use, water situation, sewage systems, solid wastes, electricity, demographical data, climatic information and food security conditions. These data was used for the analytical calculations made by the author and considered as the baseline for the research.

Chapter four is the investigating chapter in which the pre-conditions required for the existence of urban agriculture within the city boundaries were considered, discussed and analyzed from the natural and environmental point of view, Socio- economical dimensions, ecological prospective, and the physical services. This chapter is considered to be the analytical section of the research on which the hypothesis was investigated, conclusions were listed and the recommendations were generated.

Three main hypothesizes were investigated in chapter number five. This includes the investigation of the pre-conditions required for urban agriculture existence, the awareness of dwellers, institutions and

stakeholders and the investigation of the validity of urban agriculture as a tool for the city planning.

The last chapter is the conclusions and recommendations one. Many significant points were highlighted as a result of the deep analysis created in chapter number four.

CHAPTER TWO

CONCEPTUAL AND THEORETICAL BACKGROUND

2.1 Introduction:

The general planning concepts should be more than the preparation of master plans or blueprints for the future. Even when such master plans have involved substantial time and effort to prepare, they are not relevant to real developments on the ground if stakeholders do not adhere to them. In other words, the authority of a master plan can vary a great deal (UNU, 1997). Effective planning also depends upon the ability of planning authorities to enforce whatever has been agreed upon. The co-ordination and facilitation of all the individual decisions affecting urban land uses is as important as a master plan that is respected. This involves a fair amount of negotiation among stakeholders regarding their preferences: e.g. how much to intensify agriculture or how many additional dwellings to put on a plot of land (Peace Corps, 1993).

The first step in the urban and peri-urban planning process is to identify the stakeholders and institutions involved and to determine how to reflect their interests in the plans that are finally implemented. Some stakeholders are stronger than others. One tends to think that big real estate development agencies, public or private, are the strongest players. This is not necessarily the case. Individually weak stakeholders, such as small-scale market gardeners, can affect decisions by organizing themselves around a common interest. Collective action enables them to have plans

revoked that ignored their interests, and to modify plans to better fit their needs (www.fao.org).

Nablus city plan can be narrow or broad. It can be focused only on urban land uses and infrastructure, or it can incorporate environmental concerns and use of natural resources, such as water systems. The most ambitious urban plans reflect the interactions among all sectors in the urban area including urban food systems and agricultural demands (Arginti, 2000). A comprehensive plan also links with land use planning in peri-urban areas and the surrounding countryside (Ganapathi, 1983).

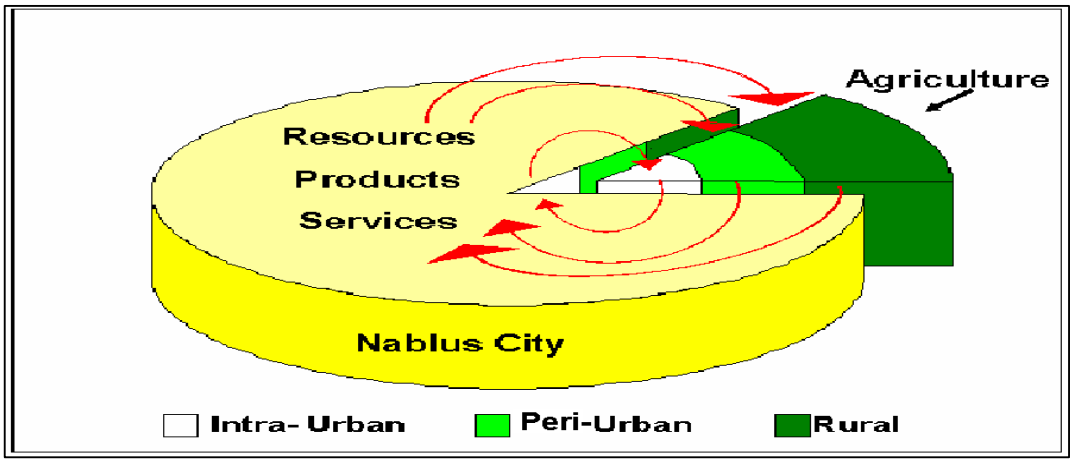
Urban food system is so far not sufficiently reflected in the urban planning process in many countries (www.fao.org). The urban food system connects to other urban systems such as the agricultural sector, the economy and ecological systems (Arginti, 2000). Urban people are not passive food recipients; in many locations they are actively involved in food production. City planning should incorporate an understanding of household food security and nutrition conditions, agricultural research and economic forces. Other components, which also need proper urban planning, are the marketing and distribution of food from rural areas into and within cities (Earth summit, agenda 21, 1992).

It is the responsibility of urban planners to identify locations for urban agriculture, while local municipal councils are largely responsible for permitting urban agricultural activities. When the monitoring of agricultural activities occurs, this falls under the purview of agriculture or

health departments, while outreach or extension services are provided primarily by agricultural and veterinary departments (GTZ- GATE, 1989).

The ultimate objective of an urban plan is to create a live-able city and relatively free of conflicts among dwellers and uses, providing for the needs of its citizens, and maintaining its natural resources (World Bank, 1995). The role of urban and peri-urban agriculture in Nablus city plan should contribute to those ends taking into the consideration the dynamic interactions between intra-urban, peri-urban and rural area as shown in the figure 2-1.

Figure 2-1:The interactions between intra-urban, peri- urban and rural areas:



(Source: the Author).

In general, urban planning should incorporate urban agriculture in order to: (i) improve urban sustainability; (ii) enhance the urban food system, especially food security; and (iii) avoid or minimize conflicts between agriculture and other resource-use activities (Boiling point, 1992). The incorporation of urban agriculture must be understood by

understanding issues such as urban agriculture diminutions and the means required for urban agriculture existence.

2.2. Urban Agriculture dimentions:

The report 31, publised by CFP in 2002, indentified the dimentions of urban agriculture by: (i) types of actors involved, (ii) types of location, (iii) types of products grown, (iv) types of economic activities, (v) product destination/ degree of market orientation and (vi) scale of production and technology used.

2.2.1. Types of actors involved:

Large part of the people involved in urban agriculture is the urban poor. Contrary to general belief they are often not recent immigrants from rural areas since the urban farmer needs time to get access to urban land, water and other productive resources (Mbiba, 1994). However, 1,032 inhabitatnt from Nablus city are invloved in agriculture (PCBS, labour force survey 2006). People involved in urban agriculture could be governemntal officals, school teachers as well as poor and rich people who are seeking a good investment for their capital (Maxwell et al., 1998).

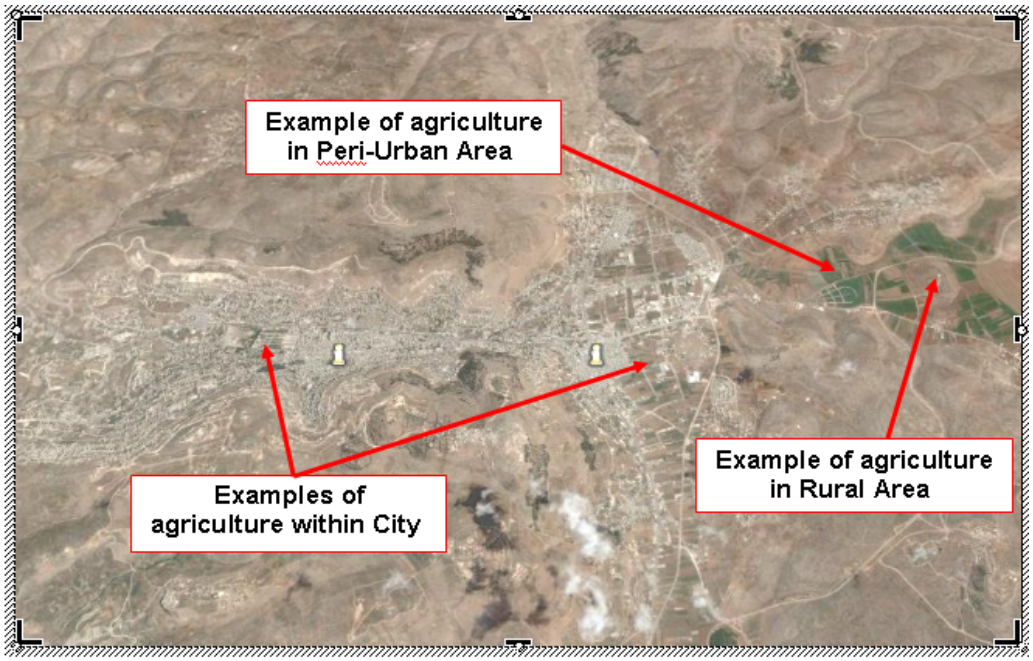
Women constitute an important part of urban farmers, since agriculture and related processing and selling activities, among others, can often be more easily combined with their other tasks in the household. It is however more difficult to combine it with urban jobs that require travelling to the town centre, industrial areas or to the houses of the rich (Ganapathi, 1983).

2.2.2. Types of location:

Urban agriculture may take place in locations inside the cities (intra-urban) or in the peri-urban areas. The activities may take place on the homestead (on-plot) or on land away from the residence (off-plot), on private land (owned, leased) or on public land (parks, conservation areas, along roads, streams and railways), or semi-public land (schoolyards, grounds of schools and hospitals) (Moustier, 1998).

Nablus city however offer a wide range of of location types within the city bounderies; within the pre-urban areas, as well as the rural areas surrounding the city. The sattlite image for the city and its eastern parts is shown in figure 2-2.

Figure 2-2: Possible urban agriculture intervention locations:



Source : Google Earth (2007).

Intra-urban/peri-urban character of location is the element most common to reviewed definitions is location "in (within) and around" cities or urban areas (e.g. Ganapathi, 1983; Sawio, 1993; Smit et al., 1996b; COAG/FAO, 1999). This definitional element is also probably the biggest source of contention. Most urban agriculture field studies have been carried out in large urban centers, national capitals or secondary cities; thus, few can be assumed to have largely dealt with agriculture located in rural areas "typical" of the respective countries. However, few actually differentiate between intra and peri-urban locations. Those which do so have used as criteria, for intra-urban agriculture, population sizes, density thresholds, official city limits (Gumbo and Ndiripo, 1996; Murray, 1997), municipal boundaries of the city (Maxwell and Armar-Klemesu, 1998b: 7), agricultural use of land zoned for other use (Mbiba, 1994), agriculture within the legal and regulatory purview of urban authorities (Aldington, 1997: 43). In a rare comparison between rural agriculture and urban agriculture, Moustier (1998) defines urban agriculture UA as one carried out within or on the outskirts of a city where a non-agricultural use of local resources is a real option; rural agriculture is one found in areas where this option is not an issue.

For peri-urban agriculture the locational definition is more problematic. By contrast to intra-urban locations well within the older and more settled urban fabric, peri-urban locations are in closer contact with rural areas and tend to undergo, over a given period of time, more dramatic agricultural changes than do locations in more central and built-up parts of the city.

Many authors recognize the need to differentiate peri-UA from intra-UA but criteria used vary widely.

Authors have been trying to delineate the outer boundary of the peri-urban area. Stevenson et al. (1996:3) say that this outer boundary varies, depending on the reach of those urban influences with the greatest impact on the production system considered. Murray (1997) and Losada et al. (1998) have identified urban, peri-urban and suburban zones based on varying ratios of buildings and roads and increasing ratios of open space per km² (Losada et al. 1998: 44) . Others understand the outer-boundary of the peri-urban zone as some isochrones (time-band), set by the travel time of non-resident farmers to their farm or the travel time of specific products to reach the urban market. Lourenço-Lindell (1995: 2) uses the area within which people living within the city's administrative boundaries can travel to engage in agricultural activities. Moustier (1998) uses the maximum distance away from city center within which farms can supply perishables to the city on a daily basis; Mwamfupe (1994) used the maximum distance which urban residents could travel to their farms in the peri-urban area on a daily basis (quoted by Stevenson et al., 1996: 39).

2.2.3. Types of economic activities:

Urban agriculture includes agricultural production activities as well as related processing and marketing activities as well as inputs (e.g. compost) and services delivery (e.g. animal health services) by specialised micro-enterprises or NGOs, etc. In urban agriculture, production and marketing

tend to be more closely interrelated in terms of time and space than for rural agriculture (Mabiba, 1994).

2.2.4. Types of products grown:

Urban agriculture includes food products, from different types of crops (grains, root crops, vegetables, mushrooms, fruits) and animals (poultry, rabbits, goats, sheep, cattle, cows, etc.) as well as *non-food products* (like aromatic and medicinal herbs, ornamental plants, tree products, etc.) or combinations of these. Often the more perishable and relatively high-valued vegetables and animal products and by-products are favored (www.fao.org).

Production units in urban agriculture in general tend to be more specialised than rural enterprises, and exchanges are taking place across production units (Mbiba, 1994). However, Nablus City is diversified by the various types of agriculture products grown such as cereals, olive, rain fed vegetables.

Figure 2-3: Urban agriculture between: (i) Haifa & Yafa Streets. (ii) Rujeeb and AlQuds Sreet.

2.2.5. Scales of production and technology used

In the city, we may encounter individual or family farms, group or cooperative farms and commercial enterprises at various scales ranging from micro- and small farms (the majority) to medium-sized and some

large-scale enterprises (www.ruff.org). The technological level of the majority of urban agriculture enterprises in developing countries is still rather low. However, the tendency is towards more technically advanced and intensive agriculture and various examples of such can be found in all cities (www.fao.org).

2.2.6. Product destination / degree of market orientation:

In most cities in developing countries, an important part of urban agricultural production is for self-consumption, with surpluses being traded. Products could be sold at farm gate, in the same or other neighbourhoods, in local shops, on local (farmers) markets or to intermediaries and supermarkets. Mainly fresh products are sold, but part of it is processed for own use, cooked and sold on the streets, or processed and packaged for sale to one of the outlets mentioned above (Arginti, 2000).

2.3. Future of integrating urban agriculture within urban planning:

The concept of urban agriculture as promoted by the international scientific community is not very well known in many developing countries (Gertel & Samir 1999, Drescher & Muwowo 1999). Most people producing

food in the cities would not recognize their own activity as being "urban agriculture", and would probably have considerable difficulties in bringing their individual struggle for food or income in relation with mainstream development policies (Nugent, R.A. (1999). The more frequent argument is that agriculture should be confined to rural areas, as it can interfere with more productive use/rent of land by other economic activities. Yet, there is little evidence so far that urban agriculture at large, or most rural agriculture for that matter, has stood in the way of urban development; its land-extensive forms are interim and interstitial use of urban land which, as other land-extensive uses (single-storey housing, ground-level parking, warehouses, etc.), migrate to less central locations during city expansion (Vinod Sharma, 1997). Urban agriculture does serve as a buffer between otherwise incompatible urban lands uses (GTZ- GATE, 1998). The land rent argument must be put in perspective. On one hand, urban planning is responsible for creating and protecting several land uses which are quite legitimate on grounds other than their mere land rent; on the other, not only is the rent of many urban land uses well below that which is deliverable by specific urban agriculture activities, but the rent of several such uses can actually be increased through their combination with urban agriculture (Granpathi, 1983). Analyzing urban system; taking into the consideration urban agriculture can help to appraise the functioning of each urban sub-system, present performance, future trends, identification of available and potential resources along with constraints, and inter-relationships between the sub-systems (UNU, 1997). It can also help in formulating long-term strategies which will help allocate the resources optimally and provide

adequate and appropriate infrastructure necessary for this envisaged development (Moustier, 1998). The comparison in terms of considerations during the preparation of a city plan has been made between urban planning and urban agriculture utilizing checklist approach as shown in the following table:

Table 2-1 : A compassion between urban planning and urban agriculture considerations during planning process (different sources):

Key factor considered during city planning		**Urban Agriculture** Consideration		Notes
		YES	**NO**	
Objective	To guide towards achievement of better quality of human life	●		Including nutrition issues
Economic perspective	Sectoral income composition of the Urban economy	●		Agriculture share
	Sectoral investment pattern in the region	●		Agriculture enterprises
	The factors of production	●		Agriculture production
	The process of production	●		Agriculture pattern
	The composition of the produce	●		Market and consumer
	Available resources	●		For agriculture production
	Future growth and trends	●		For agric. Produce consumption and space
	Urban employment	●		Share in agriculture
	Sectoral employment consumption	●		New job creation
	Wages	●		For agric. Labor
	Per-capita income	●		For the type of produce
Demographic Perspective	Population and growth rates	●		For food security issues
	Migration	●		For urban – rural balance
	Existing sex-ration pattern		●	More urban planning key

	Fertility		●	More urban planning key
	Child mortality		●	More urban planning key

Key factor considered during city planning preparation		Urban Agriculture Consideration		**Notes**
		YES	NO	
Housing perspective	Existing housing	●		For agriculture zoning
	Area and location	●		For agriculture initiatives
	Per-capita distribution over area	●		For agriculture density
	Slum settlements		●	More urban planning key
	Existing housing demands and supply aspects	●		From agriculture point of view
	Future housing needs	●		Only for agriculture
	Provision of urban infrastructure			
	Health infrastructure		●	More urban planning key
	Health facilities		●	More urban planning key
	Access to health facilities	●		In case of causality
	Spatial distribution of health facilities		●	More urban planning key
	Access to education facilities	●		For agric. Capacity building
	Spatial distribution of education facilities		●	More urban planning key
	Postal services		●	More urban planning key
	Police stations		●	More urban planning key
	Fire stations	●		For forest protection
	Urban and regional transportation linkages	●		For produce transportation

	Level of transportation capacities		●	More urban planning key
	Level of accessibility	●		For economical transport of the produce
	Model of passengers and goods movement	●		For market accessibility
	Parking characteristics		●	More urban planning key
	Water supply			
	Source of water	●		For production type
	Water resources	●		For agriculture sustainability
	Water requirements and its composition	●		Agriculture share
	Water quality	●		For production type
	Water treatment	●		For water availability
	Distribution network	●		For recycled water use
	Sanitation and drainage	●		For agriculture lands
	Existing sewage systems		●	More urban planning key
	Level of services		●	More urban planning key
	Rainfall data	●		For agriculture planning
	Drainage basin		●	More urban planning key
	Existing drainage basin		●	More urban planning key
	Solid waste management			
	Solid wastes generation chrematistics	●		For composting
	Solid waste collection system	●		For composting

Key factor considered during city planning preparation		Urban Agriculture Consideration		Notes
		YES	NO	
	Solid wastes transfer and transportation		●	More urban planning key
	Solid wastes treatment and disposal methods	●		Organic fertilizers share
	Level of service		●	More urban planning key
	Power			
	Source of power		●	More urban planning key
	Sectoral power requirement	●		Agriculture share
	Power tariff	●		Feasibility studies
	Power distribution network	●		Agric. Establishment location
	Sectoral power consumption		●	More urban planning key
	Telecommunication			
	Type and level of connectivity		●	More urban planning key
	Service providers		●	More urban planning key
	Level of service		●	More urban planning key
	Sectoral level of connectivity		●	More urban planning key
Environmental perspective	Impact assessment of urban activities on environment	●		Availability of land
	Soil degradation	●		Soil type
	Air quality and wind speed	●		Agriculture pattern
	Noise and pollution	●		Agric. Establishment direction
	Sub-surface and surface water quality	●		Soil erosion and contamination
Heritage and cultural perspective	Historical sites and cultural venues		●	More urban planning key
	Architectural and urban conservation issues		●	More urban planning key
	Tourism aspects and	●		Green space and

	mapping of potential unexplored areas			landscaping
Political and institutional perspectives	Urban administration	●		Agriculture legislatives
	Investment in urban areas	●		Agriculture share
	Building and management	●		Backyard agriculture
	Resources mobilization	●		Level of awareness
	Legislative framework	●		Urban agriculture law
	Community participation	●		Urban agriculture acceptance
Heritage and cultural perspective	Historical sites and cultural venues		●	More urban planning key
	Architectural and urban conservation issues		●	More urban planning key
	Tourism aspects and mapping of potential unexplored areas	●		Green space and landscaping

Source: Different urban planning and urban agriculture websites (Urban planning magazine, RUFF, IDRC, etc)

The major planning principles such as: accessibility, equity, equality, safety, flexibility and sustainability (Mougeot, 1999 and FAO); are the same principles considered by urban agriculture. However, Petra Jacobi, Axel W. Drescher and Jorg Amend have identified seven possible areas for the integration of urban agriculture as an intervention within city plans in there published book " Urban Agriculture: Justification and Planning Guidelines, 2000 " as the following:

Table 2-2: Possible areas for the integration of urban agriculture as an intervention.

Possible integration	Possible interventions
Urban development	- Support programs to City Authorities (Town planning)
Environment and city ecology	- Waste management and nutrient recycling - Microclimate improvement - Soil conservation - Water management - Bio-diversity
Health and nutrition	- Household food-security - Mother and child programs (nutritional programs)
Small scale business promotions and vocational training	- Urban agriculture as an income opportunity for producers - Urban agriculture as a secondary small scale enterprises - Urban agriculture as one option for vocational training - Urban agriculture credit program
Community development (Capacity building and self-help initiatives)	- Capacity building for local initiatives - Improve the creation of sustainable communities
Education	- Environmental awareness, urban agriculture as a way to bring urban people closer to nature and natural resources and school garden initiatives
Youth and women development	- Urban agriculture as an opportunity to generate income, provide food for the household and gain social status within the family or community

Source: Petra Jacobi et al, 2000.

2.4. Means Required for Urban Agriculture (The Pre-Conditions):

The existence of agricultural activities in Nablus city requires five basic conditions namely: (i) Natural conditions; (ii) Physical infrastructure and services; (iii) Socio-cultural conditions; (iv) Institutional conditions; and (v) Economic conditions:

2.4.1. Natural Conditions:

Climatic conditions (amount and seasonality of rainfall and temperature) determine urban food production (FAO). Very low annual rainfall is restrictive to the development of urban crop and vegetable production but can offer opportunities for animal husbandry (Maxwell et al, 1998). In areas with favorable climatic conditions, the occurrence of urban agriculture is higher because no major investments are necessary to start production, which makes it an option for all income groups (Petra Jacobi, Axel W. Drescher and Jörg Amend, 1999).

2.4.2. Physical infrastructure and services:

Basic requirements for production are the availability of water and space. The availability of infrastructure for water coupled with access to water can compensate for lack of rainfall and, in spite of this, lead to urban agriculture. If urban agriculture is dependent on infrastructure, urban agriculture will be dominated by certain groups having access to it and most likely more economic oriented (Arginti, 2000).

2.4.3. Socio-cultural conditions:

This refers to the households farming traditions and food preferences as an entry point into urban agriculture and indicates that urban agriculture is not a completely unknown and unskilled activity in many cases (GTZ-GATE, 1989). Food preferences are related to specific types of vegetables and other agricultural produce, often local varieties, which are not marketable or not available on local markets and therefore produced on household basis (FAO, 1998).

2.4.4. Institutional conditions:

The capability of institutions to provide or at least not restrict access to water and space as water and space accessibility reported to be social and institutional problem, often gender specific (Nugent, R.A. (1999). Access to water and space can sometimes be influenced through law and proper land use planning therefore institutional conditions have to be linked with the legal framework for urban production (FAO, 1998).

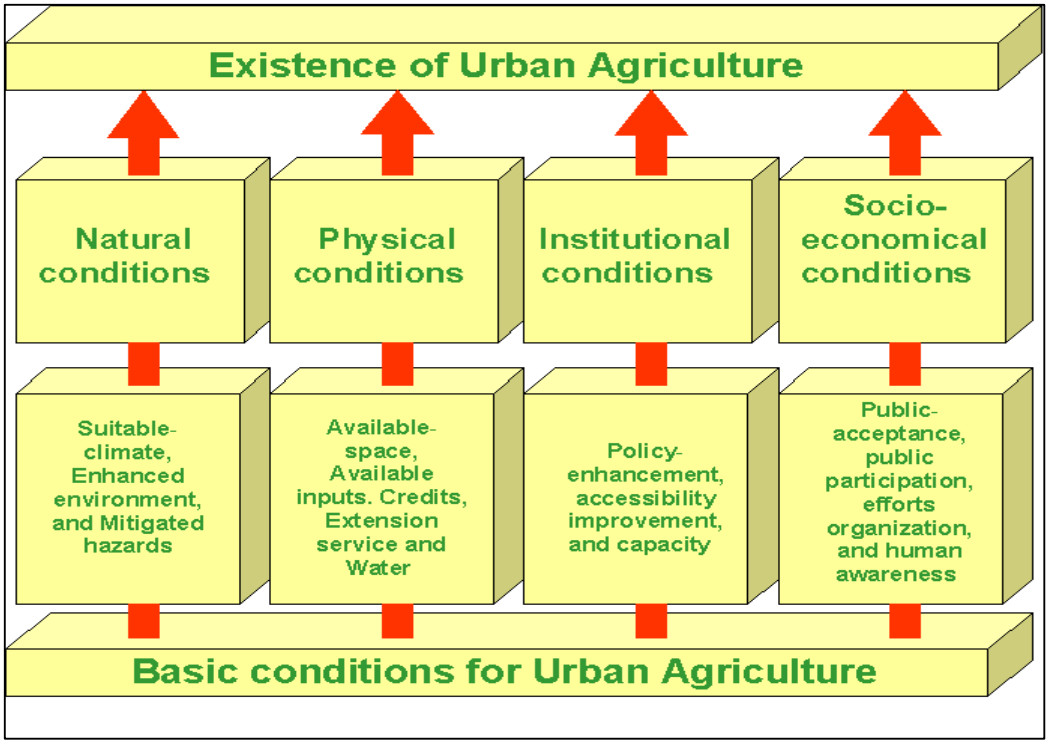
2.4.5. Economic conditions:

Urban labor market and the shortage of adequate and accessible income opportunities and an unsatisfied demand for agricultural products in quantity and quality are the major issues addressed for urban agriculture existence (Drescher, A.W. & D. Iaquinta (1999). The question of employment opportunities is self-explaining if we consider population

growth rates in Nablus city of 3.5%. Each year, the demand of new jobs is needed at least to keep the unemployment rate at a similar level.

Generally, poor rural-urban infrastructure and/ or high transport costs favor the production of perishable products (e.g. leafy vegetables, milk and milk products) when they are integral parts of the human consumption (Drescher,A.W. & D. Iaquinta (1999).

Figure 2-4: Basic conditions for urban agriculture existence:



Source: The author

CHAPTER THREE

NABLUS CITY PROFILE

The urban agriculture planning and its integration to the overall urban planning approaches require pre-analysis of the existence conditions of the given city such as physical, economical, social, and environmental conditions. The latter is basically the pre-conditions required for the existence of urban agriculture and therefore, this chapter will consist data to be applicable for further analysis as classified within the text of the upcoming chapters.

3.1. Physical profile:

3.1.1. Nablus area:

Nablus lies in a strategic position at a junction between two ancient commercial roads; one linking the coast to the Jordan valley, the other linking Nablus to the Galilee in the north, and the Negev to the south through the mountains. The entire Nablus district is 605 square kilometers, while Nablus city is 28.57 square kilometers. Nablus is surrounded by mountains on all sides. The length of the mountain chain is about 65 km from north to south. Its width is about 55 km from west to east. Ebal, the northern mountain, is the highest peak in this chain at 940 meters, while Gerizim, the southern mountain, is 881 meters high. The city lies along the narrow and fertile valley between the two mountains.

3.1.2. Location:

Nablus is located in the northern part of West Bank, approximately 65 kilometers north of Jerusalem. The city of Nablus was founded in 72 CE by Romans. By 480 CE Christianity was flourishing in Nablus and by the end of 6th century, Nablus was considered a major site in Holy Land. Arab-Islamic rule that came shortly afterwards led to the city being dubbed "Little Damascus". The 19th century brought with it economic prosperity for this area with traditional industries including the production of olive oil soap and cotton processing. Trade expanded toward new frontiers of Trans-Jordan, Egypt and Syria, establishing the area as a manufacturing and agricultural heartland. Nablus continued to be a city of economic importance in the 20th century for Palestinians (OCHA, 2005).

The historic Old City of Nablus is filed with important cultural and religious sites. Such sites included 9 historic mosques, 18 Islamic monuments, Ayyubid mausoleum and a 17th-century church. Cultural sites include Ottoman-era structure including two major market places, Turkish bath house, olive-oil soap factories and over two thousand historic houses and places (www.nablus .org).

Visible Roman ruin also lie outside the Old City and Roman-era aqueduct system runs under the city, part of which had recently been preserved by the Nablus Municipality and opened for visitors. There are also a few monuments within the Old City dating back to the Byzantine era and Crusader period (OCHA, 2005).

Figure 3-1: Nablus City satellite map.

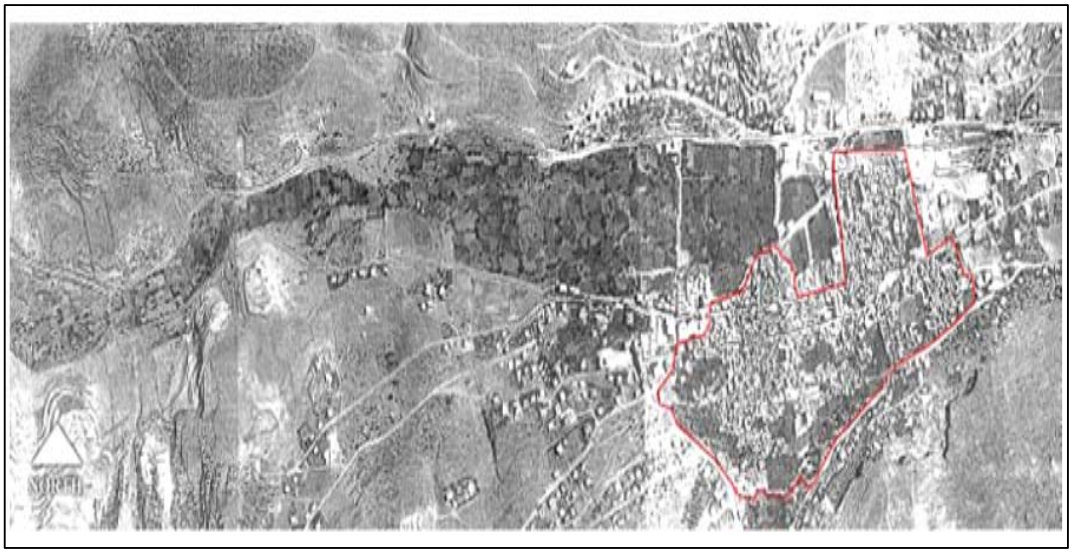
Source: Google earth 2007, Nablus satellite image (32°13′N 35°16′E)

3.1.3. City expansion:

Nablus city has the highest population among West Bank cities and considered as the major regional urban center in the northern part of the West Bank. Population density is high in Nablus city compared to the other cities where the population has increased dramatically while the expansion of urban area has been limited. The main reason is attributed to topography as Nablus city is located between steep mountains that constitute physical barriers for urban expansion. In 1989 Nablus built-up density was 150 m^2 /capita. A significant difference in density was encountered between 1989 and 2000, in the year 2000 the built-up density in Nablus became

78m^2/capita. After the establishment of the PNA, new Master plans were developed in most cities. However, the population commitment to municipality regulations varied from one city to another (World Bank, 2003). The satellite images for the years 1944 and 2000 showed that the urban areas increased while the agricultural areas declined within the city boarder.

Figure 3-2: Nablus satellite maps (1944 and 1997)



Nablus city in 1944: Atlas of Palestine- Arij.

Nablus city in 2000: Google earth 1997.

3.1.4. Land use:

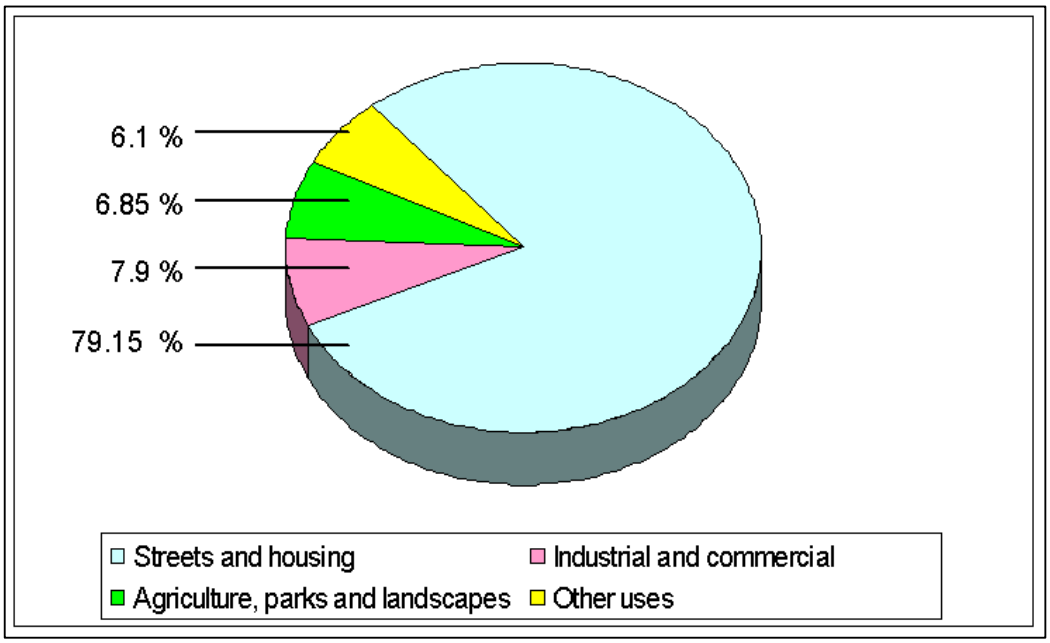
The total area of Nablus city is calculated at 28.57 km² (Nablus municipality 2007) distributed according to land use as: 5.5 km² (20%) streets (existed and proposed ones), 16 km² (56%) housing, 1.5 km² (5.15%) industrial area, 0.8 km² (2.75%) commercial area, 0.3 km² (1.1%) the area of the old city, 0.5 km² (1.7%) refugee camps area, 0.1 km² (0.35%) agriculture housing, 0.3 km² (1%) cemeteries, 0.1 km² (0.35%) quarries, 0.2 km² (0.7%) parks, 1.5 km² (5.215) green landscapes, 0.4 km² (1%) agriculture area and, 1.37 km² (4.75%) other uses (car parking, public buildings, etc). It is obvious that agriculture area, parks and open spaces forms only 2.1 km² (6.85%) out of the total city area.

Table 3-1: Nablus city land use in Km²

Item	Area in km²	Percentage
Streets	5.5	20
Housing	16	56
Industrial area	1.5	5.15
Commercial area	0.8	2.75
Old city area	0.3	1.1
Refugee camps	0.5	1.7
Agriculture housing	0.1	0.35
Cemeteries	0.3	1
Quarries	0.1	0.35
Parks	0.2	0.7
Green landscapes	1.5	5.15
Agriculture area	0.4	1
Other uses (parking, public buildings	1.37	4.75
Total	28.57	100

Source: Nablus Municipality -2007.

Figure 3-3: Land use in Nablus city:



3.1.5. Water situation:

According to Nablus municipality, a comparison between actual available water figures with the demanded projections indicates a significant need for additional water resources (concept paper, 2006). The upcoming situation if no additional water resources will be developed, will end in a sever crisis in water balance in the city estimated at year 2025 at – 30,697 m³/day if the uncounted for water (UfW) will not be eliminated by the municipality (Author calculations based on Kfw report, 2005), which means twenty three times more than as needed in year 2005 estimated at -1,322 m³/day. The projected water crisis in the city of Nablus requires an integrated comprehensive mitigation plan which must include waste and grey water

recycling taking into the consideration that water loses reached 35% in the year 2005 (www.nablus.org).

Table 3-2: Required additional portable water production - Water Balance:

Water Balance in Nablus city	Year 2005	Year 2015	Year 2025
Total water demand in m³/day (including UfW)	24,949	38,632	54,324
Total average of water production in m³/day	23,627	23,627	23,627
Total need for additional water production in m³/day	-1,322	- 15,005	- 30,697

Source: KfW project concept paper, 2006.

It has been noted that the 23,627 m³/day are pumped from 11 wells and springs managed by the city municipality. The produced water from the eleven wells and springs is distributed through 270 km of different water pipes mainly steel and galvanized cast iron (Conference paper, 2006-nablus municipality). According to PCBS (City reports series 003, 2000), more than 99% of the total housing units (17, 731 units) are connected to public water network.

It is assumed by Nablus municipality that the UfW rate will drop slightly from at present 35% to 30% in 2015 and to 25% in 2025 due to scheduled projects for water loss reduction and improvements in the network. However, the current (actual) water demand calculated by Nablus municipality in year 2005 stands at 18, 481 m³/day distributed among domestic and non-domestic water demand as:

Table 3-3: Domestic and non-domestic water demand.

Item	Domestic m^3/day	Institutional m^3/day	Industrial/ commercial m^3/day	Villages served by municipality m^3/day
Total average	11,496	1,248	2,456	3,281
			Grand total	18,481

Source: Nablus municipality, 2007.

Table 3-4: List of wells and springs and average discharge in m^3/day.

Name	Average yield in m^3/day
Audalah well	4500
Al-Badan well	4300
Al-Far'a' well	6000
Dier-Sharaf well	3500
Ein Biet El-Ma' Spring	1574
Al-Qaryon Spring	1447
Ras El-Ein Spring	1169
Ein Al-Assal Spring	457
Ein Dafna Spring	340
New Building Spring	340
Total (cubic meters per day)	23627

Source: Nablus Municipality.

3.1.6. Sewerage system and wastewater:

Raw wastewater originates from domestic and industrial sources. The characteristics of waste water are impacted by water consumption rates, population density, industrial practices, and habits of the population (Arij, 1996). The quantity of actual domestic water being consumed (in year

2005) is almost 6.75 MCM out of which 4.39 MCM of wastewater is generated in the City of Nablus (Calculation made by author and based on PCBS data, Nablus municipality and others.

The sewer network of Nablus city has mainly been constructed in the past 50 years and has a total length of almost 140 Km. the connection rate is estimated to be 95%. The remaining population uses cesspits or discharge of sewage directly to nearby wadis. Presently, the effluent collected by sewer network is discharged without treatment into nearby Wadis in the West and East of the city (Kfw: Concept paper, 2006).

3.1.7. Solid wastes:

The quantity of solid waste collected from houses, communities and market varies from 0.9 – 1.0 kg per capita per day with an estimated production of waste reached 192- 213 tons per day. This estimated amount is based on normal values of many countries of the Mediterranean region (Arij, 1996). This leads that annual domestic solid wastes produced according to 2005 population data is stands between 70084 – 77871 tons. Sources of solid waste other than municipal waste may include wrecked cars, metal materials, demolition and construction waste, gardens refuse and other various materials (Arij, 1996).

The solid waste composition according to Nablus municipality (2007) includes 0.5% glass, 1.5% papers (including cartoons), 4.5% plastic (including nylon), 1.5% iron, 0.5% textile, 0.5% leather, 1.0% wood, 3.0% soil and, 87% of organic matter. This means that organic matter produced

annually in the city lies between 61000 – 67700 tons. This huge amount is being treated by either burning it in an open area in a location to the east of Nablus, which pollutes the surrounding environment, or by transferring it to Jericho's solid wastes disposal for 35 NIS per ton (www.nablus.org).

3.1.8. Electricity:

In addition to Nablus city, 18 other villages are benefiting from the provision of electricity by Nablus municipality include the transmission and distribution of medium voltage 33 KV and 6.6 KV, low voltage 400/230 V with over head lines, under ground cables. However, Nablus is supplied with electricity from the Israeli Electricity Corporation with a total capacity of 45 MW that four connection points were built for this purpose (Nablus Municipality- www.nablus.org). According to PCBS (City reports series 003, 2000), its almost 100% of the total housing units are connected to the public electricity network.

3.2. Demography and socio-economic:

3.2.1. Population and growth rate:

According to district statistics (PCBS, different years), the population average increases 9552 inhabitant per year at average growth rate 3.33% as shown below:

Table 3-5: Mid-year population (Projected) in the Palestinian territories in Nablus governorate:

Year	2001	2002	2003	2004
Total Population	288,534	298,134	307,737	317,331
Number of increased inhabitants per year		9600	9603	9594
Year	2005	2006	2007	

Total Population	326,873	336,380	345,847
Number of increased inhabitants per year	9542	9507	9467

Source: PCBS:

Nablus city is the only urban center in the district in which 100034 inhabitant's lives within the city boarders in addition to 26438 inhabitants distributed over three refuge camps (PCBS census, 1997). This indicates that Nablus city forms approximately 44% of the total District population including the refugee camps. About 49% of the total residents are females where 51% males live in the city including male refugees (comparison between district total population 2001 and PCBS census data 1997). The distribution of population according to sex is shown in table 3-6.

Table 3-6: Population distribution according to sex and place of residence:

	Male	Female	Sub-Total
Nablus City	50945	49089	100034
Balata Camp	6620	6563	13183
Askar Camp	4800	4694	9494
Ein- Biet Elma' Camp	1929	1832	3761
Total	64294	62178	126472

Source: PCBS.

The population projection as applied by Nablus Municipality showed an increase of population at overall growth rate at 3.5%. According to the municipality estimations, the city population (excluding refugee camps and served villages by the Municipality) would increase from 131,600 inhabitants in the year 2005 to reach 261900 inhabitants in the year 2025.

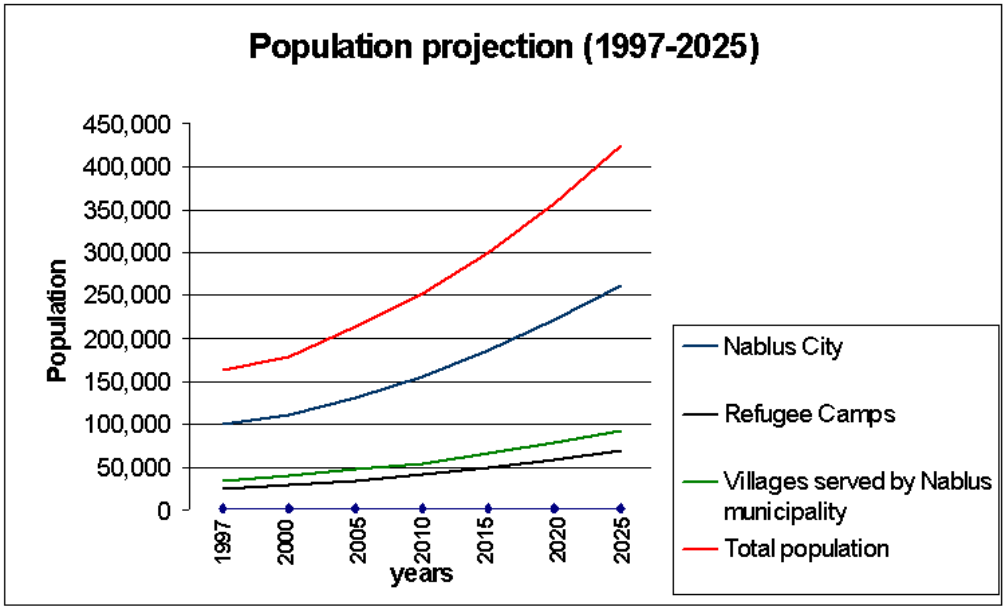
Table 3-7: Projected population (1997-2025) including city, refugees and served villages inhabitants:

Year	Nablus City	Refugee Camps	Villages served by Nablus	Total population	Growth Rate %

			municipality		
1997	100,034	26,438	35,600	162,072	3.50%
2000	110,800	29,300	39,400	179,500	
2005	131,600	34,800	46,800	213,200	3.50%
2010	156,300	41,400	55,600	253,300	
2015	185,700	49,100	66,000	300,000	3.50%
2020	220,500	58,300	78,400	357,200	
2025	261,900	69,300	93,200	424,400	3.50%

Source: Nablus Municipality

Figure 3-4: Projected population diagram.:



Source: By applying Nablus Municipality data.

3.2.2. Job opportunities and employment:

The comparison between labor force data (PCBS 2003 & 2006), indicated an increase of the total number of employed inhabitants in Nablus city while unemployment rate decreased from 9% in 2003 to 7% in 2006. About

47,759 inhabitants were standing out-side labor force in 2006 compared with 44,233 individuals in 2003 with an increase of 3526 persons, however, the employment individuals in 2003 recorded as 26, 519 inhabitant while the number reached 30,283 in year 2006.

Table 3-8: Labor force (LF) survey: PCBS, second quarter report 2003, 2006.
*Out-side LF: Individuals able to work but not joining economically active (Students, disabled, etc)

	Second quarter report 2003				-Second quarter report 2006			
	Urban	Rural	Refugee Camps	Total	Urban	Rural	Refugee Camps	Total
Employment	26,519	29,002	5,827	61,348	30,283	35,872	5,446	71,601
Unemployment	7,258	9,803	3,225	20,286	5,496	5,875	1,873	13,244
Outside of LF*	44,233	49,361	10,253	103,847	47,759	51,384	11,628	110,771
TOTAL	**78,010**	**88,166**	**19,305**	**185,481**	**83,538**	**93,131**	**18,947**	**195,616**

The distribution of labor force per place of work indicated that 27,460 individuals still economically active and working in the same city, 1,577 persons in other cities, 950 working in Israel and Israeli settlements and, 296 working abroad (PCBS, 2006). However, The distribution of labor force per sector according to PCBS (labor force, 2006) indicated that 1,032 working in agriculture, 5,188 in manufacturing, 4,038 in construction, 9,549 in commerce- hotels, 1, 767 in transport a-storage and, 8,709 in other sectors (Same source). It is obvious that agriculture plays a significant role in consuming about 3.5% of employed labor force in the city of Nablus. Most of individuals involved in agriculture within Nablus city are skilled agriculturists (PCBS, 2006).

3.2.3. Food security conditions:

The National Commission for Poverty Alleviation set an official poverty line in 1997 (World Bank, PCBS, 2004). It was initially derived from a "relative" concept of poverty, and is commonly referred to as "relative poverty." It is based on the average consumption of essential goods (food, clothing, housing, etc). PCBS sets the relative poverty line at USD 2.20 per person per day. The poverty line has been adjusted to reflect the different consumption of families based on their composition (household size and the number of children). Based on the poverty line and poverty definition, FAO and WFP (2007) classified Nablus residents into 4 groups from food security point of view as: (i) 37.38% of Nablus residents are food insecure, (ii) 11.24% vulnerable, (iii) 21.24% are marginally food insecure and, (iv) 30.14% are food secure.

Based on PCBS data (2005), the average per month quantity of household food consumption (food demand) was multiplied by the total number of Nablus households (18003 according to PCBS, 2000). The annual average demanded food for basic commodities were: 2722 tons of rice, 4882.5 tons of flour, 540 tons of wheat, 4601.5 tons of bread, 432 tons of goat and sheep meats, 734.5 tons of beef, 950.5 tons of slaughtered poultry, 281 tons of fish and sea products, 410.5 tons of cheese (different types), 756 tons of eggs, 7885 tons of fruits, 10953 tons of vegetables, 1339423 liters of milk, 1296216 liters of yogurt and 79933 liters of olive oil.

Table 3-9: Average Quantity of Household Monthly Consumption of Food Products:

Item	Unit	Average Quantity		
		For household /month	For Nablus city/month	For Nablus city/ year
Rice	Kg	12.6	226838	2722054
Flour	Kg	22.6	406868	4882414
Wheat	Kg	2.5	45007.5	540090
Bread	Kg	21.3	383464	4601567
Sheep and goat meat	Kg	2.0	36006	432072
Beef	Kg	3.4	61210.2	734522.4
Poultry (Slaughtered)	Kg	4.4	79213.2	950558.4
Sea products and fish	Kg	1.3	23403.9	280846.8
Milk	Liter	6.2	111619	1339423
Yogurt	Liter	6.0	108018	1296216
Cheese	Kg	1.9	34205.7	410468.4
Eggs	Kg	3.5	63010.5	756126
Olive oil	Liter	3.7	66611.1	799333.2
Fresh fruits	Kg	36.5	657110	7885314
Vegetables	kg	50.7	912752	10953025

Source: calculations by the researcher based on PCBS data.

3.3. Climatic profile:

3.3.1. Annual rainfall:

Rainfall in Nablus city is limited to the winter and spring months; From October to May. The annual mean rainfall is 633 mm. Figure shows the variation in the average monthly rainfall for the period 1967 -2003. In 1983/84 rainfall reached only 342.8 mm while in the year 2002/03 rainfall reached a maximum 1004.8 mm (Nablus municipality official website). Nearly 81% of the annual rainfall occurs between December and March; while July is totally dry (Environmental Profile, Arij, 1996).

Table 3-10: The long-term annual rainfall for the period `1967-2002 in mm.

Year	Total qty/water/ mm	Year	Total qty/water/mm	Year	Total qty/water/ mm
1967-1968	524.0	1980-1981	593.2	1993-1994	509.2
1968-1969	658.0	1981-1982	555.7	1994-1995	661.7
1969-1970	462.6	1982-1983	1124.2	1995-1996	658.5
1970-1971	560.9	1983-1984	342.8	1996-1997	832.8
1971-1972	619.5	1984-1985	464.9	1997-1998	735.3
1972 -1973	405.6	1985-1986	522.6	1998-1999	338.9
1973-1974	750.9	1986-1987	755.2	1999-2000	692.0
1974-1975	505.3	1987-1988	765.4	2000-2001	449.3
1975-1976	550.1	1988-1989	554.5	2001-2002	713.7
1976-1977	580.9	1989-1990	556.5	2002-2003	1004.3
1977-	476.6	1990-	490.1	1993-	509.2

1978		1991		1994	
1978-1979	327.0	1991-1992	1376.4	1994-1995	661.7
1979-1980	860.4	1992-1993	798.7	1995-1996	658.5

Nablus Municipality official website: http://www.nablus.org/en/htm/service/water_dept.htm#Statistics_.

3.3.2. Temperatures and humidity:

The geographical position of Nablus city in the northern part of the West Bank gives it a comparatively lower temperature range than other West Bank cities. During January, the coldest month, the average maximum temperature reaches 12.5 C°, and average minimum temperature reaches 6.2 C°. During August, the hottest month, the average maximum temperature is 31.5 C° and the average minimum temperature is 21.5 C°.

Table 3-11: Temperature in centigrade:

Month	1	2	3	4	5	6
Minimum	6.2	7.8	7.7	13.5	16	17.8
Maximum	12.5	13.2	14.5	20.5	23.6	23.5
Month	7	8	9	10	11	12
Minimum	20.5	21.5	22.6	19.6	17.2	10.2
Maximum	25.7	31.5	30.2	24.3	23.5	18.5

Source: Palestinian National Information Center- 2002/2004 (http://www.pnic.gov.ps/english.html)

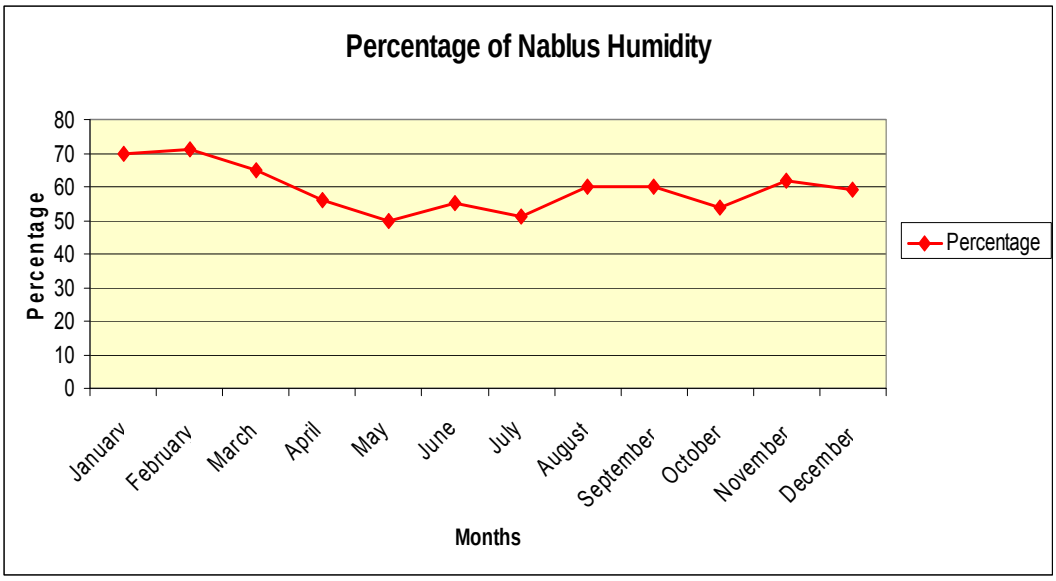
The mean annual relative humidity of Nablus city is 59.4%. During Khamaseen period, the relative humidity decreases to reach it minimum value of 50 % in May. Maximum humidity of 71% is registered in January and February so that the value increases gradually at night as shown below:

Table 3-12: The Average humidity (percentage)

Month	1	2	3	4	5	6	7	8	9	10	11	12
Percentage	70	71	65	56	50	55	51	60	60	54	62	59

Source: Palestinian National Information Center- 2002/2004 (http://www.pnic.gov.ps/english.html)

Figure 3-5: The annual average relative humidity in Nablus city.



The evaporation rate is particularly high in the summer due to strong insulation. It can reach 301.2 mm/ month (July), while in the winter it reaches only 50.2 mm/ month (January). During the spring and autumn, the evaporation is varying between 121- 169 mm per month. In December, January, February and March, precipitation exceeds the rates of evaporation.

Table 3-13: The average evaporation in millimeter (Nablus city)

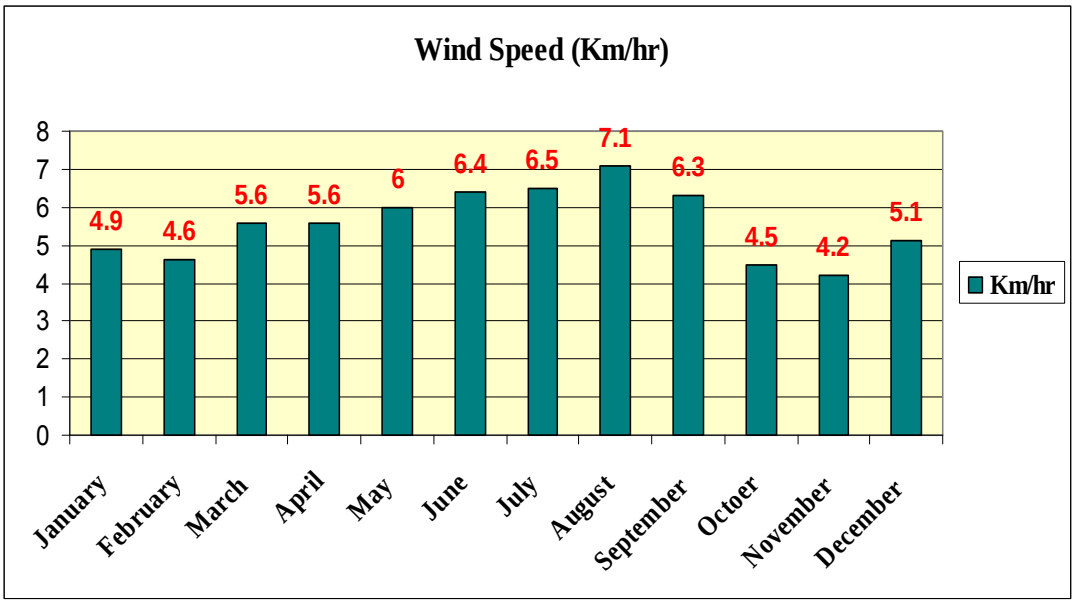
Month	1	2	3	4	5	6	7	8	9	10	11	12
In mm	50.2	70.8	121	165	217	238.2	301.2	239	202	169	140.3	80.5

Source: Palestinian National Information Center- 2002/2004 (http://www.pnic.gov.ps/english.html)

3.3.3 Wind in Nablus city:

The southwest and northwest winds are the prevailing winds in Nablus city with an annual average wind speed of 5.56 km/hr. During the summer, wind moves with relatively cooler air from the Mediterranean towards the north, with an average speed of 6.4 km/hr in June. At night, the land areas become cooler, causing diurnal fluctuations in the wind speeds due to the reduction of the pressure gradient. In winter, the wind moves from west to east over the Mediterranean, bringing westerly rain bearing winds of average wind speed 5.1 km/hr in December and 4.9 km/hr in January. The khamaseen, desert storm, may occur during the period from April to June. During the Khamaseen, the temperature increases, the humidity decreases, and the atmosphere becomes hazy with dust of desert origin.

Figure 3-6: The average wind speed in km/hr (Nablus city)



CHAPTER FOUR

INVESTIGATING URBAN AGRICULTURE PRE-CONDITIONS ON NABLUS CITY

4.1. INVESTIGATING NATURAL AND ENVIRONMENTAL CONDITIONS

Nablus city faces many urban environmental problems: These include lack of sanitation, lack of adequate solid waste collection services, water pollution from untreated municipal and industrial wastewater, indoor and ambient air pollution, contamination of soil and land from improper disposal of solid and hazardous waste and so on (Nablus municipality, 2007). It is important to address these problems for meaningful improvements to be achieved in enhancing urban livability in the city. In a very broad sense, the city environment consists of resources, human and other; processes, that convert these resources into various other useable products and services. The effects of the processes may be negative or positive (IAIA, 1998). Understanding of city environmental concept is essential for urban agriculture existence within the city boundary or in the areas surrounding the city which could be either the sub-urban or peri urban areas. Alston et al. (1998) has simplified the concept of the city environment by classifying city environmental resources.

It is obvious that environmental planning seeks to improve and protect environmental quality for urban residents through controlling the generation of pollution and through segregating activities that are

environmentally incompatible (Miller and Groot, 1997). However, the positive and negative effect of urbanization in Nablus city needs a strong and active mitigation measures.

The average growth rate of Nablus city is standing at 3.5% with 261,900 projected inhabitants on year 2025 (excluding the residents of refugee camps), which means 3.2% more than the total projected district population in year 2010 estimated at 253300 inhabitants (including refugee camps and the served villages by Nablus municipality). However, according to several studies, it's obvious that the population growth will be associated with more complicated environmental problems (Miller, 1997).

The main environmental issues considered in urban planning including per capita right to obtain cleaner air, cleaner water source, minimized solid wastes, minimized sewage water effect and better service planning (IAIA, 1998). These environmental elements are the most critical in causing huge harm to city environment impacted the health of its residents (Alston et al, 1998). This chapter will examine: (i) the environmental elements from the point of view of introducing urban agriculture as mitigation approach to environmental challenges within the boundaries of Nablus city, and (ii) the basic environmental conditions required for better urban agriculture existence.

4.1.1. Urban agriculture as mitigation response against environmental challenges:

1. Solid wastes management:

Based on population projection and the average per capita produced solid waste per day (0.95 kg/day), it has been calculated that organic wastes would increase in per year average from 64,360 tons in year 2005 to 128,117 tons in year 2025. The increased quantity of solid wastes is

expected to eliminate the capacity of municipal collection system in year 2025 where the municipality has to pay 1,238,979 US$ (for the solid waste transportation only). Referring to the current municipal solid waste disposal methods, only one third of the collected wastes transported to the dumping site near Jericho city at 35 NIS per ton so that two thirds of the total generated solid wastes are accumulated in illegal dumping sites where it is burned there (Nablus municipality, 2007). The solid wastes burning create a hazard to health and environment problems such as air contamination, leach of wastes squeezes to natural water resources, etc.

Table 4-1: the projected average of organic wastes production (2005-2025)

Year	projected population*	Solid wastes produced quantities*			Average Organic wastes (87%)
		kg/day	ton/day	ton/year	ton /year
2005	213,200	202540	202.54	73977.74	64360
2010	253,300	240635	240.635	87891.93	76465
2015	300,000	285000	285	104096.3	90563
2020	357,200	339340	339.34	123943.9	107831
2025	424,400	403180	403.18	147261.5	128117

*This includes the refugee camps and residents and the inhabitants in the served villages by Nablus municipality; (Source: Author calculations based on basic data).

Table 4-2: estimated transportation costs of average produced solid wastes at 35 NIS/ton (2005-2025)

year	Average solid wastes quantity in ton/year	disposal estimated costs (only transportation)	
		In NIS	IN US$*
2005	73977.74	2589221	622408.9
2010	87891.93	3076218	739475.4
2015	104096.3	3643371	875810.2
2020	123943.9	4338037	1042797
2025	147261.5	5154153	1238979

*US$ = 4.16 NIS; (Source: Auther calculations based on basic data).

The combination of urban organic wastes and urban agriculture creates particular issues in the modern urban setting. On the one hand, the interests of urban waste reduction mesh well with the promotion of urban agriculture, since urban and peri-urban farmers are in need of organic matter as soil conditioner/fertilizer and animal feed, and cities and towns wish to conserve disposal space and reduce the costs of municipal solid waste management (FAO, 2000). At the same time, some tensions occur between public health officials (with their concerns about diseases affecting both humans and animals and accidents associated with the reuse of municipal solid wastes) on the one hand, and the proponents of urban agriculture (who emphasize job creation and increased food production,

especially for the urban poor) on the other (GEF-UNDP,1996). It is undeniable that composting (controlled decomposition of organics) is the preferred method of processing urban organic wastes for reuse (Rosenberg and Furedy 1996).

Recently, some countries have brought in national or regional rules on solid wastes management encouraging or requiring composting for waste reduction. Composting plants are jointly run by public-private partnerships with a city supplying of wastes (Hoornweg et al 1999)

The Urban and peri-urban agriculture is one of the most demanded sectors for compost generated from organic municipal wastes. It's obvious according to many studies that compost generated from organic sources is 4 times cheaper than the one which generated by municipal garbage and wastes decomposition (Chakraborty 2000). The need of segregating and sorting municipal collected wastes is significant and essential not only on the aspect of compost production, but also on the aspect of recycling other wasted materials such as plastics, iron, papers, etc. (GTZ, 1996).

The new building instructions and rules imposed by Nablus municipality recommended enough space to surround the buildings from all sides. The average recommended space is calculated at 35% out of the total area where a new building to be constructed. These spaces are traditionally used as home gardens planted mostly with ornamental plants (Nablus municipality, planning department). Based on the information obtained from Nablus municipality planning department, it has been calculated that

the average area of these spaces makes approximately 5915 dunums, while the total allocated area for agriculture (including parks and landscapes is calculated at 2100 dunums (Nablus municipality planning department, 2007).

Table 4-3: Total available lands within the city boundaries according to Nablus municipality land use calculations:

item	area in km²	percentage of available land	area in dunums	total available area in dunums
housing	16.9	35	16900	5915
Agriculture	0.4	1	400	400
Parks	0.2	0.7	200	200
green landscapes	1.5	100	1500	1500
			Total	8015

Source: Author calculations.

According to world wide studies, plant production farmers and animal husbandry farmers have acquired and continue to access urban organic wastes and to process and use them in various ways. Green wastes obtained from fruit and vegetable markets are used for animal fodder; food wastes from hotels, canteens and food processing industries are fed to sheep and goats (Furedy et al. 1999).

In urban areas, the application to fields of decomposed municipal solid wastes has been manually sorted on site or at disposal areas or on-farm co-composting of urban animal and agricultural wastes to be use in backyard farms (Birley and Lock 1999).

Based on the calculated intra-urban spaces (area in dunums) and quantities of organic solid wastes produced annually in the city of Nablus, an application of 2- 3 tons per dunum of well fermented compost generated form the municipal wastes can consume approximately 16030 – 24045 tons which could be used in parks, open landscapes and directly in intra-urban agricultural lands. In addition, compost application as soil conditioner for the city street-trees could maximize the consumed quantities (Wade, I. 1987). Landfill compost can be used effectively in many plant production systems. Field soils can be improved by incorporating compost into the soil during land preparation or by applying it as surface mulch (GTZ- GATE, 1989). With field-grown nursery or sod crops, where significant volumes of soil are removed at harvest, compost could replenish soil losses, thus maintaining productivity (FAO, 2000). In addition, the liquid leaching of landfill as a result of decomposition and composting process could be collected and concentrated as Humic and Valvic acids soil conditioners (liquid fertilizers) where a system of collecting generated gazes could be installed and re- used in generating energy (GTZ-GATE, 1989).

Considering the year 2005 data regarding the projected quantities of municipal organic wastes, it's obvious that the enhancement of urban agriculture approach can consume 25-37% of the total generated wastes. However, urban agriculture is not limited to city boundary but also could have a broader span to include peri-urban areas where agriculture is

intensively practiced where the need of organic fertilizers is relatively more demanded (Dulac 2001).

Generally, the economics of recycling solid wastes including organic wastes is a promising feature for better city environment not only on the aspect of sanitation, but also on the aspect of creating job opportunities (EPA, 2000). However, there is no specific information regarding the cost-benefit indicators at the level of municipal solid wastes recycling (PEA, 1999). Re-using the recycled municipal organic and non-organic wastes with more economical dimension in agriculture production within urban and peri-urban areas can assist in impacting positively the city environment as listed below:

2. Reduced Greenhouse Gas Emissions:

The Environmental Protection Agency (EPA, 2006) emphasized that increasing municipal wastes recycling rate up to 35 percent could reduce annual greenhouse carbon dioxide gas emissions. It is mentioned by many environmental protection agencies that the dramatic increase of greenhouse gases emitted into the atmosphere over the last century is primarily due to burning fossil fuels for energy. Waste prevention and recycling saves energy, resulting in fewer fossil fuels burned and significantly less carbon dioxide emitted into the atmosphere. Another greenhouse gas, methane, is generated from the heaps of solid waste sent to landfills. By diverting solid waste through waste prevention and recycling (including composting) the level of methane emissions can be reduced (EPA, 2007).

3. Reduced Need for New Landfills:

Landfills take up valuable land space, are expensive to operate, and are often not very popular with local communities. By emphasizing waste prevention and recycle practices communities can benefit by extending the operating life of their current landfill. For every cubic yard of material recycled, there is one less cubic yard of landfill space required (EPA, 1996).

4. Reduced Groundwater Pollution:

New landfills are lined to protect against groundwater pollution, but no system is completely full proof. When containers with hazardous materials are improperly disposed of they often break or leak, releasing toxic elements into the soil where they can eventually end up in surface or ground waters (UNU, 2000). Even small amounts of some substances can cause fires, release toxic fumes, or harm individuals who handle them unknowingly (NORAD, 1995). It only takes one gallon of used oil to pollute one million gallons of drinking water (EPA, 1996). By recycling and properly disposing of household hazardous materials such as motor oil, oil filters, fluorescent tubes, auto batteries, and old paint, the potential for groundwater contamination is substantially lowered. Recycling household hazardous waste such as used motor oil also reduces waste. One gallon of used oil can be recycled to produce 2.5 quarts of lubricating oil, but it takes nearly 42 gallons of crude oil to make that same amount (EPA, 2000).

5. Energy Savings:

Many studies indicated that processing and manufacturing of raw materials is an extremely energy-intensive activity. Recycling and waste prevention achieve significant energy savings compared to virgin material production. For instance, recycling aluminum uses 95% less energy than producing aluminum from raw material. Recycling old paper instead of using new timber to produce paper uses 60% less energy (NORAD, 1992).

6. Reduced Air Pollution:

The extraction of raw materials often results in the release of many different and even toxic pollutants. Recycling and waste prevention are highly effective strategies for reducing air pollution. Air pollution resulting from the extraction and processing of raw materials are substantially decreased when recovered materials are used to make new products rather than virgin materials. Waste prevention is even more effective in reducing air pollution, because it reduces the need to extract, process, or transport new material in the first place (EPA, 1996).

7. Conserves Resources for Future Generation:

The earth's natural resources are extraordinary, but they are limited. The supply of nonrenewable resources, such as oil and iron, will someday be exhausted and renewable resources, such as paper and wood, only have a limited annual supply (EPA, 2000). One of the largest impacts recycling and waste prevention can have is reducing the loss of forests. For every ton

of paper recycled, 17 trees are saved from having to be cut down to make new paper (NORAD, 1992). For example, if all the newspapers printed in the United States alone were recycled, more than 250 million trees would be saved each year. Additionally, reduced forest loss increases the storage of carbon dioxide in trees and helps to reduce the level of greenhouse gases in the atmosphere (World resources, 2000).

4.1.2. Wastewater, Sewage and treatment:

Wastewater is the flow of used water from a community (EPA, 2000). The characteristics of the wastewater discharges will vary from location to location depending upon the population and industrial sector served, land uses, groundwater levels, and degree of separation between storm water and sanitary wastes (Peace Corps, 1985). Domestic wastewater includes typical wastes from the kitchen, bathroom, and laundry, as well as any other wastes that people may accidentally or intentionally pour down the drain (Arij, 1998). Sanitary wastewater consists of domestic wastewater as well as those discharged from commercial, institutional, and similar facilities (world resources, 1996).

Physically, wastewater is usually characterized by a grey color, musty odor, a solids content of about 0.1%, and 99.9% water content. The solids can be suspended (about 30%) as well as dissolved (about 70%). Dissolved solids can be precipitated by chemical and biological processes. From a physical point of view the suspended solids can lead to the development of

sludge deposits and anaerobic conditions when discharged into the receiving environment (IAIA, 1998).

The chemical composition of wastewater contains organic and inorganic compounds as well as various gases. Organic components may consist of carbohydrates, proteins, fats and greases, surfactants, oils, pesticides, phenols, etc.. Inorganic components may consist of heavy metals, nitrogen, phosphorus, sulfur, chlorides, alkalinity, toxic compounds, etc (UNEP, 1994). In domestic wastewater, the organic and inorganic portion is approximately 50% respectively. However, since wastewater contains a higher portion of dissolved solids than suspended, about 85 to 90% of the total inorganic component is dissolved and about 55 to 60% of the total organic component is dissolved. Gases commonly dissolved in wastewater are hydrogen sulfide, methane, ammonia, oxygen, carbon dioxide and nitrogen. The first three gases result from the decomposition of organic matter present in the wastewater (EPA, 2000). From the biological point of view, wastewater contains various microorganisms and plants including bacteria, fungi, protozoa, and algae, ferns, mosses, seed plants and liverworts (NORAD, 1994).

Despite the fact that wastewater has an important role to play in water resources management as a substitute for fresh water in irrigation (FAO, 2000), and its contributes to water conservation which is economically feasible by releasing freshwater sources for potable water supply only; the re-use of wastewater contains many pollutants which, if discharged directly

to the environment (peace corps, 1984). Wastewater re-use (if not treated) can seriously create pollution problems.

The need for wastewater treatment is essential even when wastewater to be re-used for irrigation and agriculture purposes (IDRC, 1996). The most appropriate wastewater treatment to be applied before effluent use in agriculture is that which will produce an effluent meeting the recommended microbiological and chemical quality guidelines both at low cost and with minimal operational and maintenance requirements (GTZ-GATE, 1989). Adopting as low a level of treatment as possible is especially desirable in developing countries, not only from the point of view of cost but also in acknowledgement of the difficulty of operating complex systems reliably (world resources, 1996). In many locations it will be better to design the re-use system to accept a low grade of effluent rather than to rely on advanced treatment processes producing a reclaimed effluent which continuously meets a stringent quality standard (World Bank, 2000).

According to Kfw study (2004) launched jointly with Nablus municipality, the average total of portable water demand excluding UfW is calculated at 18,481 m^3/day in the year 2005 (including villages already supplied by Nablus municipality). The projected demand for portable water estimated to increase at 29,639 m^3/day in year 2015 and 43,459 in the year 2025. These figures indicated the annual produced wastewater which could reach 4.39 MCM per year according to 2005 calculation.

Table 4-4: Waste water based on PCBS and municipal data.

Indicator	Value
Municipal served Population in 2005 (Nablus city, refugee camps and villages)	213200
Demanded Water/population in m^3/day (UfW is not included)	18,482
Demanded water/capita in m^3/day (total demanded water / population)	0.086684
Per capita water consumption in m^3/year (total demanded water per capita X 365.25 days)	31.66133
Total water consumption of Nablus city in Million m^3/year (per capita annual consumption X total number of population)/ 1 million)	6,75
Total estimated waste water in MCM/ year (total city consumption – unforeseen losses estimated by Nablus municipality at 0.35)	4.39

Source: Author calculations.

This huge amount of wastewater discharged without treatment into nearby Wadis in the west and east city skirts through 140 km of sewer network constructed in the past 50 years where 95% of Nablus city establishments including houses are connected to network (Nablus municipality, 2007).

Taking into the consideration the generated volume of wastewater in the city of Nablus, a proposed wastewater treatment plant inside the city municipal boundary could enhance rapidly and effectively the potential of urban agriculture where treated wastewater could be reused for irrigation of parks and gardens, agriculture and horticulture, tree plantation in the intra-urban and peri-urban areas surrounding the city. However, the establishment of wastewater treatment plants for irrigation and agriculture production purposes must exit not far from the available lands for urban agriculture production interventions (FAO, 2000). For agriculture use purposes, the wastewater should generally be treated to secondary

wastewater standard (< 20 mg/L BOD and < 30 mg/L SS) with a total coliforms less than 1000 organisms per 100 mL for maximum safety purposes (UNEP, 2003). Following the standards of UNEP 2003, treated wastewater could be re-using even for cultivations require sprinkler irrigation which means could be used to irrigate various agricultural crops.

4.1.3. The environmental impact of wastewater recycling:

Urban agriculture existence requires sustainable source of water to be used for irrigation without causing any competition with other sectors such as commercial, industrial, institutional or even portable drinking water (IDRC, 1996). The economic return as a result of urban agriculture practices is proposed to enhance financially the establishment of wastewater treatment plants within urban cities (NORAD, 1994). Treated wastewater whether it re-used for urban agriculture or even industrial sectors could further lead to positive environmental impacts which indirectly contribute in conserving agriculture production elements such as soil (land), water, and natural resources.

Water recycling can decrease diversion of freshwater from sensitive ecosystems; plants, wildlife, and fish depend on sufficient water flows to their habitats to live and reproduce (EPA, 2003). The lack of adequate flow, as a result of diversion for agricultural, urban, and industrial purposes, can cause deterioration of water quality and ecosystem health (world resources, 1996). Water users can supplement their demands by using recycled water, which can free considerable amounts of water for the

environment and increase flows to vital ecosystems (FAO, 2003). In Nablus city, the impetus for water recycling comes not from a water supply need, but from a need to eliminate or decrease wastewater discharge to Wadis in west and east areas. For example, high volumes of un-treated wastewater discharged from the city of Nablus reaching Tulkarm city has negative impacts on ground water (Nablus municipality, 2007), soil and many other environmental elements. In addition, Water recycling can reduce and prevent pollution and eliminating pollutant discharges to environmental resources.

4.1.4 Basic environmental conditions required for better urban agriculture existence:

Climatic conditions are basic factors which are essential for the consideration of Urban Agriculture as a survival strategy in Nablus city where factors such as temperature, light, rainfall, water and others must be tested as the basic requirements for good cultivation growth. It has been noted that plants generally have the same growth requirements but the major difference is the method by which the plants are supported and the organic or inorganic elements necessary for growth and development are supplied (FAO, better farming series, 2002).

1. Temperature:

Plants grow well only within a limited temperature range. Temperatures that are too high or too low will result in abnormal development and reduced production. Warm-season vegetables and most flowers grow best

between 16 C° and 24 C°. Cool-season vegetables such as lettuce and spinach should be grown between 10 C° and 21 C° production (Hackett, 1979). In Nablus city; the average maximum temperature lies between 12.5 C° in winter and 31.5 C° in summer season which indicates the suitability of growing various crops.

Each kind of crop grows and develops most rapidly at a favorable range of air temperatures. This is called the optimum air temperature range (Yamaguchi, M. 1983). For most crops the optimum functional efficiency occurs mostly between 12 C° and 24 C°. Most crops (and especially vegetables) can be classified according to the temperature requirements of their optimum air temperature range. However they are generally grouped into whether they require low or high air temperatures for growth (AVRDC. 1990). Relatively, Nablus city has a moderate air temperature (10 C° and 20 C°) lies in the optimal air temperature requirement for best optimal growth of cultivated crops.

2. Light:

All vegetable plants and many flowers require large amounts of sunlight. Grown vegetables need at least 7 to 10 hours of direct sunlight each day to produce wells. Adequate spacing between plants will ensure that each plant receives sufficient light (Nonnecke, I.L. 1989). Inter- space between cultivated plants is well known and noted in agriculture science and practices (FAO, 1976).

Light intensity is a major factor governing the rate of photosynthesis. The quantity or amount of light received by plants in a particular region is affected by the intensity of the incident (incoming) light and the length of the day. The light intensity changes with elevation and latitude (AVRDC. 1990). The amount of sunlight also varies with the season of the year and time of day, as well as, other factors, such as clouds, dust, smoke or fog (FAO, 2000).

In Nablus city, the average sunshine hours is calculated at 7.8 reaching its maximum during August month at 10.9 hours and its minimum at 4.7 hours during the month of January (Arij, 1998). Despite the variation in the number of sunshine hours between Eibal and Jarzeem mountains, the city of Nablus still has the potential to fulfill various crops sunshine requirements in terms of number of hours required for production.

3. Water:

Water is essential to photosynthesis, it plays a key role in transpiration, and it regulates the stomata (openings in leaves to evaporate leaf moisture), and thus is crucial to growth and leaf expansion of plants. When water is in balance (the supply is equal to the need), the optimum performance of all components results in steady active plant growth. However, when the balance of water is affected either because there is insufficient available moisture in the soil (or soil mix), or the transpiration of water through the stomata exceeds the plant's capacity to compensate for the internal loss, the plant comes under stress (Bjorn, 1994).

Most crops have differing critical growth periods, and if water stress occurs during critical stages of growth, yield is directly affected. When moisture requirements are not met during this critical phase permanent, irreparable damage usually is the result. The plant quality is diminished, or the plant yield is reduced (Nonnecke, I.L. 1989).

Water quality can be a problem if alkalinity or salt content can result in a nutrient imbalance and poor plant growth (FAO, 1976). Water that tests high in total salts should not be used that salt levels greater than 0.5 millions or 320 parts per million are likely to cause an imbalance of nutrients (Bjorn, 1994).

Nablus city is distinguished by its high quality water which is obtained from several wells and springs available in the intra-urban or peri-urban surrounds. According to Kfw study launched jointly with Nablus municipality in 2005, the water quality in the city is in line with WHO guidelines and the Palestinian Water Quality Standards (PS4). Most of the city backyard gardens are irrigated with water pumped by the city municipality which also used as drinking water. Street trees also irrigated by the same source of water (Nablus municipality, 2007). Some households use rainfall water collected in private cisterns for irrigation. The annual average of rainfall in the city is calculated at 633 mm and considered relatively good to rain-fed crop production as well as animal husbandry agriculture with average relative humidity at 59.4%.

4. Wind:

A slight wind is necessary to replenish carbon dioxide (CO2) near the plant leaf surface (Nonnecke, I.L. 1989). The average wind speed in Nablus city at 5.56 km/hour is relatively appropriate for the creation of plant self pollination. However, urban trees cultivations can protect crop production within the city boundaries during the Khamaseen storming period between April to June.

4.2. Investigating Physical Infrastructure and Services

Basic requirements for production are the availability of water and land space. If water or land space is not available, agriculture will not exist (FAO, better farming series, 2000). The availability of infrastructure for water coupled with access to water can compensate for lack of rainfall and, in spite of this, lead to Urban Agriculture (www.cityfarmer.org). If Urban Agriculture is dependent on infrastructure; urban agriculture will be dominated by certain groups having access to it and most likely more economic oriented (Wade 1987).

4.3. Water availability and accessibility:

1. Water demand:

It is obvious by analyzing the data obtained from the inception report prepared by kfw (Hydraulic analysis study of the Nablus water supply system, 2005) that the increase on water demand for domestic, institutional (schools, hospitals, etc), industrial and commercial uses would increase gradually year by year where the capacity of the city to provide water is

assumed to stick to its current volume (actual water production) at 23,627 m³/day (as it depends on natural reserved water and wells). Further more, even if Nablus municipality will consider seriously to eliminate the rates of unaccounted for water (UfW) estimated by kfw in year 2005 at 35%, the municipality could not reach better than 10% reduction of the total uncounted for water rates until 2025 where the rate will stand at 25% depending on water network rehabilitation or replacement as well as the available funds.

The current and projected water availability and distribution among sectors do not reflect the water used for agriculture despite the fact that agriculture, parks and landscape areas makes a total of 6.85% out of the total city lands (calculations made by author). According to Nablus municipality projections, the total amount of the demanded water in cubic meters per day will increase from 15,200 m³ / day in 2005 to reach 35,626 m³ in year 2025 (within the intra-urban area only).

Table 4-5: Water demand by sector (agriculture is excluded):

Year	Domestic m³/day	Institutional m³/day	Industrial/ commercial m³/day	Total m³/day
2005	11,496	1,248	2,456	15,200
2015	18,977	1,761	3,349	24,087
2025	28,572	2,484	4,570	35,626

Source: Nablus municipality (2007).

Based on the data of the previous table, and by comparing data regarding demanded water with actual available water according to municipal

projections (water demand, population, water resources and water pumping capacity), it is obvious that the city of Nablus is facing water supply crisis. It has been noted that roof tanks are used for water storage and act in aiding the municipality to achieve a reasonable distribution of the available water in order to match the demand (as the municipality pump water by intervals day after day).

Despite the plans prepared by Nablus municipality aiming to reduce the UfW rates, still efforts must be made in order to rehabilitate water distribution pipes. According to KfW 2004, most of the water pipes are ranging from 4- 6 inches in diameters and even used for secondary distribution networks. Considering the length of the water supply network (270 km) with such diameters, would definitely increase water losses. Table 21 gives evidence regarding the water balance in Nablus city; taking into the consideration that water used for agriculture within the city boundary is not calculated.

Table 4-6: Water balance without agriculture.

Year	Demanded water in m³/day (excluding agriculture)					Total available m³/day	Balance in m³/day
	Sectors demand in m³/day	Villages served by municipality in m³/day	UfW rate	UfW in m³/day	Total in m³/day	Actual pumped water in m³/day	
2005	15,200	3,281	35	6468	24,949	23,627	-1.322
2015	24,087	5,553	30	8992	38,632	23,627	-15,005
2025	35,626	7,833	25	108	54,32	23,627	-

				65	4		30,697

Source: Author calculations based on municipal information and KfW concept paper (2005).

Introducing urban agriculture to intra-urban and peri-urban areas is essential to re-balance the city environmental conditions (including solid waste management) and food security purposes (including the improvement of dwellers purchasing power and creating job opportunities). However, intra-urban and peri-urban agriculture would increase water demand assuming that the production would base on irrigation. By utilizing the city food demand data (PCBS, 2005) which based on per month food consumption per household, and assuming: (i) The family size will not change (average 6.4 individuals), (ii) Basic selective food commodities for consumption to be produce within Nablus municipal boundaries; the total required water for urban agriculture is calculated at 8311 m^3/day for 2005, 11694 m^3/day for 2015 and, 16541 m^3/day for 2025 (see appendix 1). Therefore, the amount of demanded water in m^3/day will increase the scarcity of the available water and will increase the necessity of identifying other water resources or sources.

Table 4-7: Water balance with urban agriculture consideration.

Year	Balance in m^3/day*	
	Without considering urban agriculture	With the consideration of urban agriculture
2005	- 1,322	- 9633
2015	- 15,005	- 26699
2025	- 30,697	- 47238

*The above projected figures describes the total water demand in m^3/day (including demands for domestic uses, industrial, commercial, institutional, uncounted for water, urban agriculture and, villages supplied with water by Nablus municipality).

2. Water Supply:

The need of alternative water sources to fulfill the city demanded water (including urban agriculture interventions) could include four different scenarios: (i) wastewater recycling, (ii) replacing industrial and commercial water demand with recycled (treated) waste water, (iii) water collection and rainfall harvesting and, (iv) rainfed consideration (no irrigation).

3. Wastewater recycling:

According to Arij 1996, wastewater is impacted by water consumption rates, population density, industrial practices, and habits of the population. The total current water availability for distribution is standing at 23,627 m^3/day (Nablus municipality, 2007). Based on the estimated uncounted for water rates estimated by kfw study 2005, the total proposed amount of wastewater generated from domestic and institutional functions in the city of Nablus is standing at 8,284 m^3/day in 2005, 14,517 m^3/day in 2015 and, 23,292 m^3/day in 2025.

Table 4-8: Estimated amount of treated wastewater in cubic meter per day:

Year	Domestic m^3/day	Institutional m^3/day	Total m^3/day	UfW rate	Total UfW in m3/day	Total m^3/day
2005	11,496	1,248	12,744	35 %	4460.4	8,284
2015	18,977	1,761	20,738	30 %	6221.4	14,517
2025	28,572	2,484	31,056	25 %	7764	23,292

Source: Author calculations based on basic data obtained from various resources.

By comparing the total possible generated treated wastewater in m^3/day with the total water balance based on supplying capacity and water required consumption in m^3/day, the overall total demanded water will stay negative but determine the requirements and specifications of the design of the wastewater treatment plant. Its obvious that wastewater treatment plant

would need a storage area or tanks before start pumping water for city sectors utilizations enough to hold at least 9633 m³ in 2005, 26699 m³ in 2015 and, 47238 m³ in year 2025 where treated water to be collected and stored for at least 28 hours in 2005, 45 hours in 2015 and, 49 hours in year 2025 before start pumping for city functioning sectors including urban agriculture. The calculations were based on the proposed amount of generated wastewater (assuming proper connection and best quality of treated water to be use for irrigation) that the fulfillment of required water need to be stored prior to start pumping once the storage tanks are filled with the total amount of treated water actually needed per day for city functions. ((total amount needed per day in m³ X 24 hours) / proposed amount of treated wastewater in m³ = the number of hours required before start reusing treated water).

Table 4-9: Estimated balance of the amount of available water after the treatment:

Year	Balance in m³/day (after wastewater treatment)		
	With the consideration of urban agriculture in m³/day	Possible produced treated wastewater in m³/day	Balance in m³/day = total demanded – total allocated
2005	- 9633	8284	-1349
2015	- 26699	14517	-12182
2025	- 47238	23292	-23946

Source: Author calculations based on basic data obtained from various resources.

Table 4-10: Estimated wastewater amount in cubic meters if storages used before pumping.

Year	Balance in m³/day (after determined starting hour)				
	With the consideration of urban agriculture in m³/day	Proposed treated wastewater in m³/24 hours	Certain hours	Proposed treated wastewater in m³/ certain number of hours	Balance in m³/day

2005	- 9633	8284	28	9665	+ 32
2015	- 26699	14517	45	27219	+ 520
2025	- 47238	23292	49	47555	+ 317

Source: Author calculations based on basic data obtained from various resources.

4. Water collection and rainwater harvesting:

Rainwater harvesting is the collection and storage of rain from roofs or from surface catchments for multi-sectoral uses in-intra-urban and peri-urban areas (SKAT,1996). The water is generally stored in rainwater tanks or big reservoirs to be ready for use (IDRC,1996). Rainwater harvesting can provide lifeline water for human consumption, reduce water bills and the need to build reservoirs which may require the use of valuable land (WRI, 1996).

Traditionally, rainwater harvesting has been practiced in arid and semi-arid areas, and has provided drinking water, domestic water, water for livestock, water for small irrigation and a way to replenish ground water levels (UNEP/ETC, 1998).

Rainwater harvesting in urban areas can have manifold reasons. To provide supplemental water for the city's requirement, to increase soil moisture levels for urban greenery, to increase the ground water table through artificial recharge, to mitigate urban flooding and to improve the quality of groundwater are some of the reasons why rainwater harvesting can be adopted in cities (Fengrui et al, 2000). In urban areas of the developed world, at a household level, harvested rainwater can be used for flushing toilets and washing laundry. Indeed in hard water areas it is

superior to mains water for this. It can also be used for showering or bathing. It may require treatment prior to use for drinking (Preul, HC, 1994).

In Nablus city, the projected water demand will keep increasing to reach -83,570 m³/day in year 2025 which equal to 30,523,943 m³/year (about 30.5 MCM). Given that the average annual rainfall in Nablus city is standing at 633 mm and employing a moderate runoff coefficient of 25%, the average rainfall would be effective for collection at 474.75 mm per year = 474.75 m³ for each 1000 m² (1 dunum) of lands where annual rainfall – 25% of the total rainfall gives the total water available for rainwater harvesting over unit area (which equal to 1 dunum in this case).

Table 4-11: Water balance based on rainwater harvesting scenario in cubic meter.

Year	Domestic m³/day	Institutional m³/day	Industrial/ commercial m³/day	Villages served by municipality in m³/day	Urban agriculture m³/day	UfW in m³/day only for connected premises	Total demand m³/day	Available water m³/day	Total rainwater harvesting required m³/day (Balance= total demanded – available water in m³/day)
2005	11,496	1,248	2,456	3,281	8311	6468	33260	23,627	- 9,633
2015	18,977	1,761	3,349	5,553	11694	8992	50326	23,627	- 26,699
2025	28,572	2,484	4,570	7,833	16541	10865	70865	23,627	- 47,238
Total in m³/day									- 83,570

Source: Author calculations based on basic available data.

By dividing the total demanded water over actual amount of the annual rainfall as: (30,523,943 m^3 in year 2025) / 474.75 m^3 (the actual rainwater available for harvesting), about 64,294.77 dunums (catchments area) are required for enough rainwater harvesting amount to fulfill the city water scarcity where pumped available water to be use for only drinking uses. The huge number of required dunums for rainwater catchments at 64.3 $km^2$is exceeding the city total area equal to 28.57 km^2. Despite the possible rainwater harvesting for specific sector usage such as industry, commercial or agriculture, its obvious that the investment costs of such proposed projects at municipal level is very costly (Kanmani S. & Kamegam, 1987). Running rainfall harvesting systems is more economically visible per individual business establishment or at per building level which further requires high level of dwellers awareness as well as water use optimization campaigns. However, the municipalities should consider rainwater harvesting in designing the streets noting that 20% out of total Nablus city area is allocated for streets which make an area almost of 5500 dunums capable to catch an average of 2,611,125 m^3 per year.

5. Wastewater reuse for industry:

Treated wastewater can be used for industrial purposes if suitable industries are not far from the treatment plant (William M. et al, 1982), that off-site treatment plants reuse of wastewater may be limited by the need to pipe treated wastewater to where it is needed (Abu-Zreig et al, 2000). The total amount of daily demanded water in industries and commercial business in Nablus city standing at 2456 m^3/ day in 2005, 3349 m^3/ day in

2015 and, 4570 m³/ day for 2025 (Author calculations based on kfW report 2004). However, urban agriculture daily demand for water for irrigation was calculated (see appendix 1) at 8311 m³/ day in 2005, 11694 m³/ day in 2015 and, 16541 m³/ day in 2025. the calculated figures indicated that replacement of industrial daily demanded water in m³ to be use for urban agriculture interventions is not feasible and also costly according to many studies and research papers (UNEP/ETC 1998, Preul HC. 1994, Peace corps 1985).

6. Rain fed consideration (No irrigation)

Relying on annual rainfall for agriculture purposes including urban agriculture will eliminate the cropping options, type of cultivation that its land consuming as well as economically not feasible to create job opportunities (Bjorn, 1994). However, rainfed agriculture still exist as an option for forage crops cultivations and orchards such as olive trees or almond. Its obvious that urban agriculture is not included by Nablus municipality water supplying regimes (Planning department, Nablus municipality, 2007).

4.3. Water accessibility:

The water consumption in Nablus city is limited in the first place by the production and in the second by the technical inadequacy of the supply system. The number and capacity of the existing wells is not sufficient to satisfy the demand. Only in winter when spring yields are rich the consumption is suppressed by the limited capacity of the undersized

network (KFW inception report, 2006). According to Nablus municipality, only 23,627 m³/day are pumped from 11 wells through 270 km of different types of water pipes (Nablus municipality, 2007). There are ten operating storage tanks mostly combined with pumping stations located inside the city. These storage facilities provide a volume of 11,800 m³ representing the current average demand of the city calculated by Kfw at 74 letter per capita per day, which still substantially lower than the WHO average of 150 l/c/d (Nablus municipality, 2007). The list of these storage facilities is as below:

Table 4-12: Nablus city reservoirs capacity in cubic meter pumping per day.

Reservoir	Capacity in m³	Elevation (meter above sea level)
Ein Dafna	5000	531
New Reservoir	3500	459
Northern	500	668
Southern	500	645
Ras Al-Ein	300	580
Ein al Assal	150	563
Qaryon	600	538
Junied	500	615
Ein-Beit Elma'	250	454
Al-Rahbat	150	568
Total	11,800	

Source: Nablus municipality (2007)

However, Nablus city is divided into 9 water services zones with some interconnections exist between these zones (Kfw, 2004), in the lower situated parts of the service areas, the pressure in the distribution network reaches extremely high values due to the differences in altitude within the supply zone. The municipality supplies the zones intermittently by opening

and closing various valves during a number of hours. More than 31,000 houses are connected to the water distribution network (Nablus municipality 2007).

4.4. Land availability and accessibility:

Urban agriculture is increasingly becoming an important activity in urban economies that it can contribute significantly to the well being of farmers and other citizens, if properly managed (Arginti, 2000). The growth of human settlements creates a competition between the traditional urban land uses and urban agriculture (Chapin and Kaiser, 1979). Whilst regional and urban planners have generally accepted the peri-urban zone as a mixed zone in terms of land use categories (including urban agriculture), the intra-urban zone in most cases remains a preserve for "traditional" urban uses (Ouon, 1999).

Urban planning in most developing countries has tended to be characterized by long-term comprehensive planning, which adopt a blue-print approach. This type of planning is associated with rigidity and a lack of responsiveness to social issues, and has negatively affected the integration of urban agriculture (Dubbelling, 2003). Planning departments in Palestine are often ill-equipped, understaffed and the position of planners is not often at the level of real decision making. This means that their decisions are not always recognized and their plans are often shelved for lack of resources to implement them (Faludi, 1973).

Urban, city or town planning is the discipline of land use planning which deals with the physical, social, and economic development of metropolitan regions, municipalities and neighborhoods (Ouon, 1999). Land use planning is the term used for a branch of public policy which encompasses various disciplines which seek to order and regulate the use of land in an efficient way (Chapin and Kaiser, 1979). Urban planners shape patterns of land use and the built environment in and around cities to solve and prevent challenges of urbanization, including providing shelter, food and other basic needs of life, protecting and conserving the natural environment and assuring equitable and efficient distribution of community resources, including land (Dubbelling, 2003). Urban planning lays claim to being comprehensive in scope, future oriented, public interest driven, and of wanting to enhance the livability of human settlements. It is also distinguished by its focus on numerous functional systems that make up the community, including the study of their characteristics and interconnectedness (Faludi, 1973).

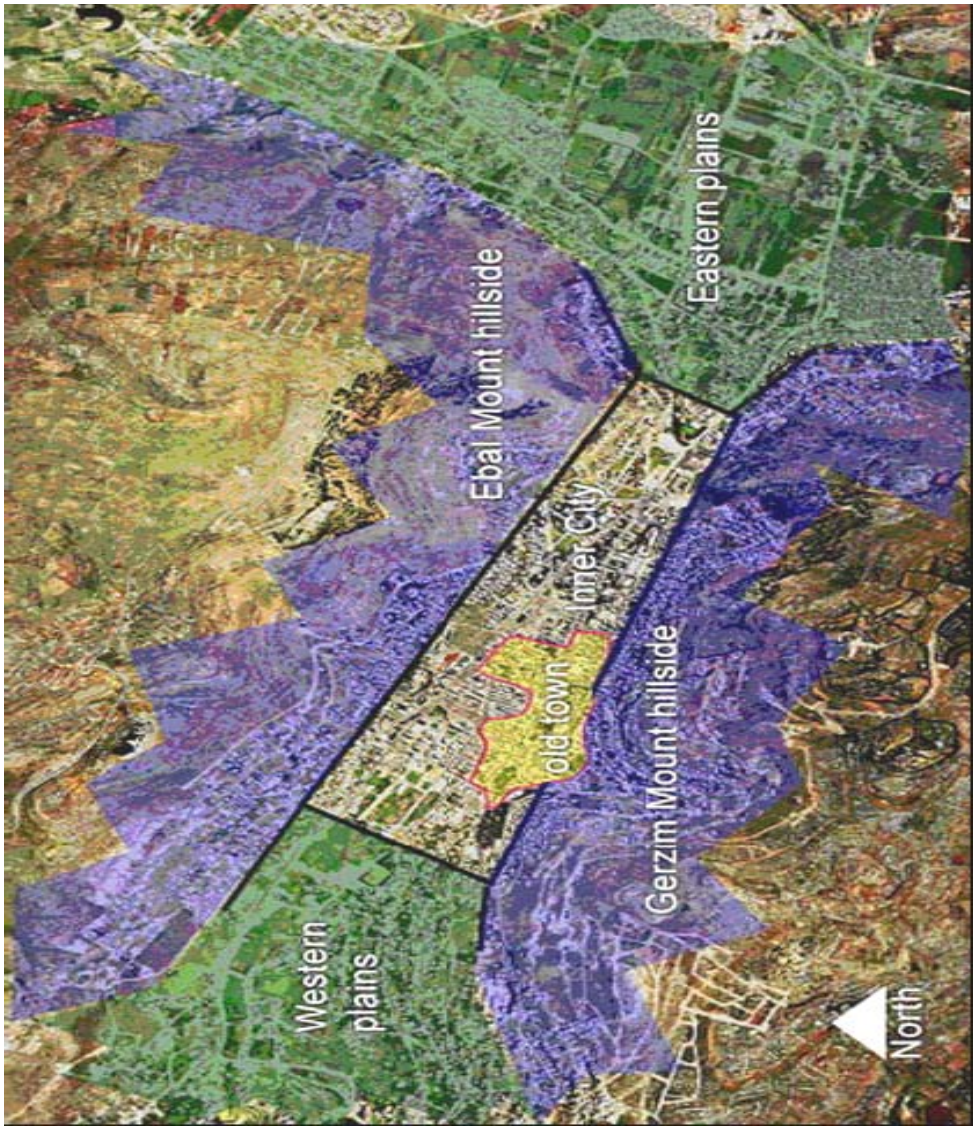
4.4.1. Land use planning:

An urban area is made up of complementing and conflicting uses and demands that have to be properly managed. This scenario is made worse by the fact that land is a finite resource and the demands on a particular piece of land are many and varied (Mushanba et al, 2003). Land use planning is viewed as the process of organizing the use of land and its resources to best meet the people's needs over time according to the land's capabilities. (Chapin and Kaiser, 1997) According to this definition every piece of land

within an urban environment should have an appropriate use. The definition further relates to the concepts of sustainable development and use of resources. Land use planning can also be viewed as the development of a plan for the future use of land, for instance, through zoning. Land use planning is not a haphazard event but should be a well thought out process (Faludi, 1973). Thus, if a certain use of land, for instance urban agriculture, is not considered during the planning process, it would then be very difficult to properly include it in the implementation of the plan, and to achieve the maximum benefit (Mposha, Mike, 2005).

By reviewing land use map published by Nablus municipality (2007), it's obvious that agriculture area is making only 1% out of the total municipal area. Further, the allocated agriculture zone is not concentrated in one location but dispersed among the overall city landscape. Ramzi Hassan & K. Jorgensen, 2004 illustrated three main zones that characterized the landscape of Nablus area: (i) Eastern plains, (ii) Western Plains, (iii) Inner-city and, (iv) the mountains (Ebal and Gerzim).

Figure 4-1: Nablus city landscapes and zones.

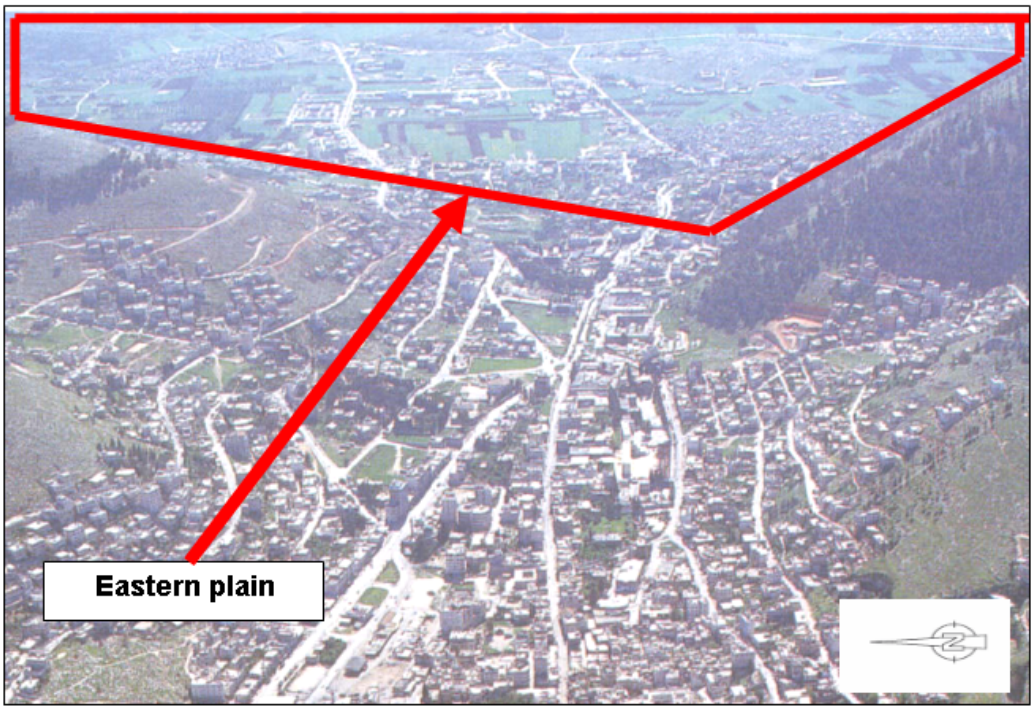


Source: R.Hassan & K. Jorgensen 2004.

Based on the illustrated zones proposed by Ramzi Hasan & k. Jorgensen, the eastern plain of Nablus city contains (in its entire) the most fertile soil available within municipal boundaries and categorized as the most suitable

for urban agriculture interventions. A sky picture took in 1994, showing the evidence of urban agriculture interventions within Nablus municipal boundaries.

Figure 4-2: The Sky view of Nablus city.



Source: the Author (searching internet pictures for Nablus city) Nablus in 1994.

However, according to Nablus municipality published land use map in (2007), it's obvious that this area is considered as industrial zone where urban agriculture practices in the zone are totally ignored. According to EPA 2000, expanding industrial areas without highest environmental concerns and assessment studies will result in huge harm to the surrounding environment. From urban agriculture planning point of view, the industrial area in the eastern zone will act as barrier between peri-urban and intra-urban area assuming that sub-urban location are not existing any more due

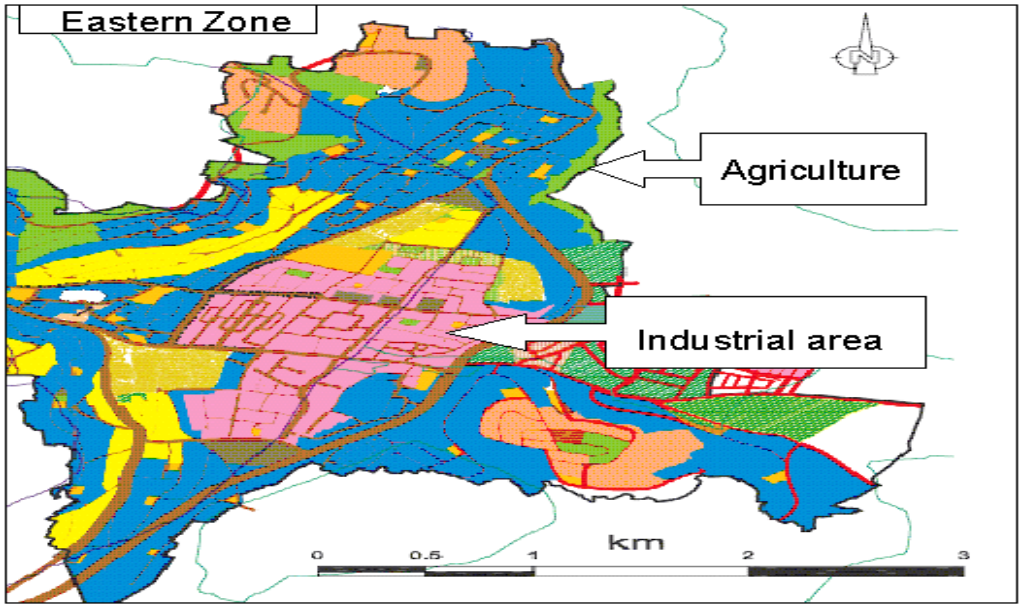
to the rapid expansion of the city as well as the nearest surrounding rural communities (peri-urban areas). The following section of the municipal published land use map and satellite images took from Google (2007) give the evidence. (see figures 20 and 21).

The establishments of the industrial zone (or any other not related agriculture zones) between urban and peri-urban areas will double the transportation cost of the agriculture produce and will cause additional load over the environment as will as may cause traffic jam. However, if the industrial area is allocated between peri-urban and urban areas; then a reasonable land must be allocated next to the industrial area for urban agriculture functions.

4.3.2. Access to land:

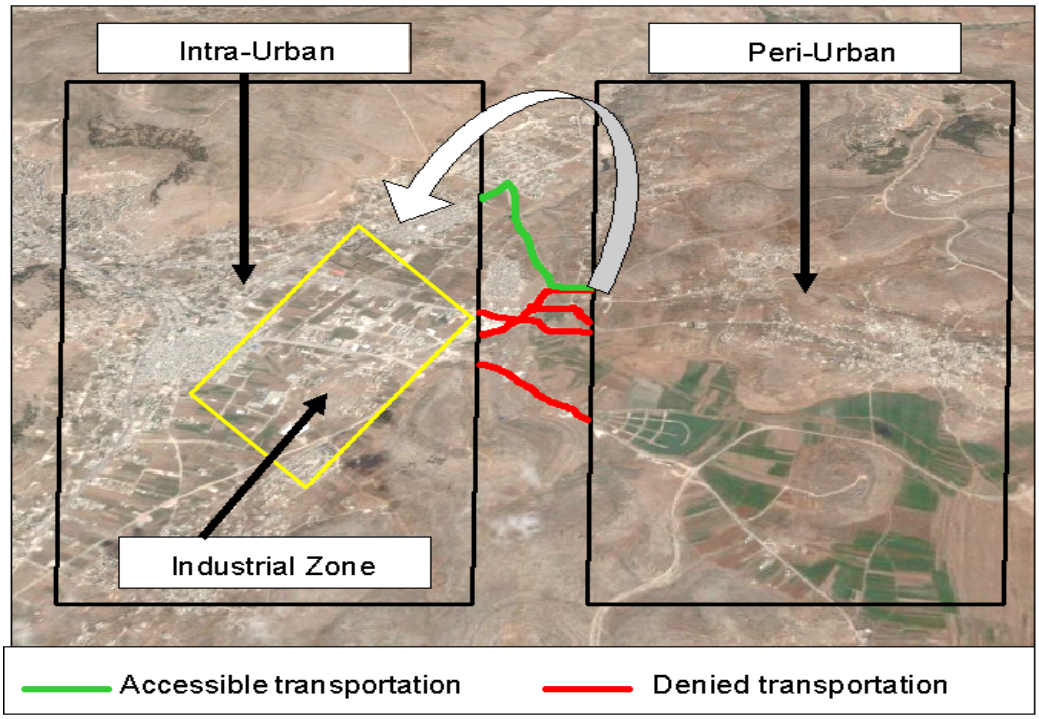
Land is one of the most controversial issues associated with urban agriculture, referring to the issues of secure tenure and conflicts over use of scarce urban land, water and other resources. Land for urban agriculture is either not available, or when available it may not be accessible, and when accessible it may not be usable for a particular form of agriculture (Mushamba et al., 2003).

Figure 4-3: Land use map of Nablus city in the eastern plain.



Source: Nablus municipality GIS map modified by the author.

Figure 4-4: Satellite view for eastern plain shows that industrial zone will effect accessibility to the wholesale market in Nablus city .



Source: Google earth (2007), modifications made by author.

1. Land Availability:

In most cities and towns there is a high demand for land for residential, commercial and industrial development, among others. The productive or potentially productive areas of the city that have not been paved over are not limited to communal farms and private gardens (Mposha, Mike, 2005). In Nablus city, agricultural use of the land is limited because of claims for other uses. This makes availability of land, and other resources associated with land such as water, a great concern for the urban farmer. Institutional land areas (belonging to hospitals, schools, and churches), parks, lands under high-voltage electrical towers that cannot be used for buildings and those surrounding refuse dumps make up much of a municipality's territory (Dubbelling, 2003). Planning the use and exploitation of these spaces requires mapping their location as a first step and then assessing their

potential. It is important to assess the availability of land for urban agriculture in a given city in the short, medium or long-term period. Land may not be available due to rapid development of the built-up environment (Burdge, 1996).

It has been estimated by the author that 2515.5 dunums are required in 2005 for urban agriculture interventions, 3539.5 dunums in 2015 and, 5006 dunums in the year 2025 (See appendix 2). However, according to Nablus municipality, only 400 dunums are available for direct agriculture use within the city municipal boundaries. Parks and other green landscapes make about 1700 dunums.

Table 4-13 : Number of dunums demanded for intensive urban agriculture option.

Crop	Number of demanded dunums		
	2005	2015	2025
For horticulture	2390	3363	4757
For livestock	125.5	176.5	249
Total in dunums	2515.5	3539.5	5006

Source: Author calculations (see appendix 2).

Regardless the spatial organization of the required calculated lands for urban agriculture interventions within intra-urban area, and assuming that: (i) all these lands are suitable for agriculture production, (ii) all the lands are accessible, (iii) the allocated area will not change at 400 dunums till the year 2025; The intra-urban agriculture lands (based on the previous assumptions) would cover only 16% of the total agriculture production required for the city dwellers consumption in year 2005, 11% for 2015, and will decrease up to 8 % in year 2025 (based on assumed monthly

consumption calculations described in appendix 1 and by calculating the percentage of 400 dunums from the total required area as calculated in the above table). Based on basic agriculture commodities assumptions required to fulfill the consumption demand for Nablus city dwellers, the city still need links and access to more available lands of 2115.5 dunums in 2005, 3139.5 dunums in 2015 and, 4606 dunums in 2025.

Table 4-14: Comparison between agriculture available lands and assumed required lands for urban agriculture interventions at economical level.

Crop	Number of demanded dunums		
	2005	2015	2025
Total agriculture lands required to fulfill city dwellers food consumption	2515.5	3539.5	5006
Assumed available lands in dunum	400	400	400
% of assumed land contribution to provide the city with needed food for consumption	16	11	8
Total lands required (but not available in intra-urban area) in dunums = total required lands to fulfill dwellers food consumption (appendix 2) – 400 dunums assumed to be available for agriculture production till the year 2025	2115.5	3139.5	4606
% of additional required lands in dunums	84	81	92

Source: Author calculations based on available data.

According to PCBS (2000), villages such as Rujeib, Huwwara, kufur Qaleel, Salim, Dier Al-Hatab and Azmout posses total vacant lands of 50250 dunums distributed as 31804 dunums in the East-north plain and, 18446 dunums in the East- south plain. The availability of land per each identified peri-urban area is exceeding the total area required to undertake the urban agriculture intervention in concern with the total demanded food for Nablus city dwellers consumption. However, factors such as: (i) distance or peri-urban location from the city, (ii) agriculture skills of village dwellers, (iii) soil type and fertility, (iv) village poverty status and unemployment rate, (v) Village micro-climatic conditions and, (vi) land rent price; are the basic in selecting the most appropriate peri-urban location.

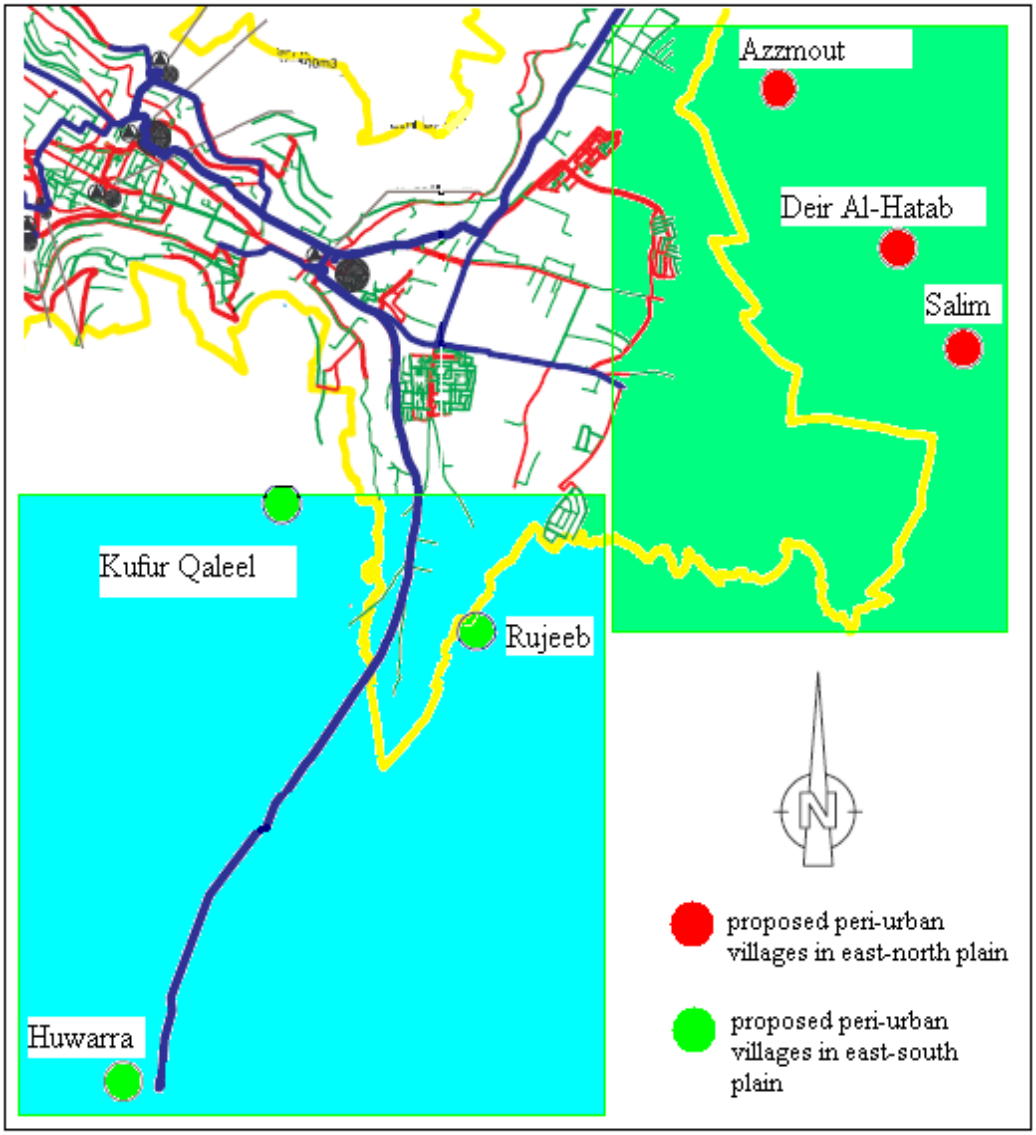
Table 4-15 : Proposed land identification zone and area in dunums.

Proposed peri-urban area	Total land in dunums	Built-up area in dunums	Available area for agriculture intervention (total land area – built up area) in dunums
East- North Plain			
Azmout	10748	217	10531
Dier Al-Hatab	11532	173	11359
Salim	10293	379	9914
Sub-total			31804
East- South plain			
Rujeeb	7038	473	6565
Huwarra	7982	738	7244
Kufur Qaleel	4732	95	4637
Sub-total			18446
Grand total			50250

Source: The Palestinian communities guide, Nablus district- Volume 6, PCBS, 2000.

However, selecting the most appropriate peri-urban site for intensive agriculture production practices could accompanied with environmental assessment in order to mitigate any possible harmful to the environment once agriculture practices intensively to take place in the identified site; further, this doesn't mean that urban agriculture is not feasible in the intra-urban vacant plots, but most likely to be reserved for green spaces, parks or individual agriculture intervention. On the other hand, other villages peri-urban sites) can practice agriculture per site household food consumption or as a source for income generating at household level, or vacant spaces could be use for green landscaping.

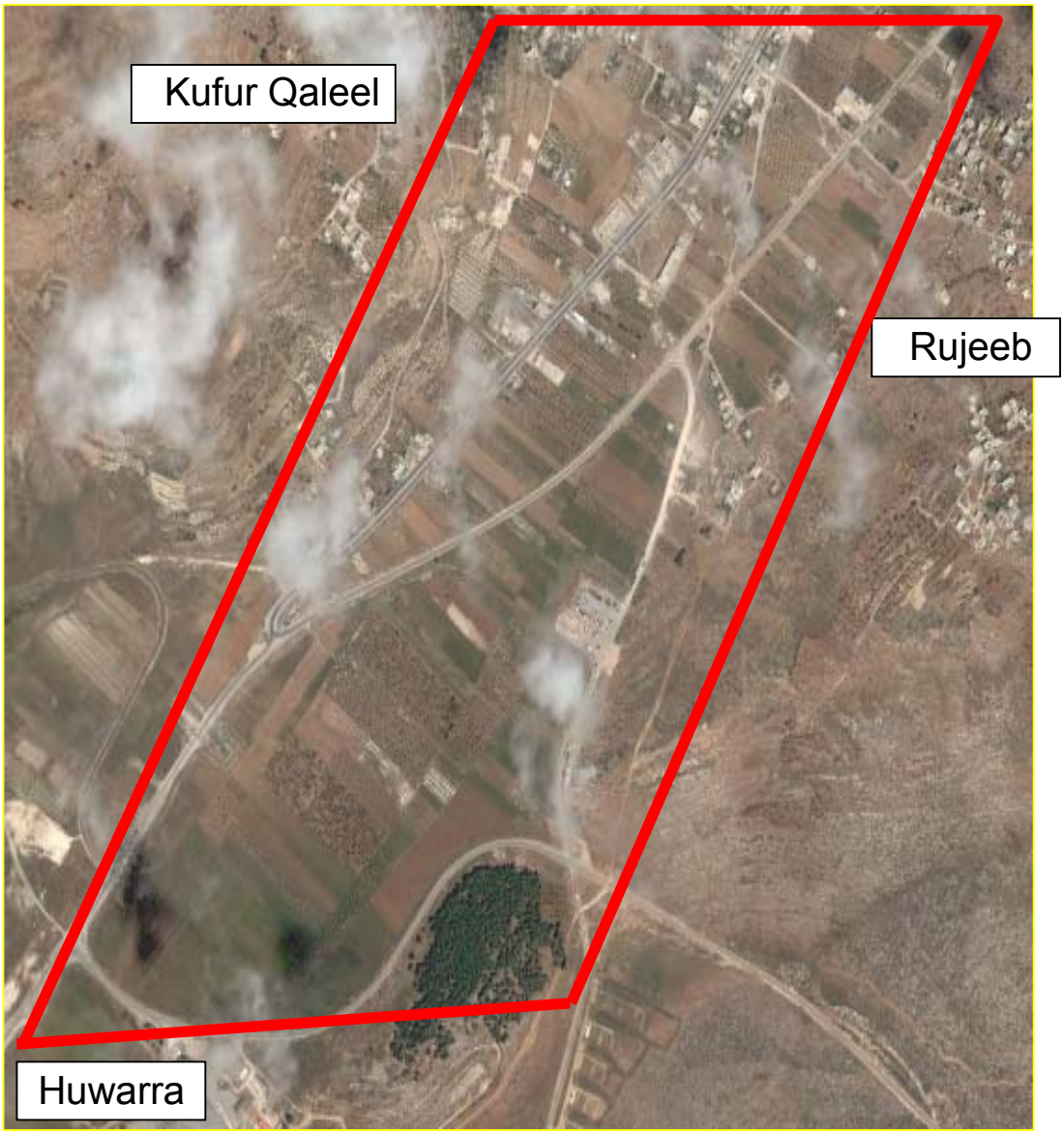
Figure 4-5: The spatial organization of possible peri-urban areas.



Source: Nablus municipality, GIS department (2007) modified by the author.

The satellite images obtained from Google earth (2007) indicating the type of land cover of the identified peri-urban area in the east-south plain of the Nablus city where orchard horticulture as well as fodder and field crops are cultivated traditionally in the site, which can be used for livestock feeding.

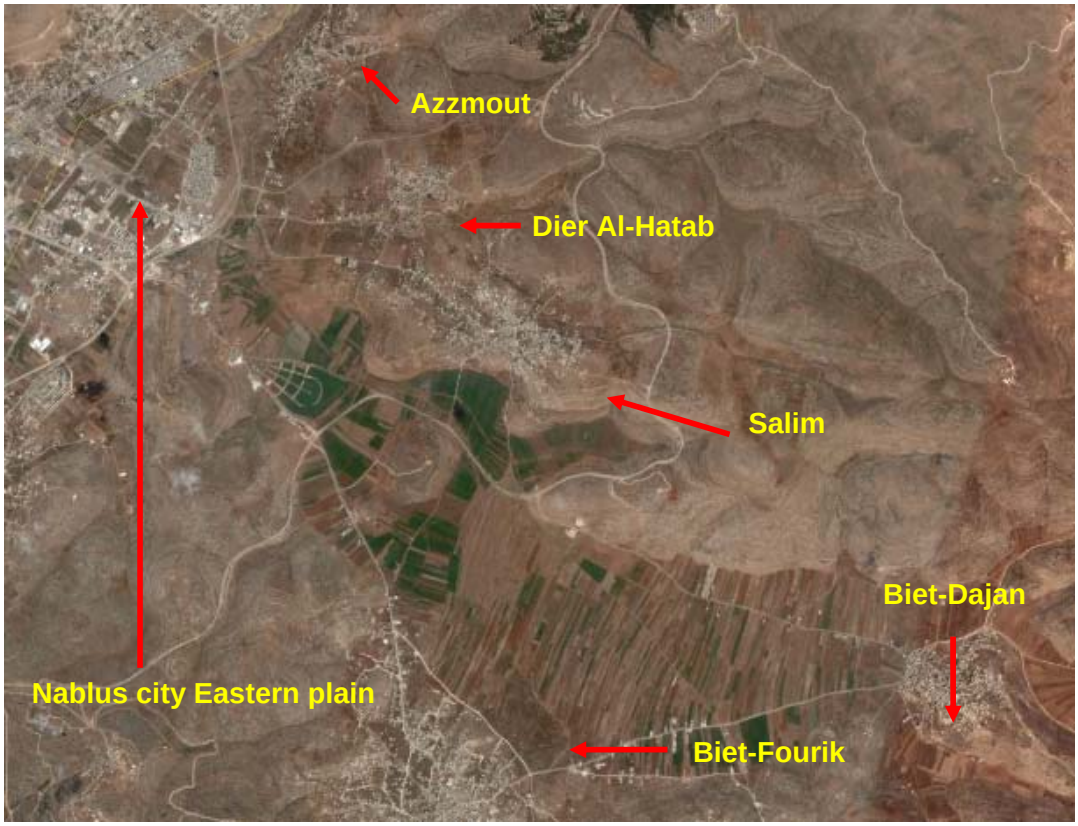
Figure 4-6: the land cover at the East-south plain.



Sours: Google earth 2007, modified by the Author.

Further to the land cover satellite view, the following image for east-north plain shows great potential for vegetable, horticulture and livestock agriculture.

Figure 4-7: Proposed peri-urban area for agriculture production intervention.



Sours: Google earth 2007, modified by the Author.

However, the consideration of the eastern villages' cluster as peri-urban area will depend on 3 main factors: (i) treated waste water for irrigation purposes (supplied by Nablus municipality), (ii) Land allocation for basic agriculture marketing facilities (Storages, backing houses, grading, etc), (iii) Composting and solid waste recycling plant, (iv) Suitable credit scheme planning, (v) appropriate extension service and, (vi) appropriate agricultural inputs availability.

2. Accessibility, usability and land tenure:

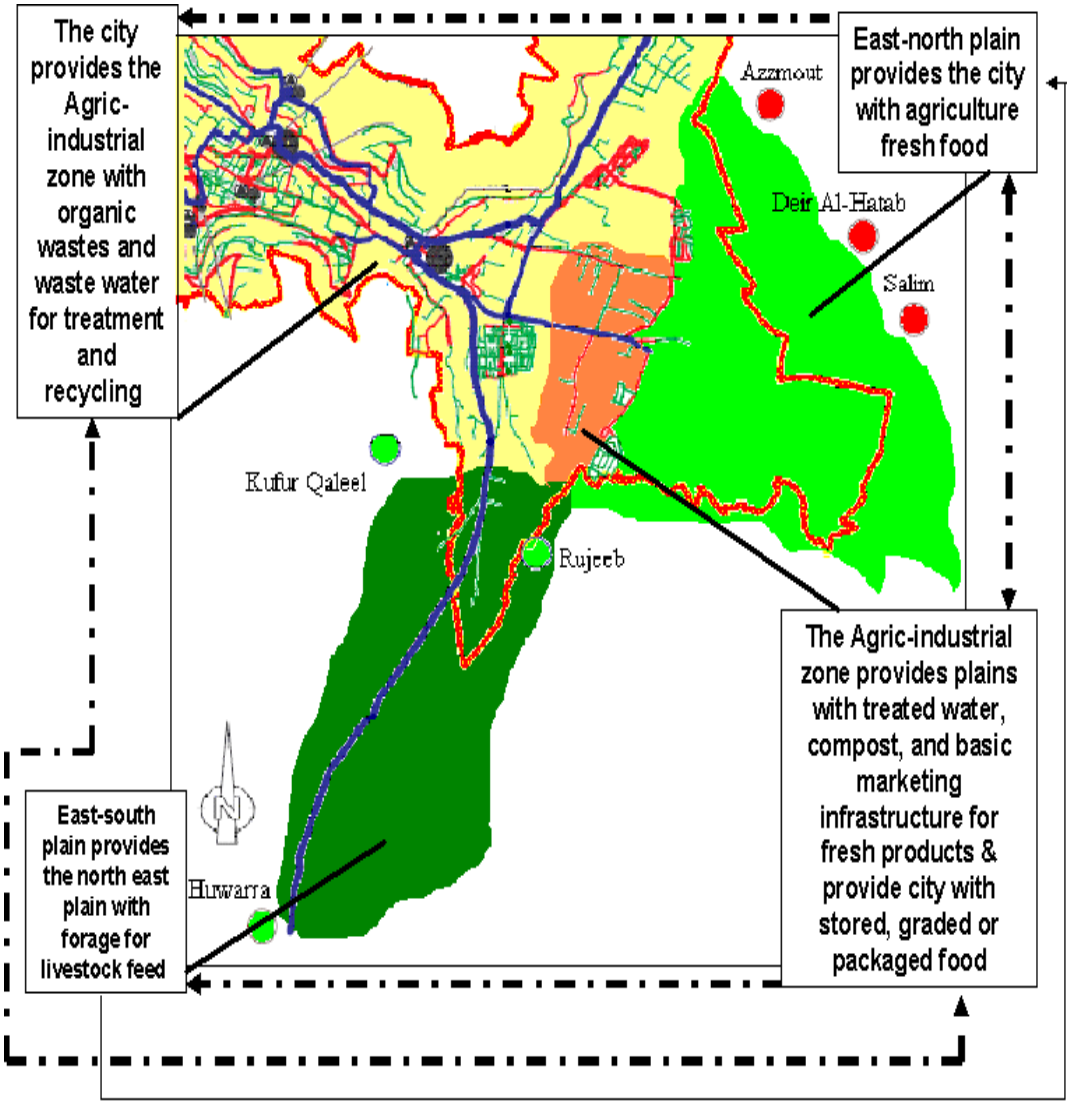
Land may be available but not accessible because of social or political reasons (Mposha, 2005). Accessibility relates to the opportunity for the actual utilization of available land by needy households or groups, taking into account administrative procedures and conflicts that may arise (Peace corps, 1991). According to GTZ-GATE 1989, the accessibility means the availability of land as well as the power to use it, which is the case of the eastern village cluster of Nablus city. in many cases, the ownership and tenure patterns are not known because of lack of records or frequent change of hands; further, land may also be far from where farmers live and public transportation and roads could be inadequate or not available so available land may be too costly for farmers to rent (Evenson R. E., 1999). These economical factors are not applicable in the case of Nablus city where the determined peri-urban zone located at the core of the villagers residential area.

.The usability of available and accessible land is determined by factors such as topography, size of plot, soil texture and quality, availability of water and security of tenure. Also, services such as water for irrigation and inputs or market facilities, transportation infrastructure are factors that determine a plot's usability (Babu S., 2000). In Nablus city eastern zone where the municipality planed to construct wastewater treatment plant, a secondary treatment plant can generate the required water quantities for agriculture production where the municipality will use to connect and

pump water for the determined per- urban area with maximum pipe length of 6 km.

Land tenure refers to the system of rights and institutions that governs access to and use of land and other resources on that land. It determines who can use what land and how (Babu S. 2000). Land tenure determines the level of investment that urban farmers themselves put into projects (Mposha, 2005). The private sector is often not willing to advance loans to urban farmers as they lack legal rights to land and are therefore unable to use it as collateral (FAO, 1984). The tenure situation of women is even more precarious (FAO, 2001). Administrative arrangements for secure tenure are cumbersome and proper registration of plots and users is often nonexistent. However, the determination of peri-urban area and later enabling the land owners to practice agriculture production over there lands will not create land tenure conflict. In addition, unemployed rate in the city will decrease by the number of job opportunities that the peri-urban area can offer in terms of agriculture labor demand. The overall vision of urban agriculture from geographical and land availability point of view is summarizing as describe in the figure below:

Figure 4-8: Vision of peri-urban spatial interaction in the eastern plain of Nablus city.



4.4. Investigating Socio- Cultural and Institutional Conditions

From the socio-cultural point of view, urban agriculture could impact the residents on their attitude, beliefs, resource distribution, and status of women, income distribution, nutritional implications, institutional implications and many other factors (Burdge, 1996). The assessment of socio-cultural impacts on the community can be assessed through socio-

economic surveys and careful monitoring (Vanclay 1996). Issues such as public acceptance, public participation, efforts of existing organizations and human awareness are basic in order to examine the existence of urban agriculture.

4.4.1. Basic socio-cultural conditions:

1. Public acceptance of reusing treated wastewater in irrigation:

The combination of urban organic wastes, the use of treated wastewater and urban agriculture creates particular issues in the modern urban setting (Peace Corps, 1985). On the one hand, the interests of urban waste reduction mesh well with the promotion of urban agriculture, since urban and peri-urban farmers are in need of organic matter as soil conditioner/fertilizer and animal feed, and cities and towns wish to conserve disposal space and reduce the costs of municipal solid waste management (Quon, 1999). At the same time, some tensions occur between public health officials (with their concerns about diseases affecting both humans and animals and accidents associated with the reuse of municipal solid wastes) on the one hand, and the proponents of urban agriculture (who emphasize job creation and increased food production, especially for the urban poor) on the other (IDRIC, 1996). It has been noted and declared by many studies that reusing treated wastewater in irrigating fresh foods is the most obstacle facing urban agriculture development from socio-cultural point of view (Shaxon L., 1999). However, the level of public acceptance requires two main aiding approaches; the first approach is accompanying

urban agriculture with formal and informal economic sector and, the second approach is public awareness and education campaigns using media. The intensive public awareness campaigns must be emphasizing on the water scarcity from one side and the economical and environmental impact of urban agriculture from the other side (Omiti J. & et al, 1999).

Most of urban agriculture interventions at the southern plain of Nablus city were using untreated wastewater that cultivators recorded to be in conflict with health sanitation department (Nablsu municipality) as well as the agriculture department in the city (Nablus agriculture department, 2007). The local authority represented by the municipality, agriculture department and in many cases governor office, used to destroy the cultivations irrigated by un-treated wastewater due to health and environment harmfulness caused by untreated wastewater usage and the direct exposure of the farmers to its contamination (Nablus municipality, 2007). However, the degree of acceptance of the reusing treated wastewater is vary between the producer (who touch economic benefits once agriculture production is facilitated by infrastructure and direct support offered from the local authority), and consumer (who will be aware about the health issues). Reasons such as drinking water scarcity, high water cost used for irrigation, high cost of investment for rainwater collection schemes, and many other economical concerns will lead to acceptance from producing point of view. However, from the consumer point of view, still guarantees of no health injuries (as a result of reusing wastewater for food production) and effective plans to involve city poor in urban and peri-urban

agriculture interventions; would increase the consumers degree of acceptance as they will be directly involved in the agriculture producing cycle as labor or technical individuals in order to overcome their poverty and break unemployment.

To achieve general acceptance of wastewater use schemes, experience shows that active public involvement from the planning phase to full implementation process is critical. Public involvement starts with the identification of and early contact with potential users, leading to the formation of an advisory committee and the holding of public hearing on potential use scheme (Cabannes Y. 2003). The exchange of information between authorities and public representatives ensures that adoption of a specific water reuse program will address real user needs and generally recognized community goals for health, safety, ecological concerns, program costs, etc (IDRICl, 1999).

Gaining public acceptance is easier once the need to use wastewater is established. If a community is aware of water scarcity and the need to conserve high-quality water sources for domestic purposes, they will be more willing to accept wastewater in itself (UNU, 1979).

2. Cultural and religious beliefs:

Untreated wastewater is currently used for agriculture irrigation in many parts of the world (SIKAT, 1996). Although there does not appear to be many significant socio-cultural revulsion at this practice because of economic necessity, treated wastewater is much less objectionable in

appearance than untreated wastewater and, from a socio-aesthetic (as well as health) perspective, is more suitable for agricultural use (UNU, 1979).

In 2001, a survey was conducted by Al khateeb in order to assess the socio- cultural acceptance of reusing treated wastewater in irrigation. The survey which focused on Nablus city dwellers (including surrounding villages) and stakeholders (general public, municipality and farmers) concluded that villagers believed that the reuse of treated wastewater is acceptable in Islam providing that effluent quality is safe and does not harm the health of the users where drought and water shortage justified the reuse of wastewater in irrigation in order to conserve fresh water for other uses.

In many Islamic cities, it has been judged that wastewater can be used for irrigation provided that impurities present in raw wastewater are removed. According to Farooq & Ansari (1983), there are three ways in which impure water may be transformed into pure water:

1- Self-purification of the water (e.g . removal of the impurities by sedimentation);

2- Addition of pure water in sufficient quantity to dilute the impurities and;

3- Removal of the impurities by the passage of time or physical efforts (e.g. sunlight and wind).

It is notable that the first and third of these transformations are essentially similar to those achieved by wastewater treatment processes. In 1978, the council of leading Islamic scholars of Sudia Arabia issues a legal ruling on the issue of religious importance (Fatwa) concerning the use of wastewater in Islamic societies. the fatwa stated: " Impure wastewater can be considered as pure water similar to the original pure water, if its treatment using advanced technical procedures is capable of removing its impurities with regard to taste, color and smell, as witnessed by honest, specialized and knowledgeable experts. Then it can be used to remove body impurities and purifying, even for drinking. If there are negative impacts from its direct use on the human health, then it is better to avoid its use, not because it is impure but to avoid harming the human beings".

3. Public participation:

Involving multiple stakeholders in urban agriculture development must include various sectors representatives including municipal departments, NGO's, local leaders, village councils, private sector, academic or research and interested institutions (Deelstra et al, 2001). To be effective, planning processes on urban agriculture should address the needs and priorities of the different stakeholders involved, as well as the specific socio-economic and political-institutional context in each locality (UNU, 1979). Effort has to taken in identifying the different stakeholders involved and motivating them to participate in project development, policy and planning. Such a multi-stakeholder approach has in principle - and compared to other approaches - the following benefits: (i) It allows for better quality decision

finding and making (through better understanding of priority issues and needs of different stakeholders involved), (ii) It improves the likelihood of implementation (through enhanced ownership, improved mechanisms and processes for coordination, and more effective use of available human, technical and financial resources), and (iii) It gives to the process (and its results) a higher credibility, as well as wider outreach (Hemmati, 2002).

Few city authorities and other local stakeholders have experience with these so-called participatory and multi-stakeholder processes, and therefore require well-designed methods and tools, technical assistance and staff training (Pubbeling et al, 2003). Spaces for participation should be created and formalized. Special consideration needs to be given to the non-organized and often excluded segments of the population: women, immigrants and youth. (Deelstra et al, 3001). Stakeholders involved need training in how to work together with people they have never worked with before (UNU, 1979). Innovative means to involve urban producers in identifying, developing and monitoring urban agriculture projects and policies is needed. This also means that urban producers should learn to negotiate with different levels of government and other external agencies to achieve their goals. Funds would be needed to jointly implement defined action and policies. Yet, questions remain on how to effectively use multi-stakeholder processes to influence policymaking and planning (Cabannes Y. et al, 2003).

4. Efforts of the organizations:

Local, provincial and national governments play a key role, ensuring the availability and secure tenure of land and water, access to public services, approval of regulations and standards (World Bank, 2000). These different levels of government are already engaged in many areas of service provision and regulation, such as urban planning, water treatment, waste collection, management of green spaces, which have direct interactions with urban agriculture (peace corps, 1985). Activities started up without the involvement of those who influence decision-making (mayor, council members, heads of departments, policy advisers) may achieve little in the long term (UNU, 1979). Therefore, it is essential to involve government representatives in the discussions throughout the planning process, in order to acknowledge their opinion and suggestions, overcome possible resistance and gain support for policy review and formulation.

A. Commercial and subsistence farmers and gardeners and their organizations:

One should bear in mind that urban producers do not form a homogeneous group. Livestock farmers have different interests from horticulture or aquaculture farmers. Commercial farmers differ in their interests to subsistence or hobby farmers (FAO, 2000). Promotion of different urban agriculture production systems therefore requires different policies and interventions (SKAT, 1996). Taking into account the expertise, local knowledge and views of different producers and producer

groups is important in this regard (IDRC, 1996). The efforts of gathering urban and peri-urban farmers in groups will advocate space allocation during the process of city planning and will keep agriculture area within the municipal boundaries existing similar to industrial or commercial areas. Grouping farmers and agriculture stakeholder in Nablus city would enhance the social linkage between agriculture producers and produce consumers once economic benefits are the common enhanced target of both groups.

B. Residential neighbors and other interest groups:

As already mentioned, urban agriculture may play an important social role in providing opportunities for education, training, recreation and leisure (UN HABITAT, 1996). Actions to promote the social aspects of urban agriculture should be discussed with the targeted groups (i.e. children and schools, urban citizens, community and health care organizations) and their associations (IDRC, 1996). Among citizens, it would be important to involve individuals or groups, whose dwellings or activities are located near sites of urban agriculture, and who are or might be affected positively (improved greening and contact with nature) or negatively (pollution, noise) by current and future urban agriculture activities (Peace corps, 1985).

C. NGOs, community-based organizations and universities:

Urban producers may lack expertise regarding specific aspects of urban agriculture (i.e. specific production or processing techniques). Universities,

research centers, agriculture departments or NGOs could provide support for the development of appropriate technologies for food production and processing and provide methodological support in diagnosis, monitoring, and training. NGOs or community-based organizations could also play a crucial role in linking urban producers with governmental authorities or research institutes. Finally, these organizations could often help finance and implement projects that are defined as a result of multi-stakeholder processes (Chapin F.S. and Kaiser E.J., 1979).

4.4.2. Secondary socio-cultural conditions:

4.4.2. Farming traditions, urban-rural farmers and cultural conflicts:

A traditional farmer (traditionally rural dweller) can be defined as a man or woman, or more accurately a family complex, which uses traditional tools and controls a piece of land on which the entire family depends for survival. He or she is an expert in his own environment, growing various crops year after year through his whole career. He or she tends to be suspicious of innovations from outside, especially when they affect crops that he has grown all his life (FAO Ceres, 1981). Unlike traditional farmer, woman and man coming from all income groups who grow informally food (including raising animals) in the cities for self-consumption or as income generating are defined as urban farmers (Mougeot, 1999). In most countries (if not in all), agriculture remains one of the professions with the highest risks that farmer (traditional or urban) lives his life with risk as he has no control of the weather, of crop diseases or of insect pests (GTZ, 1985).

Generally, farmers are always aware of whether innovations introduced by the extension officer will work, or what the price of the products will be when his crops reach the market so that farmers lives under uncertainty tension and may run immediate risk when the crops fail as the result, many of them hesitate to accept innovations because they cannot bear to contemplate the more possibility of loss (Arginti, 2000). In addition to farmers warranty regarding issues such as the price of the agriculture products, market size, supply and demand threshold, the competition between urban and traditional farmers would increase if planning to enhance urban agriculture failed to address appropriate marketing channels based on equity satisfactions for both farming groups.

However, urban agriculture doesn't conflict with traditional rural-based farming but based on the complementary approach with urban agriculture practices (www.fao.org), for example, by 2030, some two thirds of the world's people will be living in cities, according to UN projections, which also predict that the world's population will rise to nine billion by 2050 (Habitate, 1994). This rapid trend of urbanization will be accompanied with accelerated conversion in terms of area from rural areas to small urban centers. From one hand, this projected spatial conversion in terms of area will enrich the scheme of urban agriculture by assuming an increase of agriculture skilled dwellers who practiced (or still practicing) traditional agriculture. From the other hand, considering urban agriculture in cities planning will push planners to identify and allocate enough space accessible for these framers to keep on their income sources in order to

avoid cultural conflicts. The social and cultural conflicts can be raised if: (i) these farmers loss gradually or suddenly their accessibility to land and water resources (due to other urban activities but not agriculture), (ii) loss access to jobs or self employment opportunities, (iii) detect sharp decline in their farm return due to unfair competition leading to low income.

Avoiding such possible indirect social and cultural problems is not less important than in-migration problems between rural and urban areas which further accompanied with: (i) an increase of the poverty rate, (ii) increase of unemployed number, (iii) increase in rent price (houses and lands), (v) food security and environmental problems and many others. Therefore, appropriate urban agriculture planning could be applied as a tool of city planning from these key points in order to respond and re-balance the cultural and social factors between urban and rural area. In this context, the function of urban agriculture will exceed the boundaries of the physical city limits to its more surroundings (peri-urban) and consequently to up to the regional and possibly to national level.

4.4.3. Avoiding rural-urban cultural and social conflicts:

The main challenge of land use inside Nablus city stands at the high price of lands and land tenure (Planning department, Nablus municipality, 2007). Therefore, any agriculture production intervention within the city of Nablus will not be sustainable due to four main reasons which are: (i) High cost of land, (ii) limited water accessibility for irrigation, (iii) poor skills of Nablus

dwellers regarding agriculture production and, (iv) rapid urbanization growth (utilization of space for non-agriculture purposes).

Yet, many urban farmers are cultivating the 400 dunums calculated according to the land use map provided by the planning department of Nablus municipality (2007). These urban farmers who may own the land or not or who may use suitable water for production or not, are competing in a way or another the traditional farmers by occupying part of the agriculture market demands for certain agriculture produces. Assuming that urban agriculture concepts would be enhanced within the city boundaries for agriculture production (then city planners would be forced to allocate more lands for agriculture interventions), and assuming the number of urban farmers would be increase, the result would be higher the competition between new urban farmers and traditional ones from one hand, and between agriculture sector and other city functioning sectors for water, space, market accessibility including transportation from the other hand. This when happen will increase the social conflict between urban and rural areas and will switch the cultural practices between urban areas (which traditionally trade and commercial centers) and rural areas (which traditionally agricultural produce centers). On the other hand, facilitating urban agriculture within the city boundaries will be limited for those having access to lands and water (mostly rich land owners) where they will import skilled labor from rural areas to maximize their farm profits and therefore reducing the chances of poor city dwellers to have job opportunities.

According to FAO (2001), the concept of urban agriculture is not limited to agriculture production within intra-urban areas but also contains in its entire definition the art of city landscaping, parks, gardens, open spaces, etc. Therefore, reserving vacant areas and open spaces within the intra-urban areas for such interventions will help in beating the city and protect environment. At the same time, considering peri-urban areas for agriculture production is a must in order to avoid social and cultural conflicts as well as the argue about land tenure.

4.4.4. Avoiding immigration from rural areas to urban centers:

As voiced by national and international agencies such as the United Nations and the Food and Agriculture Organization (FAO) that urbanization is set to continue where more of the world's population will live in urban areas rather than in rural areas; the consideration of peri-urban areas as a production and processing zones to feed the cities will eliminate poor people from migrating into intra-urban so that they will not suffer the lack access to land for urban agriculture as its. Planning policies and legislation must support the allocation of space in the most nearer peri-urban areas in order to fit with each particular city food demand as well as offering job opportunities for workers and unemployed individuals who can easily return back after their working hours to their original place of resident.

4.4.5. Gender specific and participation:

Gender Women tend to dominate certain components of urban cultivation such as backyard gardening (UNDP, 2003). Women are still disadvantage in the formal sector of the urban economy and therefore get involved in small- and micro-scale production (FAO, 2000). Urban food production offers opportunities to be integrated into other household activities and women uphold the responsibility for household food security (SKAT, 1996). Men tend to dominate the commercial urban food production (IDRC, 1996). However, in Nablus city most of backyard gardens are used for ornamental plants and decorations with some who cultivate small-scale vegetables; but raising animal husbandry is prohibited by the local authority (Nablus municipality, 2007).

Generally, women used to be engaged in agriculture production in the rural areas that 65 % of farm work lies upon their shoulders (PARC, 1996). Therefore, considering prei-urban areas as agriculture production zones is distinguished by the high rate of women involvement in agriculture.

4.5. Investigating the Economic Conditions

Urban agriculture provides multiple functions and benefits to urban dwellers and cities (Habitate, II series, 1996). Political support is growing and further research and financial support to enhance the contribution of urban agriculture to sustainable urban development is necessary (GTZ-GATE, 1989).

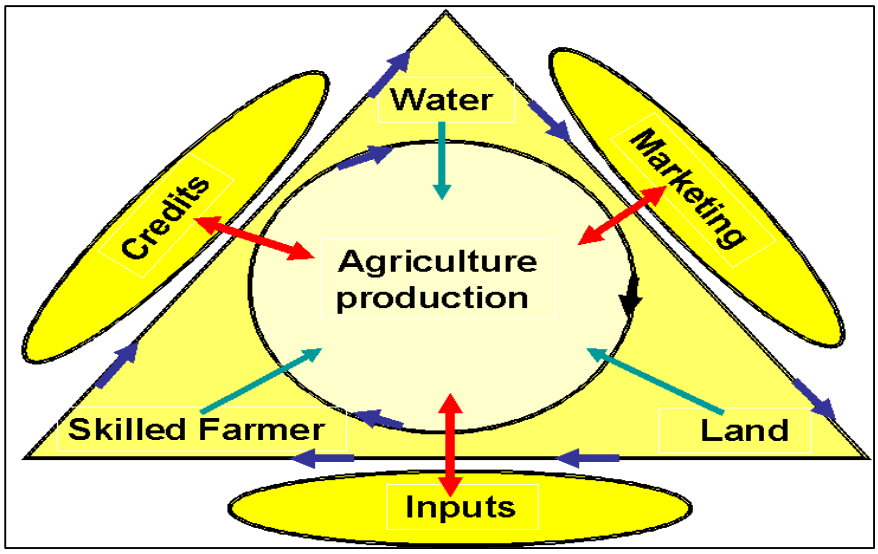
Although UA is found to be growing in absolute terms, its contribution to urban food supply varies, relative to rural agriculture, depending on product and season (Peace corps, 1991). However, growing own food saves household expenditures on food; poor people in poor countries generally spend a substantial part of their income (50 – 70%) on food. Growing the relatively expensive vegetables therefore saves money as well as on bartering of produce. Selling produce (fresh or processed) brings in cash (René van Veenhuizen, 2006).

From economical point of view, producing food using vacant spaces within the city or in backyard plots will lead to small-scale agriculture production, which actually will not meet the actual demanded quantities of food for the city dwellers (as calculated in appendix 2 that in Nablus city, the required lands for economically urban agriculture intervention is exceeding the calculated area used for agriculture according to land use maps). Therefore, urban agriculture in its general concept must not doubt the need for additional open spaces accessible to skilled farmers who can offer jobs opportunities for unemployed individuals of a given city (Peace corps, 1996).

According to many agricultural studies, sustainable agriculture production is based on triangular elements which are: (i) Skilled farmer (human resources), (ii) Land accessibility and, (iii) water for irrigation (NORAD, 1996). These basic elements are available within the production triangle where other factors can affect production process as well as influenced by production activities which are: (i) Credit, (ii) Inputs and, (iii) Marketing

(Mbiba, 1994). If one of the production factors affecting basic requirements for agriculture production is missing, then agriculture production will not be either economically visible or sustainable (Feder, G. 2000). Urban agriculture in large scale is good opportunity not only for city planners to organize agriculture areas within the city and identify the roles of vacant space, but also considered to be ideal for agriculture planning at local, regional and national levels by organizing the efforts of farmers and stakeholders toward achieving a balance between food supply to the cities and urban growth (land availability (Ali, M. 1998)). The balance between the need of more space to undertake agriculture intervention and demanded land for housing, industries, commercial and landscaping, must be economically feasible and can aid in solving other urbanization problems such as pollution, soil degradation, poverty, social and cultural conflicts, etc.

Figure 4-9: Basic agriculture production dimensions.



Source: The Author.

The combinations of basic factors of sustainable urban agriculture production are basically economic factors influencing the existence of urban agriculture and city planning. From one side, the city planners have to identify and allocate water and land space for urban agriculture production and, they must consider the impact of urban agriculture practices from the other side (Peace corps, 1991). The push factors for city planners to consider urban agriculture in their plans are not limited to the problems of solid wastes and wastewater treatment or environmental problems, but including issues such as growth rates, unemployment rates, poverty and much more about city food demand.

4.5.1.. Understanding urban agriculture economics:

It has been noted that prior to agriculture production, water and lands must be available and accessible for urban farmers (Moustier, 1998). In economic terms, accessibility alone is not enough to decide which intervention to be chosen among city functions (trade, commercial, industrial, agriculture, etc). If urban agriculture is a choice and not a decision, the price of water service and land to be added to the costs of other cultivation inputs (fertilizers, plastic, pipes, pesticides, etc). Both expendable and non expendable (fix assets) costs also to be considered along with the running cost (transportation, labor, etc). It's recommended that prior to decide investment in agriculture production to undertake feasibility studies (IIRR, 1992). However, feasibility studies for one crop choice is not enough where comparative advantages of several crops choice to be considered (World Bank, 2003). This will help in calculating the maximum rate of return of agriculture farm based on the produce selling

price in the market. However, transportation and distance between the farm and nearest market to sell agriculture produce is added as additional cost of the production that consumers usually forced to pay or share it indirectly (Arginti, 2000). This also can influence the selling price of agriculture produce where poor city dwellers can't afford to purchase it and later they may fall under food insecurity conditions.

Factors such as limited or no purchase of the agriculture produce (due to poverty reasons) will affect farmer's profitability as they will be forced to sell in low price as a result of low demand on the crops they produce (UNDP, 1996). In addition, long distance in transporting their production to wholesale or retailer centers will create loses which so called post harvest losses (FAO, 2001). Without appropriate agriculture planning based on demand-supply factors, the agriculture development will fall down and number of poor will increase (World Bank, 2003). Therefore, urban agriculture is exceeding the supply-demand factors to wider concerns such as environmental one as it linked to treated wastewater reuse for irrigation, urban solid waste recycling and composting, response to poverty and unemployment, mitigate immigration, assure city food supply and food security, response to tenure conflicts, and concern socio-cultural aspects. Thus from economical point of view, urban agriculture interventions are evaluated by cost-benefit tools and not by using pure economic feasibility (different sources: IDRC 1999, FAO 2001, SKAT1996 and others). Examples of urban agriculture cost-benefit factors and variation between urban and traditional agriculture are listed in tables 31 and 32.

Table 4-16: Examples of urban agriculture cost- benefit factors

Benefits	Costs
Agriculture out-puts	Land
Economic diversity	Water
Food security	Labor time
Job opportunities	Tools and equipments
Environmental improvement	Energy inputs (fuel and electricity)
Social and public involvement	Health risk
Health benefits	Environmental degradation

Source: IDRC 1999, FAO 2001, SKAT1996 and others.

Table 4-17: Examples of variation terms between urban and traditional agriculture

Terms of variation	Traditional agriculture	Urban agriculture
Investment cost	High and intensive	Selective (high, medium and low)
Risk	High (individualistic)	Medium (supported)
Level of organization	Low and random	High and restricted
Land use	Random	Organized (planned)
Intervention purpose	Profit & job opportunity	Multiple (economical, environmental, social, and institutional)
Intervention level	Large scale	Large and small-scale
Production pattern	Random	Studied (planned)
Transportation of produce	Vary	Studied (planned)
Losses (post harvest)	High	Low
Level of stakeholders	Limited	Wide
Types of actors involved	Limited	Un-limited
Environmental concern	Low	High
Resources use optimization	Low	High
Agriculture practices skills	High	Low to medium
Place of intervention	Rural	Urban, peri-urban

Source: IDRC 1999

4.5.2. Food supply and demand:

According to PCBS data (2005), the average per household monthly consumption for food was estimated at average family size equal to 6.4 individual per family (PCBS, 2000). By applying these information on the projected population (As estimated by Nablus Municipality), the projected quantities of basic (selective) food commodities for the monthly consumption by Nablus dwellers have been calculated assuming that family size and consumption habits will unchanged. The calculated quantities then projected according to the estimated number of the city population till the year 2025 and therefore considered as the projected demand (see appendix 1). Theoretically, food production (supply) must meet dwellers food consumption (demand) in order to keep per unit farm profit at acceptable rate which can sustain the agriculture production (reasonable selling price of the agriculture produce). On the other hand, per unit production selling price must meet the purchasing power of the consumer (TUAN, 1994). If consumers (in this case Nablus city dwellers) are unable to purchase their basic food commodities due to their poverty or unemployment reasons (don’t have purchasing power or enough fund), then agriculture in general will drop down and the producers (farmers) will suffer poverty (as they have no profit and later no cash).

From the applied agriculture point of view, it's understood that due to land location, climate, environment and soil type, the city of Nablus can't provide the total estimated quantities of food (as selective food commodities were calculated in appendix 1). From one hand, urban

agriculture production must fit with the city capabilities to provide land and water for irrigation. From the other hand, urban agriculture must consider other economical factors such as dwellers purchasing power, food demand and food supply. For example, wheat and flour were excluded from the calculations made in appendix number one that wheat requires huge space of land to fulfill the demand. In addition, wheat production will cost more than the price required to obtain it from other sources (FAO, 2000), so in the case of wheat example, if city dwellers have enough cash to purchase the needed quantities of wheat, its not a priority to produce it for city dwellers consumption. According to UNDP (Urban agriculture book, 1996), obtaining food for city dwellers consumption has two scenarios: the first assuming that city dwellers have to produce their own food and, the second scenario assumes dwellers are accessible to obtain the food by means of their ability to purchase it (in this case dwellers assumed to be able to purchase the wheat from other areas).

The first scenario as stated by UNDP (1996) will be not applicable if poor dwellers have no access to reasonable plots (mainly due to tenure problems) in order to produce their food. However, if poor city dwellers have access to main production elements namely land and water, they properly cant invest money to run agriculture due to their poverty regardless they are agriculture skilled or not. However, if city dwellers can produce some of their basic consumed food, agriculture production will be unorganized mainly if some household encouraged to sell their over plot production in the local market to earn some cash (as many developmental

organization encourages this mistakenly). The effect of this option on city planning will be obvious by the increase number of informal agriculture producers and illegal street sellers.

The second stated scenario by UNDP (1996) is based on dwellers purchasing power which assumes that they are able to buy their food. In unemployment conditions, unemployed dwellers are theoretically unable to purchase their food or at least they will either reduce their food consumption or reduce their rare expenditure over food and later fall in food insecurity. However, increasing the purchasing power of the city dwellers to fulfill their food consumption demand is more applicable to the city planner.

As agriculture farmers are production oriented individuals aiming to produce at lowest cost and maximum selling price to maximize their net profit per agriculture unit (IIRR, 1992), city planners must be aware about the problems accompanying the urbanization growth such as poverty, unemployment rate, environmental problems and food security issues (Norton G.W. & J. Alwang, 1998). In order to balance between the interests of agriculture producers and city planners concerns, agriculture is a suitable option to create job opportunities for poor city dwellers (Arginti, 2000). Theoretically, once unemployment rate reduced in the city, the poverty rate will reduce gradually and the city dwellers assumed to have an increase of their purchasing power so that they will be enabled to purchase agriculture produce and become more food secure (SKAT, 1996 and World Bank, 2003). In conclusion, introducing urban agriculture is a bilateral

function shared between farmers who must produce fresh food for the city and, the city planners who must focus to increase the purchasing power of the city dwellers to consume the produced food.

4.5.3. Identifying locations for urban agriculture intervention:

1. Transportation factor:

The transportation infrastructure within a country facilitates competition in food products and services, which promotes more efficient resource allocation and lower food costs. Thus, maintaining, upgrading, and expanding the infrastructure plays an important role in supporting economic growth (Ali, M. 1998). For farmers, new or upgraded infrastructure can lower transaction costs for marketing products and purchasing inputs, reduce the likelihood of post-harvest losses by increasing the quantity and quality of transport services, and ultimately bring higher returns for the producer and lower food costs for the consumer (Feder, G. 2000).

However, due to Nablus city shape as linear city, transportation plays a major role in determining the location where urban agriculture intervention to take place within the city boundary. In city planning, identifying the appropriate location for intervention is not an easy task. Regardless the isotropic surface assumed by Christaller, W (1966), the breaking point between two locations where both consumer and producer can meet for best economical transaction could be determine by Christaller formula (1966): djk=dij/(1+Square Root of(Pi/Pj)) where djk is the distance from j

to k, dij is the distance between two towns, Pi/Pj are the populations of j and i and i is the bigger town.

For example, Nablus city population counted by PCBS in the year 1997 at 100231 inhabitants and this = pi, While the estimated population number of Salim village in the same year was 3799 inhabitants and this = pj, If we consider the distance between the village and Nablus city urban center which equal to 6 km and in this case = dij, then the most appropriate location for urban agriculture between Salim village and Nablus urban center could be calculated as:

Appropriate location (djk = distance between Nablus and Salim) = 6 km / ((1+ square root of (100231/3799) = 0.98 km from Nablus city.

This means that the most economical place to undertake urban agriculture under the consideration of the two locations namely Nablus and Salim village is located at less than 1 km from Nablus city boundary (at the eastern plain) where: (i) transporting agriculture production to this point is economically feasible, (ii) both farmers and consumers (in this case wholesale market or urban agriculture service area) will consume the least efforts and; (iii) the distance would be acceptable and economically feasible for both producers and consumers and post harvest loses would be minimized.

In Nablus city case, this explains the need for urban agriculture service center accessible to provide the eastern plain with treated wastewater for irrigation, compost for soil conditioner, storage and packaging houses for

agriculture production, agriculture inputs, etc. therefore, upgrading the transportation network in the eastern plain is essential to be connected to the proposed urban agriculture service area. From one hand, eliminating long travels and transportation will help in environment reserve indirectly by: (i) reducing the amount of fuel, energy and gazes released by transportation means used for agriculture. (ii) Help in solving traffic jams when agriculture produce transferred to wholesale markets. From the other hand, this will help to reduce the production cost and will reduce the selling price for the consumer.

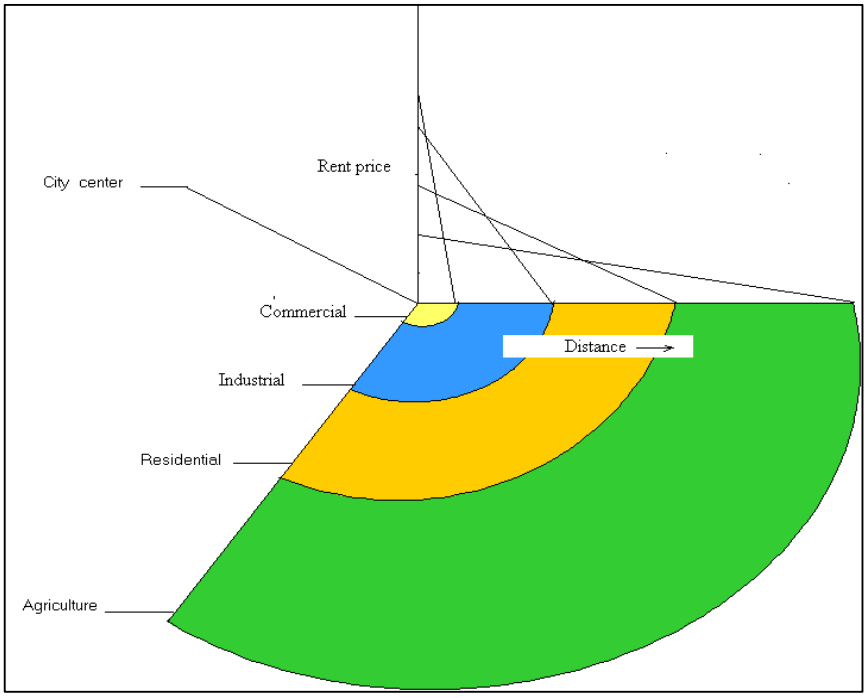
2. Distance factor and land rent:

Distance between production area and selling market is a critical factor which can increase or decrease the agriculture produce cost (Lewis, W.A. 1958). However, practicing agriculture within the city boundary is not practical due to land tenure problems and land rent price (as the nearest space can reduce transportation costs, land rent can affect the production profitability). In Nablus city, the expansion can increase the cost of agricultural production near residential and manufacturing areas in a number of ways. First, regulatory measures are often more effectively implemented, enforcing farmers to internalize some of the negative externalities generated, e.g. by the use of chemical inputs (Lipton, M. 1977). Second, user costs of land may increase through property taxes (Arginti, 2000). Third, farmers' costs can increase due to vandalism and poaching in the sub-urban fringe (Bhadra and Brandao 1993). Fourth, agricultural production decisions can become distorted due to land

speculation. Therefore, peri-urban areas remain the most economical option for the city to practice agriculture in organized approach.

Its understood that when analyzing urban-rural relations with regard to agriculture, one sees that functionally there can be no strict separation between rural and urban and the same is true for land use (Lipton,M. 1977). The von Thunen location theory, developed some 180 years ago for urban-rural relations in Northern Germany, suggests a gradient of agricultural systems relative to their distance from urban centers (von Thünen 1826). In economic terms, von Thunen-like models suggest that land use patterns and the market price of land are established by relative rental gradients for agricultural and non-agricultural land use (the cheapest land price (rent) is the most far from the urban center which practically referred to peri-urban areas).

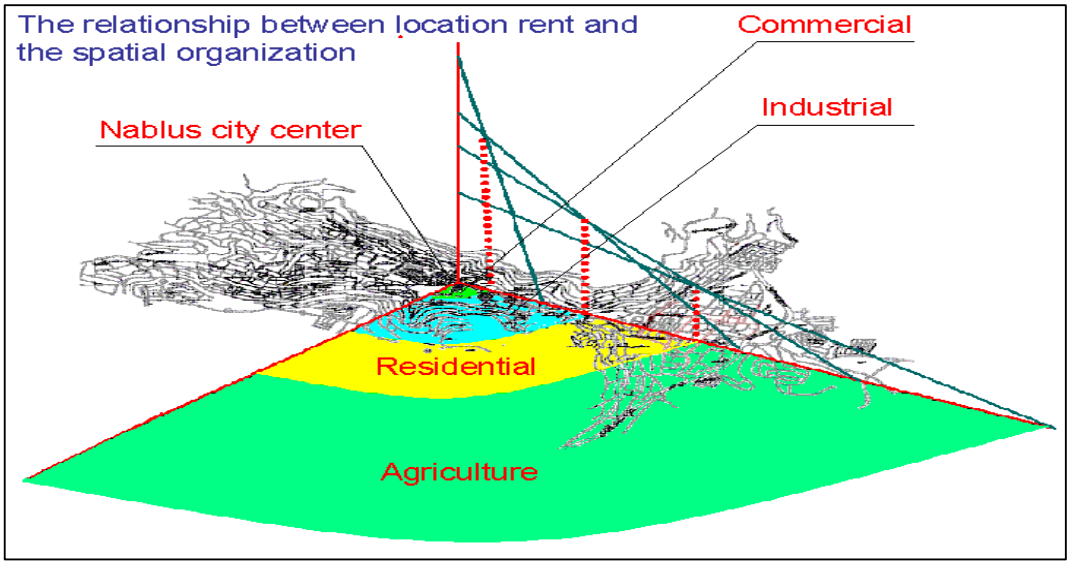
Figure 4-10: Von Thunen model: land rent cost (1826).



Source: Von Thunen basic illustrated figure drawn by the author.

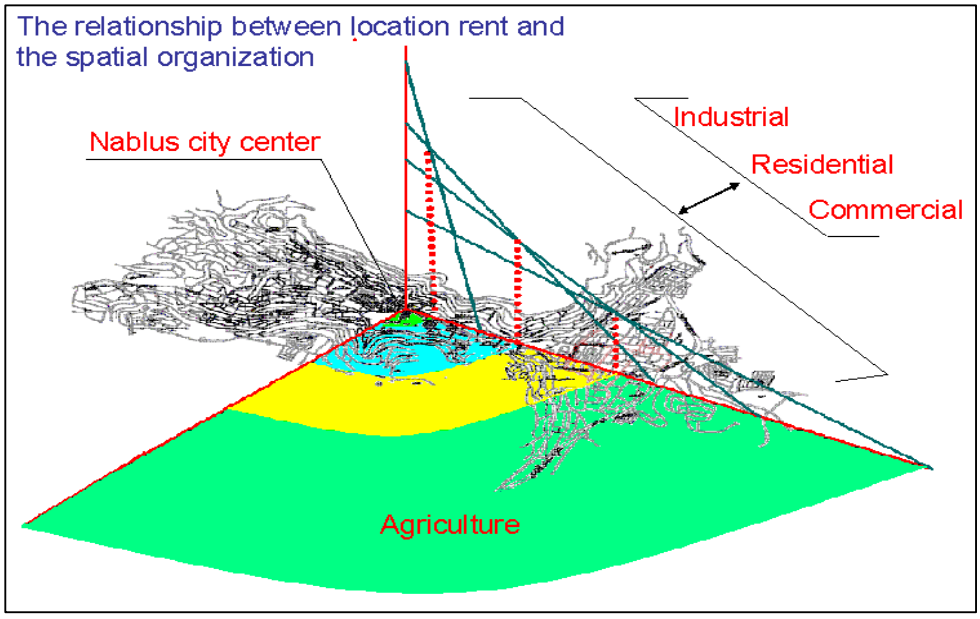
By applying von Thunen model on Nablus city map, one sees that intra-urban land uses reserved for commercial, residential and industrial functions regardless the order of these functions around the city center, but the land used for agriculture remains at the surrounding areas at the city skirts and peri-urban areas. The reason for that is the unbalanced urban expansion which means that the conversion of land into different uses does not proceed in concentric circles around the market town as suggested by von Thunen in his theoretical model. This phenomena gives the evidence that using vacant areas for urban agriculture practices within the city boundary will remain unsustainable that planners cant rely on it for agriculture production mainly due to the changes of land rent price (as explained by Nablus municipality, planning department, 2007). However, Katzmann, M.T. (1974), stated that the application of location theory to urban areas has shown that urbanization does not make agriculture disappear. City administrators and planners need to take into account the fact that agricultural production occurs in an urban-rural continuum rather than in isolated, far away rural areas (Itharattana, K. 1997). City dwellers and city planners are aware to keep in urban agriculture but in micro-scale appearance. The city planners keep allocating lands within the city area for other urban agriculture forms such as parks, landscapes, and opening green spaces to beating the city; similarly city dwellers keep having their backyard gardens (which could be used in crisis time as supporting units for food security at household level) but non of them could be considered economically feasible at large scale or city level (Lipton, M. 1977).

Figure 4-11: Application of von Thunen theory on Nablus city layout.



Source: the author: applying von Thunen model on Nablus city map shows that the city major functioning zones are not fit to the reality and existing situation in terms of land use where mix land use is common observations (makes urban agriculture existence at economical level more complicated).

Figure 4-12: The actual situation of spatial organizations and activities in Nablus city shows that agricultural lands still exist at peri-urban area at low land rent price (based on Thunen's theory)..



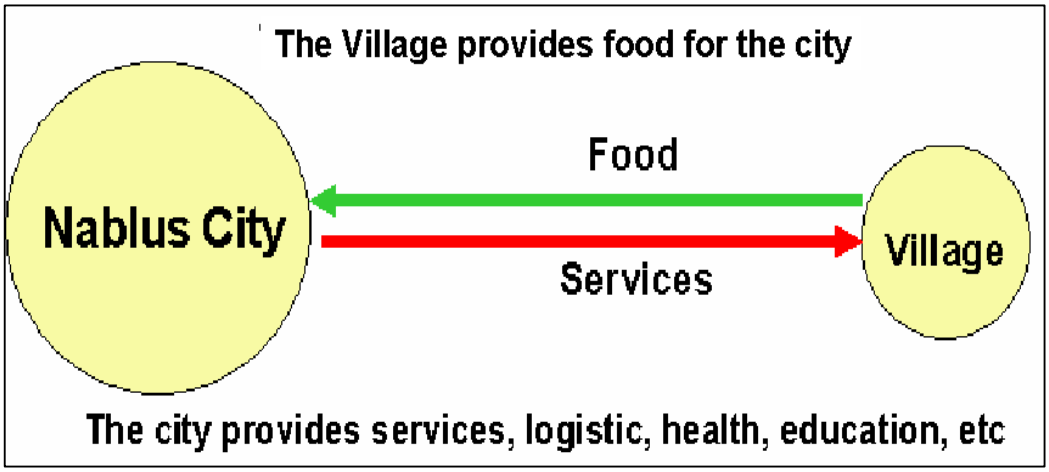
Source: The author: The actual existing situation of land use as applied on Nablus city map according to von Thunen model shows that agriculture area stands at city skirts).

The application of von Thunen model on Nablus city map shows that unbalanced city expansion will push the city boundaries more toward peri-urban and rural areas (where land rent price is lower according to von Thunen theory, 1826). At the same time, the expansion of the rural area will accelerate this phenomenon in order to stick with the city boundary and benefit from the city services (Sen, A., 1981). This explain the statement of FAO (2000) which emphasizes that by 2025 more than 65% of world population will live in urban areas.

Edward Ullman's (1956) suggested three fundamental bases underlying all spatial interactions. First, for interaction to take place between two places, they must be complementary to each other. In other words, there must be a demand-supply relationship between them (one place must want what another place has got and the later must be prepared to supply it). The second fundamental base suggested by Ullman's is referred to the intervening opportunities which considered as an alternative source of supply. The last fundamental base is referred to perfect complementarities and an absence of intervening opportunities interactions.

Traditionally, the villages supposed to provide the city with food where the city provides the villages with services such as health care and education as shown below:

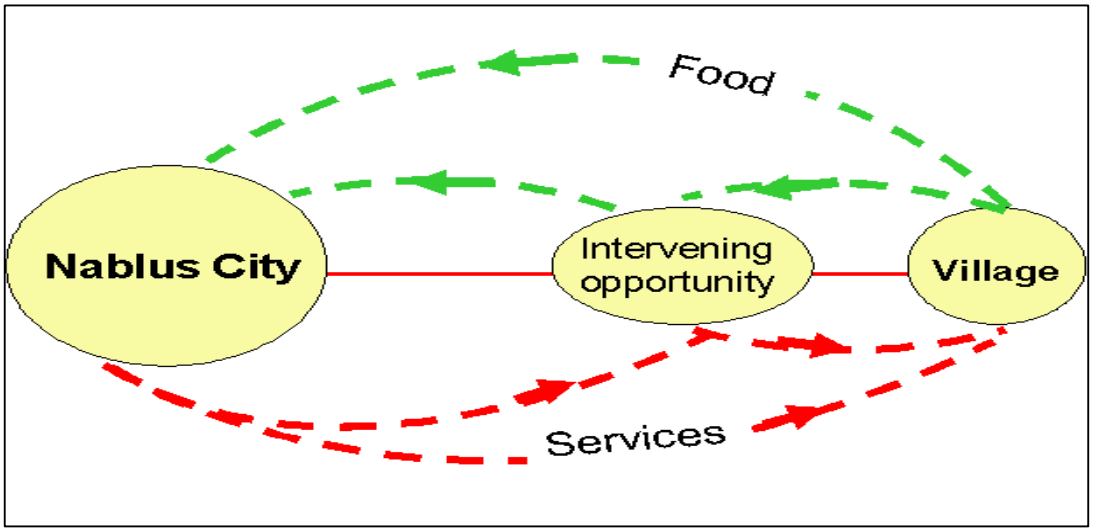
Figure 4-13: The interaction between rural and urban centers in a complementary base



Source: the author.

However, according to many proposed urban agriculture agendas (FAO 2001, RUFF 2006, UNDP 1996 and others), if the city will be responsible to provide its dwellers with food under different scenarios such as backyard gardens, vacant spaces cultivation, roof gardens, allocating agriculture areas within the city boundary, etc, then the level of agriculture interaction between urban center and rural areas will be eliminated to the services that the city providing to the rural areas. In this case, rural residents are projected to live in the cities more rapidly mostly for employment reasons. Benefiting from Ullman's fundamental bases regarding the interactions between rural and urban areas, the intervening opportunity could be created as a barrier between rural and urban areas as shown in figure 4-14.

Figure 4-14: The function of intervening opportunities which can eliminate urban and rural imbalanced expansion.



Source: The author.

The figure explains that having intervening opportunity (in this case agriculture zone in the most appropriate peri-urban area) will eliminate the threats of introducing urban agriculture within the city boundaries as well as will keep on the traditional interactions between urban and rural areas. From one hand, the intervening opportunity to be identified by the city planner will be an agriculture zone where: (i) intensive agriculture practices takes place, (ii) agriculture skilled rural residents will have the opportunities to find permanent jobs and utilizing city unemployed individuals for agriculture production, (iii) the villages will keep providing the city with food (agriculture production) and, (iv) the city will provide the intervening opportunity (agriculture zone).

3. Urban agriculture and labor market:

Based on the assumed existence of urban agriculture in the eastern Nablus plain according to the examined considerations in the previous chapters, it has been estimated in appendix number 3 that 7674 job opportunities could be created in the plain in year 2005 (the base year for calculations), 10797 job opportunities in year 2015 and, 15267 job opportunities in the year 2025. These estimated employment where calculated according to the projected population number till 2025 assuming that eastern plain to be develop as per-urban agriculture area, wastewater treatment is used for agriculture production irrigation, solid wastes (organic compost) is produced.

Table 4-18: Estimated employment opportunities in intensive peri-urban agriculture interventions at eastern plain of Nablus city.

Business type	Employment opportunities (persons)		
	Agriculture unit holder		
	2005	2015	2025
Livestock labor force demanded	504	708	996
Horticulture labor force demanded	7170	10089	14271
Total	7674	10797	15267

Source: Author calculations (see appendix 3).

According to PCBS 2003 (Labor force: second quarter report), it's obvious that the total unemployment number were estimated 20,286 individuals (including urban, rural and refugee camps). By comparing the estimated job opportunities calculated in appendix number 3 for the years 2015 and 2025 with PCBS estimated unemployment number in the year

2003, then if peri-urban agriculture area to be exist in 2015, it will consume more than 53% out of the total unemployment numbers in the year 2015 and more than 75% in the year 2025. This simple calculations based on the assumptions of the existence of peri-urban areas gives additional economical dimension to urban and peri-urban agriculture where poverty rate expected to be reduced as well as the purchasing power of the city dwellers to be improved.

Generally, other job opportunities would accompanying urban agriculture development such as the need of packaging and storage houses, slaughtering houses, composting, etc, which all expected to increase the job opportunities within the city of Nablus as well as reserving the income sources of the peri-urban dwellers. It's understood that other rural areas surrounding the city need an action plans for economical development and poverty alleviation. These rural localities will keep providing the city with agriculture production (which couldn't be produce in the identified city peri-urban agriculture production zone). However, job opportunities must be balanced for all at district level. Credits and effective developmental plan must be considered with full political support the provision of all assistance in order to create small agriculture industries in the rural villages at the regional level.

CHAPTER FIVE

INVESTIGATING RESEARCH HYPOTHESIS

Urban development plans of cities and their neighboring districts serve to establish policy for the development and transformation of these areas (UNU, 1997). These plans are based on the analysis of existing structures and, in particular, on the identification of inequalities in the geographical distribution of housing, activities, roadways and transportation resources (UN, 1987). The mapping of cities, land cover modes and the evolution in time and space of these various sectoral themes are the main tools used by urban planners in their work (World resources, 1996).

National regulations, which are first and foremost established to give direction to development of the nation's territory, have also served locally as a means of implementing today's large, politically motivated projects (UNHABITAT, 1996). However, urban planners have to balance between urban development and issues that include: (i) Rapid economic growth, (ii) Energy savings, (iii) Reduction of social inequalities, (iv) Environmental protection, (v) Historical conservation, (vi) Promotion of high-tech industries and, more recently (vii) Urban agriculture. (Quen, 1999, Shukla, V. 1996, and Zeew, de H. et al, 2000). The establishment of an urban development plan is thus at the crossroads of the architecture and urban planning fields, but also involves the fields of economics, sociology and environmental, engineering and must involve agriculturists.

According to FAO (1998), in the year 2015 about 26 cities in the world are expected to have a population of 10 million or more. To feed a city of this size today - for example Tokyo, São Paulo or Mexico City - at least 6000 tons of food must be imported each day. Nablus city which is relatively too small to be compared in terms of population size with major world cities will consume at least 185 tons of food per each day in the year 2015 and more than 261 tons per day in 2025 (only from basic commodities calculated in Appendix 1). Within this context, supplying Nablus city with this projected quantities of food require appropriate city planning. For example; organizing the food distribution within the city as well as collecting the organic wastes as a result of people daily consumption, requires effective transportation plan and spatial consideration for food marketing centers. However, the huge amount of the required food for the city consumption per day is not only related to food security or food production factors, but it includes within its entire core issues such as: (i) water scarcity and water availability, (ii) land use and availability, (iii) land and water accessibility, (iv) wastewater and solid wastes recycling, and many other environmental, social and economical aspects. The later concerns are actually the major issues that city planners used to consider during their jobs, which mean that urban agriculture is worth to be tested in terms of its suitability for Nablus city planning.

Its without doubt that urban agriculture brings huge benefits to the city as emphasized and recognized by international organizations such as FAO, RUFF, WHO, UNCED, HABITAT, CGIAR (Waibel, H. 2000). Many

cities worldwide are practicing urban agriculture such as Nairobi in Kenya, Dakar in Senegal, Dar es Salaam in Tanzania, Mexico City in Mexico, Manila in Philippines and many others (IDRC, 1999). The scale of urban agriculture interventions is varying from one city to another and depending on water and land availability and accessibility as well as other agriculture production support elements such as inputs availability, policy and government support, public participation (Nugent, R.A., 1999). It's understood that the questions of urban agriculture existence or non-existence or the level of urban agriculture interventions within specific urban location depends on four basic pre-conditions which are: Environment, economic, social and physical.

In particular, these basic pre-conditions were examined through the previous chapters considering Nablus city as a case study. However, this research was designed on the base of three assumptions which are: (i) Urban agriculture practices in Nablus city are not exist, (ii) awareness and concerns in relation to urban agriculture among cities planning institutions and stakeholders are not exist, (iii) Urban agriculture couldn't exist as a tool for Nablus city planning even if all its pre-conditions assured. These three assumptions further studied on the bases of the four essential pre-conditions required for urban agriculture existence:

Table 5-1: Investigating hypothesis against urban agriculture pre-conditions required:

Investigating the hypothesis against:		
Natural and environmental pre-conditions		
Factors	Hypothesis assumptions	Tested pre-condition
Solid wastes	Urban agriculture cant contribute in solving urban solid wastes problems	Appropriate introduction of urban agriculture in Nablus city can consume 25 % - 37% out of the total generated organic wastes as compost and soil conditioners only for inter-urban calculated areas.
Wastewater	Urban agriculture cant help in solving wastewater effects on the environment	Appropriate introduction of urban agriculture can consume 4.39 MCM of treated wastewater in Nablus city.
Temperature	Nablus city temperature cant aid agriculture existence	Nablus city temperature lies between 12 Cº in winter and 31 Cº during summer which fit with most vegetable cultivation and most fruit trees temperature requirements.
Light	The day light in Nablus city is not suitable for agriculture production	The average sunshine hours in Nablus city lies between 7.8 and 10.9 hours per day and can fulfill various crops sunshine requirements.
Water (rainfall)	The annual rainfall average is not enough to undertake urban agriculture intervention	The average annual rainfall in Nablus city is 633 mm which fit with most rainfed cultivations.
Wind	The wind speed and direction is not suitable for agriculture production	The average wind speed in Nablus city is 5.56 km/hour which highly suitable for plant pollination and agriculture production
Investigating the hypothesis against:		
Physical pre-conditions		
Factors	Hypothesis assumptions	Tested conditions
Water demand	High water demand can’t allow the existence	Wastewater treatment plants is under consideration by

	of urban agriculture due to water scarcity issues	Nablus municipality that urban agriculture within Nablus city has three choices: (i) replacing industrial demanded water with treated wastewater and ten using fresh water for agriculture irrigation, (ii) irrigating by treated wastewater or, (iii) cultivating rain fed crops.
Water supply	Water supply within Nablus city boundary is not effective	Municipality reservoirs and per house water tanks increase the efficiency of water supply and therefore backyard gardens exists within the city
Rainfall collection	Rainfall collection couldn't be applied in Nablus city for urban agriculture interventions	Rainwater could be collected from house roofs for backyard garden, streets which makes 20% out of the total city area.
Wastewater reuse	Wastewater collection, treatment and reuse schemes couldn't be applied in Nablus city	99 % of Nablus houses are connected to sewer network where treating wastewater considered to be feasible in both eastern and western plains of the city due to the city topographical characteristics
Water accessibility	Water is not accessible for all inter-urban areas	99 % of Nablus inter-urban areas is connected to water supply network and accessible in every where within the city
Land accessibility	Land is not accessible for urban poor to cultivate in the intra-urban areas	Still 400 dunums are accessible for direct urban agriculture practices within the intra-urban area where other 1500 dunums allocated by the municipality as green space in addition to 200 dunums formulating the three city parks
Land use planning	Land use planning ignoring agriculture areas	The Planning department in Nablus municipality is allocating agriculture areas

		within the city of Nablus
Land availability	Vacant and open spaces are not available	Peri-urban areas in the eastern plain makes 50250 dunums available for agriculture production in addition to other 400 dunums available within the city area
Land tenure	Land tenure problems restrict the existence of urban agriculture in Nablus city	Considering peri-urban areas for agriculture production will keep the land owners cultivating their farms where land tenure conflict to be minimized to its minimal rate
Investigating the hypothesis against:		
Socio-cultural & institutional pre-conditions		
Factors	Hypothesis assumptions	Tested conditions
Public acceptance	Public acceptance for wastewater treatment and reuse for irrigation will not exist	Using a secondary wastewater treatment plants will improve public acceptance rates for the reuse of treated wastewater in irrigation where eastern plain residents are already accepting,
Public participation	Public participation in urban agriculture will not exist	Municipality, NGO's and people will participate expected to benefit from introducing urban agriculture at large scale in the per-urban areas in terms of their employment
Efforts of organizations	No efforts would enhance urban agriculture existence	FAO, WFP, Municipalities and many agriculture NGO's are pushing to introduce urban agriculture in the national policies
Farming traditions	Urban agriculture will change and affect farming traditions	Peri-urban agriculture and urban agriculture would improve the production techniques used by tradition farmers where new urban farmers are not necessary to exist by relying on peri-urban residents who are skilled in

		agriculture
Rural-urban conflicts	Urban agriculture will increase the urban-rural conflicts	Suggesting peri-urban areas as convening opportunities area will reduce the rural-urban conflicts and will reduce immigration from rural areas to urban centers for job opportunities as well. This must canopying with national rural development plans
Investigating the hypothesis against:		
Economical pre-conditions		
Factors	Hypothesis assumptions	Tested conditions
Food supply-demand relations	Urban agriculture cant balance food demand and food supply relations	Urban agriculture has been tested to be ideal opportunity to balance between production and consumption during land use planning for agriculture production
Transportation cost	Urban agriculture cant reduce post harvest loses and transportation costs of agriculture produce	Urban agriculture and per-urban agriculture minimizing the transportation cost of the agriculture produce to its minimum
Distance and land rent	Urban agriculture requires vacant lands with high rent price	Existence of per-urban agriculture at Nablus city skirts will minimize the land rent cost as its far from the city center
Labor and job creation	Urban agriculture cant provide job opportunities	Employment and job opportunities would increase directly and indirectly in Nablus city due to Urban and peri-urban agriculture practices

5.1. Investigating hypothesis on the aspect of urban agriculture existence in Nablus city:

According to Nablus municipality land use data (2007), it's obvious that there are 400 dunums used for agriculture production within the intra-urban area of Nablus city, about 1500 dunums for green spaces and other 200 dunums used as public parks. The satellite images obtained from Google

earth (2007) gives evidence that urban agriculture production is practiced at two levels: (i) Small-scale to medium-scale agriculture production using spaces and plots for olive trees, almond, and some other horticultural cultivations, (ii) Backyard gardens and small plots used for vegetables production. However, some households used to cultivate their backyard spaces with ornamental plant where some others used to plant thymes and mint for their domestic consumption. Generally, none of both levels could be considered economically feasible and therefore, the city dwellers actually don't rely too much on such plots for either feeding their families or generating income. In conclusion, urban agriculture is exists within the city boundaries but obvious its not organized and randomly practiced.

5.2. Investigating hypothesis on the aspect of urban agriculture awareness:

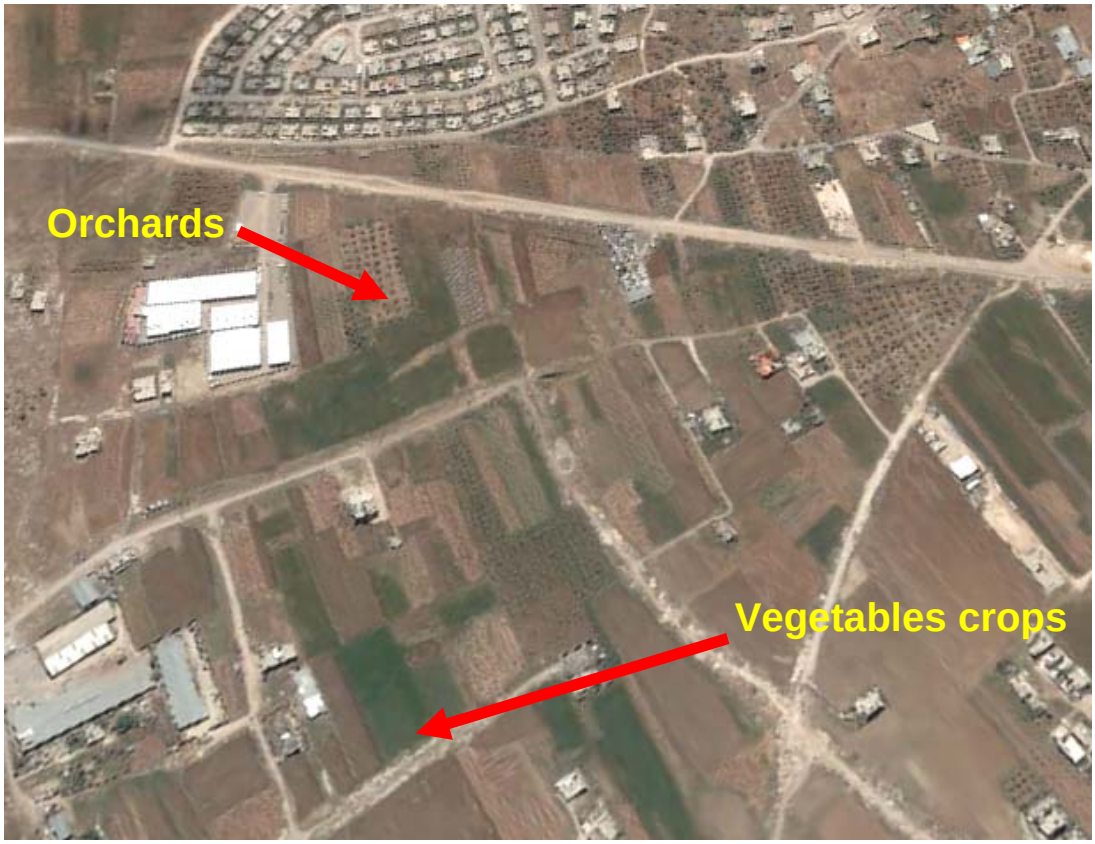
According to (PCBS, labour force survey 2006), about 1,032 inhabitant from Nablus city are involved in agriculture. Some are graduated agriculture agronomists or school teachers. In addition, it has been noted from Nablus municipality (2007) that many women and community based organizations are running agricultural projects in Nablus city aiming at alleviating households' food security conditions. Most of these project are focusing on food processing and backyard gardening.

However, there are 10 shops selling agriculture inputs and one governmental agriculture department in the city of Nablus providing agriculture extension and veterinary services in addition to other 3

agriculture NGO's (PCBS, 2000). According to Nablus municipality (2007), there is one functioning slaughtering house in addition to another proposed slaughtering house for poultry which currently under fund consideration. Further, the agriculture wholesale market in Nablus city (established over 40 dunums of land in 1971 having 5700 m² for cold storage) is considered to be one of the biggest agricultural wholesale markets in the West Bank. These facts are added to the huge concern showed by the Planning department in Nablus municipality regarding allocating spaces for agriculture, parks and landscaping.

However, the lack of information regarding the concepts of urban agriculture makes those who are involved don't know that what they are actually practicing is urban agriculture. Therefore, despite urban agriculture awareness must be for those involved actors including consumers, it couldn't be assumed that awareness regarding urban agriculture doesn't exist in Nablus city.

Figure 5-1: Examples of orchards and vegetables grown area in Nablsu city.



Source: Google earth, 2007.

5.3. Investigating hypothesis on the aspect of urban agriculture existent:

The integration of urban agriculture in urban planning was tested in chapter three from planning point of view. However, the detailed comparison made in chapter three between urban agriculture and urban planning considerations gave the theoretical evidence that urban agriculture can contribute toward solving major city environmental, economical and physical problems associated with land use and tenure issues. According to Petra Jacobi (2000), urban agriculture was identified as one of the most

possible and applicable intervention which can influence positively urban planning.

The provision of urban agriculture in city master plans and incorporating it into urban expansion plans seem essential due to rapid urbanization growth which almost associated with environmental, cultural, economical, health, physical and more recently food insecurity problems. These require serious revision of urban regulations at local, regional and national levels in order to include urban agriculture within all levels agenda as a tool for city planning due to its ability to contribute in solving part of urban problems. It's obvious from agricultural point of view the role that urban agriculture can play in the city of Nablus. However, developing appropriate planning tool relying on urban agriculture approaches requires more analytical scheme. Therefore, the pre-condition required for urban agriculture existence were tested more in detail in order to assure that urban agriculture could be used as a tool for city planning:

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1. CONCLUSIONS:

Integrating urban agriculture as a tool for city planning will become soon part of the urban development plans which are created by urban planning offices (Jerzy Regulski, 1976). Urban managers and planners (world-wide) are focusing their attention not only on the proven possibilities of urban agriculture but also on its untapped potential (Quen, 1999). The current thinking among experts in the field is that urban agriculture is a viable function for attaining the goals of urban sustainability (FAO, 2001). The fact is that urban agriculture is growing more and more in our cities and we have the challenge of managing it as part of the solution to our needs. But the most important challenge is to include in the land management processes those who are the very essence of the city who are the dwellers (Chicorel 1975).

Inserting urban agriculture into the land management system is not a task to be worked out on a drawing board. It depends, to a great extent on the interrelation among planners and doers, the community and governments (UNHABITAT, 1996). The role of city planners and developers in this respect should not be limited to ensuring the availability of spaces for agricultural activities. They should also be involved in defining scales, activities and tools that would promote the insertion of urban agriculture into land management. In this regard, the meaning of urban agriculture as

an urban function has to be oriented as follows: (i) Work on the different planning scales, (ii) Coherent relationship among production, location, design, (iii) Identification and use of linkages and work flows and, (iv) Identification and execution of actions ensuring the evolution of urban agriculture towards sustainability. The following table summarizes the objectives which could be enhanced by introducing urban agriculture within the frame of city planning and indicating the types of possible activities, means and actors involved:

Table 6-1: Action plan matrix for introducing urban agriculture.

Objectives	Expected out-puts	Activities	Means required	Responsibilities
Enhancing the reservation measures of natural resources through integrated urban agriculture programming	Effective environmental reservation plan and improved environment quality through appropriate physical planning	1- Protect and restore the existing environmental assets. 2- Solid waste recycling and wastewater treatment. 3- Rainwater harvesting. 4- Developing appropriate environmental action plan. 5- Optimizing the use of good quality water. 6- Elimination of city expansion over suitable lands for agriculture. 7- Developing and extend urban agriculture- 8- Forests and landscaping development. 9- Increasing vegetation area in intra-urban areas. 10 – Activating land reservation schemes.	1- Appropriate land use planning. 2- City plans revisions and urban agriculture integration. 3- Improved awareness and skills of actors involved.	Local authorities, NGO's, Ministries, CBO's, Universities and, research institutions.
Enhancing Socio-cultural and institutional conditions through appropriate urban agriculture	Resolved developmental pressure and land tenure obstacles	1- Enhancing public participation in planning. 2- Integrating available knowledge and skills in a comprehensive social alleviation campaigns. 3- Alleviating food	1- Authority support. 2- Community education. 3- Improved accessibility to land and water. 4- Legislative	Local, regional and national authorities, NGO's, Ministries, CBO's, Universities and,

planning		security conditions for dwellers. 4- Involving unemployed groups in urban agriculture. 5- reserving cultural heritage and traditional farming values. 6- Enhance complementary collaboration and organized linkages between urban and rural centers. 7- participatory identifications for peri-urban areas for agriculture production purposes. 8- involving youth and women in decision making. 9- strengthening community based and non-governmental organizations. 10- Establishment of producers and consumers grassroots organizations. 11- Harmonizing efforts and interventions. 12- Improving public acceptance for the reuse of treated wastewater. 13- Setting-up effective plans against immigrations between rural and urban centers. 14- encouraging urban agriculture and eliminating decline in agriculture population	support and urban agriculture law formulation. 5- encouraging food processing in rural areas.	research institutions
Contributing in alleviating poverty and	Reduced poverty and unemployment rate	1- Diversification of rural and urban economy for Job creation through	1- Appropriate accreditation and credit	Local, regional and national authorities,

improving dwellers welfare status through urban agriculture interventions		urban and peri-urban agriculture. 2- Integrated developmental plan for resources utilization and land rent mapping. 3- Improving urban- rural services. 4- improving marketing infrastructure and food distribution. 5- Establishment of peri-urban agricultural zones. 6- improving dwellers purchasing power through employment and job creation projects. 7- balance the relation between food demand and food supply and food security conditions. 8- improve investment and credit schemes for urban agriculture interventions. 9- Encouraging privatization and setting up aid and financing strategies. 10 – Eliminating post-harvest loses through appropriate spatial organizations of urban agriculture interventions based on minimum distance and transportation studies.	schemes for urban agriculture micro and macro interventions. 2- A comprehensive national developmental plan.	NGO's, Ministries, CBO's, private sector, banks, credit organization and donors

Based on SWOT analytical matrix and the proposed action plan, it is obvious that there are three opportunities through which urban agriculture could be integrated (as planning tool) into urban, regional and national planning: (i) as a tool for the enhancement and reservation of natural resources, (ii) as a tool for socio-cultural and institutional empowerment and, (iii) as a tool to overcome and alleviating poverty.

Table 6-2: SWOT analysis matrix:

ENVIRONMENTAL			
Strengths	**Weaknesses**	**Opportunities**	**Threats**
Natural resources and Diverse environment assets include air, soil, water, and landscape.	Intensively overlapping uses, fragmentation and loss of environmental assets	Protect and restore the existing environmental assets: (i) Solid waste recycling, (ii) Wastewater treatment, (iii) Rainwater harvesting, (iv) Water reservation, (v) Appropriate environmental action plan and, (vi) Land reservation.	(i)High demand for drinking water, (ii) unexpected city expansion over agricultural suitable lands
A rich built and industrial heritage	Poor environment quality	Develop and extend urban agriculture- environment schemes: (i) Forests development (ii) Increase vegetation area, (iii) appropriate transportation plan, (iv) Create attractive open spaces and, (v) Improved awareness.	Lack of social, economic and environmental integration
Large number of designated sites at peri-urban level	Declining rural land management skills	Develop the large urban market for regional products that help to deliver environmental benefits	Development pressures
SOCIAL AND INSTITUTIONAL			
Strong municipal roles and regulations	Limited support from central government	(ii) urban and peri-urban agricultural sites allocation and, (iii) Provision of logistics required for urban and peri-urban agricultural interventions.	(i) City expansion toward rural areas or rural areas toward urban centers. (ii) Lack of planners experience regarding urban and peri-urban agriculture.
Local authorities, agencies,	Fund competition and weak	(i) Involving communities in local plans and projects - making use of all the skills	(i) Absence of cooperation

CBO's and NGOs existence	cooperation	available and, (ii) urban and peri-urban agricultural policy formulation.	policy and agreements, (ii) multi objectives and duplicate efforts.
Young population	Limited public participation and unbalanced demographic trend (population growth and immigration)	(i) Diversification of rural and urban economy for Job creation through urban and peri-urban agriculture and, (ii) Integrated developmental plan for resources utilization and land mapping.	(i) Decline of agricultural population, (ii) limited population acceptance and skills
Links between urban- rural centers	Lack of rural services	(i) Improve peri-urban and urban links by creating peri-urban agricultural zone between urban and rural centers. (ii) Adding value to local products production for food security purposes.	Abandonment of agricultural land on urban skirts

ECONOMICAL			
Strengths	**Weaknesses**	**Opportunities**	**Threats**
A diverse agricultural capabilities and land availabilities in intra-urban (backyard gardens) and peri-urban areas (fertile landscapes).	(i) Improper spatial distribution of agriculture interventions. (ii) and poor services (transportation, packaging houses, cold storages and grading centers).	(i) Demand for food consumption and organic compost (recycled wastes). (ii) Job opportunities and employment	(i) Improper food distribution plans cause post-harvest loses and, (ii) low investment schemes for urban and peri-urban agricultural enterprises (aid to start-up costs)
Wholesale market and production inputs suppliers	(i) Poor market accessibility and increased number of middlemen (increase of agriculture product cost and	Vertical integration between producers and processors	Restrictive planning policies and lack of funding.

	selling price). (ii) Lack of marketing structure		
Credit organizations and Banks	Poor addressing of agriculture importance as intervention	(i) Establishments of producers and consumers grassroots organization (negotiating lowest interests rate). (ii) Involvement of private sector and donor agencies.	(i) Improper local and national planning. (ii) emergency projects priorities

The enhancement and preservation of natural resources through urban agriculture programming is relying on the environmental and climatic conditions in Nablus city. In other words, it's firstly relying on the suitability of these conditions for agriculture production and, secondly on the availability of the basic production resources which are simply refereed to human, land and water.

It's without doubt (according to the previous chapters) that Nablus city environment is fit to most agricultural crops mainly fodders, vegetables and many fruit trees. However, undertaking the decision of agriculture production in the intra-urban areas would be eliminated to the individual's accessibility to the land and water regardless they are poor, rich, and skilled or not. Therefore, urban agriculture in the intra-city will be practiced as traditionally exist in the backyard gardens and wherever plots are available for cultivations. Such conclusion is also supported by the fact that most of Nablus city dwellers are suffering the limitation of food accessibility by means of lack purchasing power due the huge unemployment rates and

poverty reasons, and therefore many of Nablus residents were classified food insecure by FAO and WFP in 2006. However, one can see that the city dwellers are in need for jobs and income generating opportunities more than their actual need for food. In other words, the dwellers will prefer to obtain jobs enabling their cash to purchase daily food for themselves and for their families more than searching a plot for cultivation in order to produce food. This also been emphasized by this research paper due to four main reasons: (i) Hunger crisis is not exist, (ii) Continues humanitarian aid provided by international agencies in terms of food packages, (iii) high cost of land rent and limitation of funds to start small-scale agriculture production intervention, (iv) poor skills and knowledge in agriculture production. Therefore, poor inhabitants are willing to join economic cycle as labor, regardless the type of the work which could be offered for them.

Similar poverty and unemployment conditions are also concluded by PCBS (2006) in the closest rural areas surrounding the city of Nablus. These rural areas surrounding Nablus municipal boundaries could be considered as peri-urban areas. However, these rural villagers are abandoning their areas to search better job opportunities in the city despite they are agricultural skilled and most of them own plots of lands. The reason of these villagers abandoning their lands or in other words their traditional skills which is agriculture is the shortage of water for irrigation. However, from natural resources reservation point of view, one can conclude that many lands will be uncultivated and if cultivated benefiting from the relatively reasonable rainfall will not be economically feasible.

The combination between these two groups of people (city dwellers and peri-urban villagers) who meet in their need for job is an ideal opportunity to create a complementary relation between them but if water is accessible for agriculture production. In other words, if water is available for irrigation, the villagers who are skilled in agriculture can cultivate their lands for agriculture production and in large scale where they will be in need for workers and labor force (in this case unemployed city and village inhabitants).

Returning back to environmental quality and natural resources reservation, it was analyzed that the population growth will continue to increase where water availability for example will be the same in terms of quantities in cubic meters. This justifying why fresh water couldn't be used in Nablus city and its surrounding areas for agriculture. Despite the efforts of Nablus municipality to reduce the uncounted for water rates from 35% to 25%, the amount of water which could be saved by such measure will be the same amount of demanded water over the time required to overcome water loses due to population growth factor and therefore actual saving of water for irrigation will not exist. At the same time, the already available fresh water is subjected to high level of pollution as a result of the flow of wastewater generated from the city in both the eastern and western plains. Wastewater is almost associated with environmental problems and harms and therefore its treatment is critical and a must. From the physical and topographical point of view, the eastern plain of Nablus city is more suitable for agriculture production interventions due to land availability and

soil fertility where potentials of reusing the huge generated wastewater in irrigating agriculture cultivations are considered to be high due to two factors: (i) The short distance separating the identified location for wastewater treatment plant from Nablus eastern plain which can also reduce the investment amount and, (ii) the availability of agricultural skilled villagers who also own the lands. It's without doubt that any investment in constructing wastewater treatment plant in that area would need appropriate usage of the generated treated water and in this case the eastern plain is ideal option.

Benefiting form the unemployment in both eastern villages and Nablus city (which now become an opportunity), potentials of developing the plain stands between Deir-Al-Hatab, Salim, Rujeeb villages will not only solve huge part of unemployment problems, but it will also avoid issues related to land tenure if urban agriculture will take place as economical opportunity within the intra-urban area of Nablus city. This because the plain lands is owned by the previous mentioned villages dwellers so that renting lands for urban agriculture production is not a problem. Further, the plain is considered relatively far from Nablus urban center which means according to von Thunen land rent theory that even renting lands in the plain will be as much lower in terms of price as in the intra-urban areas.

However, such scenario is based on the capabilities of Nablus municipality to treat the generated wastewater and applying such option which can: (i) Create job opportunities, (ii) eliminate villager's migration to search jobs in the city, (iii) reserve the land and water resources, (iv) meet

food security requirement, (v) reduce the cost of wastewater treatment operations and, (vi) creates agriculture lands which can consume municipal organic wastes in terms of recycled solid wastes (compost).

Based on the same scenario, another plain which is between Rujeeb, Huwarra and Kufur Qaleel could be also developed for fodder and forage crops cultivations which can provide feed to livestock numbers required for Nablus city food requirements as calculated in appendixes. These potentials of reusing wastewaters have been tested within this research context from public and social acceptance point of view that gradually introducing treated wastewater for irrigation could start with forage crops, feed crops and fruit trees and later for vegetables production. This requires appropriate planning where public participation is essential.

Empowering communities and institutions within urban agriculture framework for better social and cultural practices, social linkage, institution and communities collaboration; must be based on the well understanding of exist situation and the vision to have better future. However, developmental plans considering urban or rural development areas are strongly relying on public participation and involvement of people in order to gain their acceptance and avoiding conflicts on lands, resources, activities and services. Regardless the degree of people involvement in issues concerning their beliefs, habits, practices and heritage; people participation will definitely influence the decision making and will aid planners for best planning practices and setting up realistic solutions applicable on the ground and accepted by the people.

Again, wastewater treatment and wastewater reuse for irrigation is an issue which has been addressed parallel with the rising voices regarding water scarcity. For the simple individual, water scarcity might mean to him only drinking water but at the same time he wills belief that nothing can remain alive without water. From urban agriculture point of view, water means food for dwellers consumption, and therefore wastewater treatment and reusing in multi-sectoral activities is essential including agriculture. However, people beliefs and religious commitments might influence the level up to which reusing treated wastewater could be accepted if applied for agriculture production purposes. This might also eliminate the scope of choosing the types of urban agriculture intervention and could further determine the crop that comparative advantages will not be applicable. Narrowing the scope of choosing crops means limited economical opportunities and then such thing if happen due to the dwellers rejection will drop down urban agriculture to its old scenarios of using fresh water for cultivations. However, public acceptance and involvement is essential to be empowered by the efforts of the organizations and community based associations. Involving people in designing and mapping wastewater treatment project is essential for the success of the overall approach.

Fresh water use for irrigation is a big questionable issue from agriculture point of view. Its simply means farmers are selling the water they bought to run their cultivations for other consumers in terms of production, and once the agriculture produce is sold below water price it means the communities will lose double the water. In addition, it's understood that industrial,

institutional, commercial and other city functioning sectors will increase competition on fresh water. Therefore water demand will increase to the limit where its accessibility and service costs will be increase. The later will lead that agriculture production in particular will not be economically feasible. However, the municipality and other local organizations have to encourage water use optimization and effectively cooperate to search seriously other sources for water including rainfall collection.

Rainwater collection by all means that rainfall and water harvesting option seems to be applicable at domestic level where backyard gardens can't economically offer job opportunities and therefore planners cant rely on it even to make water savings. This simply due to rapid population growth which will keep the demanded water more than the actually available in Nablus city or more than the amount of water which could be harvested from the rain. However, optimizing the use of water and water harvesting will solve part of the current problem, but at the same time couldn’t be considered as a sustainable option. It's therefore without doubt that wastewater treatment is a permanent and practical option which must be accompanying with comprehensive plan. The plan must also include alternatives of reusing treated wastewater and so agriculture option is tested to be the best.

Again and from urban agriculture point of view, it was essential to calculate per-capita daily food consumption. Food consumption was successfully linked within the context of this research with planning concerns such as: land use pattern, location identification, land rent and

transportation, water and water accessibility, unemployment and job creation, poverty rate, population growth, city expansion, climatic conditions, soil and topography, food security, links between rural and urban centers, resources considerations, efforts of organizations, public acceptance and public participation. The later not only emphasize again the suitability of urban agriculture as a tool for city planning, but also as a mitigation response to major city problems, environment, economic, physical, institutional and social.

In summary, urban agriculture can play a vital role in designing the city and its entire actors and resources through its application and consideration in urban planning contexts. However, urban and peri-urban agriculture will need support from all involved actors at local, regional and national levels and more essentially at community level in order to assure its effective utilization as a planning tool. Urban agriculture is a great opportunity for remapping the planning approaches and revising policies being environmental, physical, economical, social, cultural, institutional, commercial or educational.

The major findings:

Based on the above results, the following could summarize the major findings:

1. A wide scope of integrating urban agriculture within the frame of the overall city plans and concepts were founded different aspects

such as, environmental, cultural, socio-economical and physical land use planning.

2. Land planning and mapping system are weakly addressed during the preparation of urban plans.

3. Public participation throughout city planning process is weakly considered by the planners. Weak attention is given further toward the public awareness, dwellers skills and knowledge.

4. During the city planning process, none of the Palestinian authorities (local, regional and national) are considering the urban agriculture as a mitigation response toward eliminating food insecurity conditions and environmental hazards.

5. Poor inhabitants are rarely encouraged t join the economic cycle as labour or/and owners of agricultural self help initiatives or small scale enterprises. The Banks, credit agencies and authorities have had a weak legislative roles and understanding in relation to urban and peri-urban agricultural interventions improvement.

6. Urban agriculture is not yet identified within the multi-sectoral comprehensive plans and therefore weakly addressed by the local Palestinian agencies and governmental bodies.

7. No agricultural zone is allocated by the city planners which can enable the urban agriculture interventions. The pre-urban areas are not yet identified by the city planners.

8. The daily per-capita food consumption is not considered during the city planning process despite it needs to be facilitated by appropriate roads for food distribution, storage houses, backing houses and despite its vital role in generating the organic wastes in the city.

9. The urban agriculture requirements (lands, buildings, facilities, storage houses, waste treatment stations, roads, etc) are not considered during the city planning process.

6.2. RECOMMENDATIONS:

1. Urban managers and city planners should integrate urban agriculture as a tool for city planning due to its vital role and functions for attaining the goals of urban sustainability.

2. Urban agriculture should be inserted into the land management and mapping systems in order to identify the most appropriate urban and peri-urban areas where agriculture activities could be practiced without competing other city functions.

3. City planners, local authorities, NGO's and community based organization should assure public participation throughout the planning process in order to enhance public awareness, knowledge and skills in relation to urban agriculture contexts.

4. Urban agriculture concepts should be adopted as a preservation measure of natural resources which then can assure

better food security conditions for the city dwellers (including the creation of new job opportunities).

5. Planners and governmental bodies should encourage poor inhabitants to join the economic cycle as labour or/and owners of agricultural self help initiatives, small scale enterprises that Banks, credit agencies and authorities should formulate appropriate legislative roles in relation to urban and peri-urban agricultural interventions improvement.

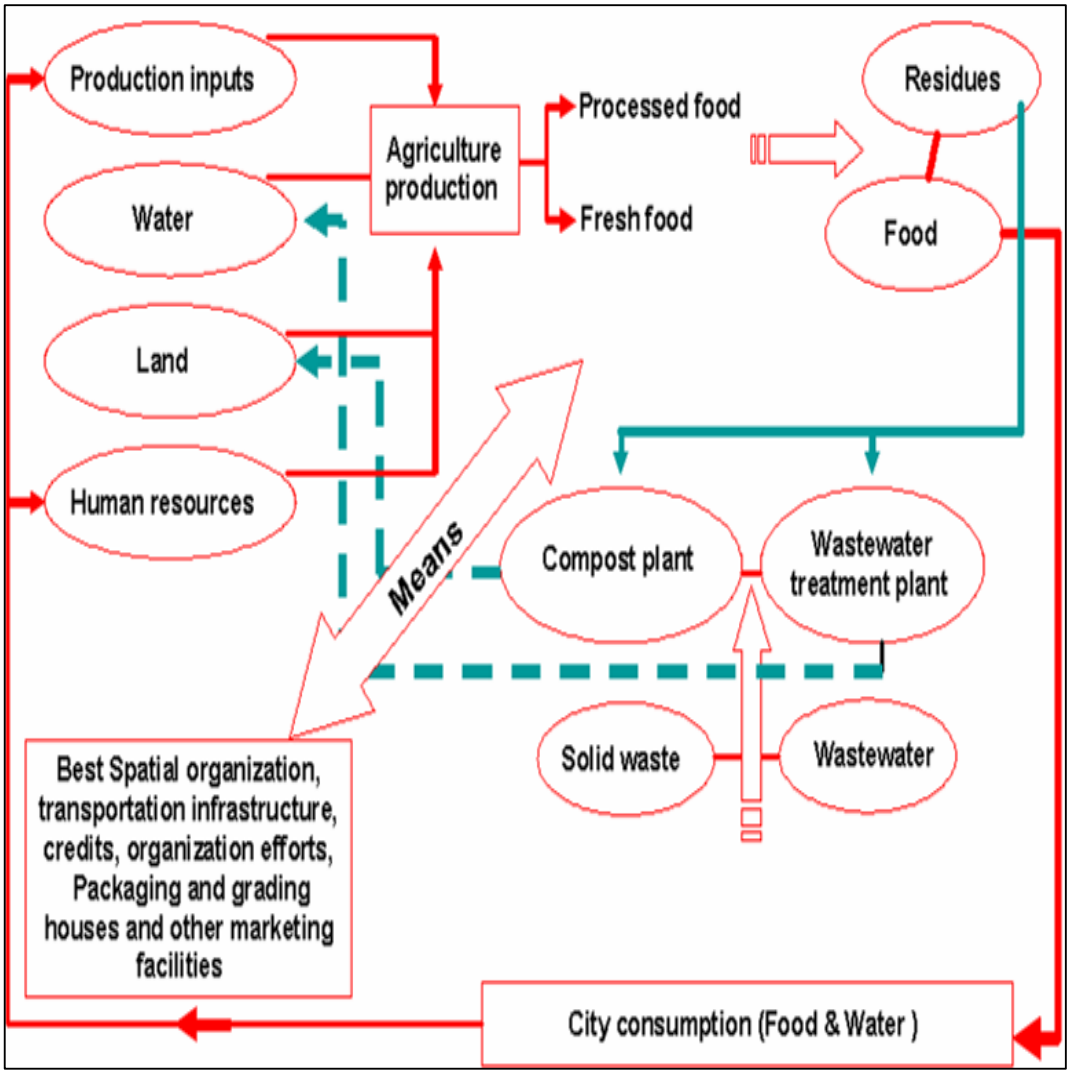
6. The legislative and legal bodies must assist in the formulation of better definitions of urban and per-urban agriculture at local, regional and national levels.

7. Urban agriculture zone should be established within the boundary of each city at the most nearer and appropriate location to the identified per-urban areas surrounding the cities with more focus on accessibilities.

8. The daily per-capita food consumption should be considered and calculated during the preparation of city plans and must be projected according to the population growth rates.

9. The city physical planning must consider urban agriculture requirements (lands, buildings, facilities, storage houses, waste treatment stations, roads, etc).

Figure 6-1: Urban agriculture role in Nablus city.



Source: The author.

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APPENDIX 1:

WATER DEMAND FOR INTRODUCING URBAN AGRICULTURE WITHIN NABLUS MUNICIPAL BOUNDARIES BASED ON PER CAPITA MONTHLY FOOD CONSUMPTION FOR SELECTIVE FOOD COMMODITIES FIT

WITH NABLUS ENVIRONMENT

1. Projected monthly consumption assuming that family size will not change:

The average household monthly consumption of basic food commodities (selective) based on PCBS data (2005) considering the average family size at 6.4 individuals per family (PCBS, 2000) is calculated as below:

Item	Unit	Average Quantity				
		For household /month	Per capita/ month	Projected monthly consumption in tons *		
				2005	2015	2025
Sheep and goat meat	Kg	2.0	0.3125	66.625	93.75	132.625
Beef	Kg	3.4	0.53125	113.2625	159.375	225.4625
Poultry (Slaughtered)	Kg	4.4	0.6875	146.575	206.25	291.775
Milk	Liter	6.2	0.96875	206.5375	290.625	411.1375
Yogurt	Liter	6.0	0.9375	199.875	281.25	397.875
Cheese	Kg	1.9	0.296875	63.29375	89.0625	125.9938
Eggs	Kg	3.5	0.54687	116.593	164.062	232.093

			5	8	5	8
Olive oil	Liter	3.7	0.578125	123.2563	173.4375	245.3563
Fresh fruits	Kg	36.5	5.703125	1215.906	1710.938	2420.406
Vegetables	Kg	50.7	7.921875	1688.944	2376.563	3362.044

* Projected monthly consumption is based on the projected population number estimated by Nablus municipality = (per capita monthly consumption X projected population)/ 1000 kg).

2. Livestock Number:

Calculated number of cattle, sheep and hens based on data obtained from the above table (regardless the life-span of livestock; assuming that the number of heads or hens will remain the same to fulfill the monthly consumption demand in the city).

*** Total required milk to produce demanded cheese, yogurt and pure milk according to its source (cattle or sheep and total number of cows and ewes: (**The calculations based on data obtained from FAO web site (www.fao.org) and compared with average production of milk from sheep and cattle in Palestine).:

A. The average milk production from cattle source (cow) is standing at 6300 litters per year per cow and 400 litters per ewe per year.

B. The average milk production from cattle source (cow) in litters per month = yearly produced milk per cow / 12 months = 525 litter per month per cow. While the average milk production from sheep

source in litters per month = yearly average produced milk per ewe / 12 months = 33.33 litters per month per ewe.

C. The total average of required milk in litters to produce 1 kg of cheese or 9 litters of yogurt =10 litters.

Item	Year		
	2005	2015	2025
Total demanded milk for monthly consumption in litters	207000	291000	411000
Total demanded milk to produce monthly demanded yogurt from cattle or sheep source = (total monthly demanded yogurt in litters X 10 litters)/ 9 litters	222083	312500	442083
Total demanded milk to produce monthly demanded cheese from cattle or sheep source = (total monthly demanded cheese in kg X 10 litters)/ 1 litters	632940	890630	1259940
Total required milk in litters per month = demanded milk to produce yogurt, cheese and portable milk	1062023	1494130	2113023
Number of cows required to produce per month milk for monthly consumption (including cheese and yogurt processing) = (total required milk per month in litters / monthly average of milk production per cow per month)	2023	2846	4025
Number of sheep (ewes) required to produce per month milk for monthly consumption (including cheese and yogurt processing) = (total required milk per month in litters / monthly average of milk production per ewe per month)	31864	44828	63397

Number of livestock required to fulfill the monthly consumption demand in terms of Beef, meet and slaughtered poultries: Based on the monthly demanded beef and meat quantities as well as the amount of slaughtered poultries in kg, the following estimates have been calculated

according to the obtained data from the Palestinian Ministry of Agriculture (2006), PCBS data (2005). Taking into the consideration that average net weight of meat in kg which could be produced from a single sheep is equal to 25 kg, while stands at 250 kg for slaughtered bull, and 1.5 kg per single slaughtered poultry.

A. The total number of bulls required to fulfill the monthly consumption demand from beef is = total demanded quantity of beef for monthly consumption in kg / 250 kg (the average net beef of slaughtered bull).

B. The total number of sheep required to fulfill the monthly consumption demand from meat is = total demanded quantity of meat for monthly consumption in kg / 25 kg (the average net meat of slaughtered sheep).

C. The total number of poultries required to fulfill the monthly consumption demand from poultry white meat is = total demanded quantity of white meat from poultry source for monthly consumption in kg / 1.5 kg (the average net white meat from slaughtered poultry).

D.

Item	Year		
	2005	2015	2025
Total number of bulls or cows required per month to meet the monthly consumption demand in Nablus city = total demanded beef in kg per month for consumption / 250 kg	453	638	902
Total number of sheep required per month to meet the monthly consumption demand in Nablus city = total demanded meat in kg per month for consumption / 25 kg	2665	3750	5305

Total number of poultries required per month to meet the monthly consumption demand in Nablus city = total demanded poultry meat in kg per month for consumption / 1.5 kg	97717	137500	194517

Number of hens required to fulfill the monthly consumption demand in terms of eggs: Based on PCBS data (2005) regarding per capita average eggs consumption per month in kg, it has been calculated the number of hens required to produce the monthly demanded eggs assuming the average weight of produced Palestinian eggs stands at 50 gm which equal to 1.5 kg per each 30 eggs; where the average eggs production per hen is equal to 2 eggs per day per hen.

A. The average number of eggs required for monthly consumption = (monthly required eggs in kg X 30 eggs)/ 1.5 kg.

B. The number of hens required to produce the quantities of monthly consumed eggs = (total quantities of eggs for monthly consumption X 1 hen) / 2 eggs

C.

Item	Year		
	2005	2015	2025
Total demanded eggs for consumption per month in kg	116594	164063	232094
Monthly required eggs in number = (monthly demanded	23318	32812	46418

eggs in kg X 30)/1.5 kg	80	60	80
Total number of hens to produced the demanded eggs for monthly consumption = (total number of eggs for monthly consumption X 1 hen)/ 2 eggs	11659 40	16406 30	23209 40

3. Total water demand for livestock (according to calculated livestock numbers):

According to different studies, the average livestock water intake (drinking water and water used for sanitation) is vary between hot season and cold one, its obvious that the mean of daily water intake is ranging between 75 – 100 litters per day per cattle and 8 – 10 litters per day per sheep (William M. & Paul M., 1982).

The average daily water intake for either broiler or chickens (poultry) is standing at 0.5 litters per day per poultry. However, the average water required per day per head / poultry is calculated by the mean at: 0.5 litters per poultry, 9 litters per sheep and 80 litters per cow or bull.

(see also http://www.omafra.gov.on.ca/english/engineer/facts/86-053.htm.

Based on the calculated number of livestock which needed to fulfill the monthly consumption demand of basic agriculture commodities (from animal source) in Nablus city; the following table shows the daily

water requirement (water intake and sanitation water quantities) for the calculated livestock:

Item	Year		
	2005	2015	2025
Cows and bulls			
Number of cows for milk production	2023	2846	4025
Number of cows/ bulls for beef production	453	638	902
Total number of cows / bulls	2476	3484	4927
Goats and sheep			
Number of sheep / goats for milk production	31864	44828	63397
Number of sheep / goats for meat production	2665	3750	5305
Total number of sheep and goats	34529	48578	68702
Hens and poultries			
Number of poultries for slaughtering	97717	137500	194517
Number of poultries for eggs production	1165940	1640630	2320940
Total number of poultries	12636	17781	25154

	57	30	57
Water requirement in litters per day			
Required water for total number of cows / bulls	198080	278720	394160
Required water for total number of sheep and goats	310761	437202	618318
Required water for total number of poultries	631829	889065	1257729
Grand total of demanded water for livestock in litters/ day	1140670	1604987	2270207
Grand total of demanded water for livestock in m^3/ day	1141	1605	2270

4. Horticulture production (water demand and space):

According to the environmental and climatic conditions of Nablus city as described in chapter 4, and based on monthly per-capita consumption (PCBS , 2005) as well as after reviewing the agriculture statistics (PCBS, 1997, 2000 and 2006) regarding crops, yield and production, the following horticultural and field crops where determined:

Main group	Main crops
Fruit trees	Figs, grapes, apricots, Almond, Akadenia, pomegranate, plums
Vegetables	Snake cucumber, squash, okra, tomato, cucumber, peppers, broad beans, cabbage, lettuce, radish, parsley, cauliflower , egg plants
Field crops	Tuber onion, thyme, Garlic

A. Assuming that monthly consumption demand (based on per capita calculation) would be distributed among the identified crops equally; the quantities in kg for each identified fruit crop would be equal to: Total demanded fresh fruit for consumption in kg / 7 (the number of identified fruit crops suitable for urban agriculture in Nablus city). While for each demanded vegetable crop in kg would be equal to: total demanded fresh vegetables for consumption in kg / 16 (the number of identified vegetable crops suitable for urban agriculture in Nablus city).

B. The total number of dunums would be calculated as: total allocated monthly amount for per capita projected consumption per crop item in kg / average total yield in kg per identified crop.

C. These consideration are made according to average water requirement for fruit trees and vegetables production per dunum per day = 3 mm / day/ dunum or 3 m^3/day/dunum where crops could be

chosen based on the given number of dunums as calculated below (that water requirement per dunum will remain the same per day in m^3).

4.1. Distribution of total demanded fresh fruit and vegetables (in kg) over crops:

Item	Year		
	2005	2015	2025
Total demanded fresh fruit for consumption in kg	1215906	1710938	2420406
Total demanded fresh fruit per identified fruit type in kg = demanded for consumption in kg / 7	173701	244420	345772
Total demanded fresh vegetables for consumption in kg	1688944	2376563	3362044
Total demanded fresh vegetables per identified vegetable type in kg = demanded for consumption in kg / 16	105559	148535	210128

4.2. Total number of required dunums to fit with total demanded monthly consumption per crop (open field figures):

Crop	Average yield in kg / dunum	Total required dunums in the given years = total allocated quantity of vegetables or fresh fruit consumed / average crop yield		
		2005	2015	2025
Fig	975	178	251	355
Grapes	1991	87	123	174
Apricot	777	224	315	445
Almond	400	434	611	864
Akadenia	2097	83	117	165
pomegranate	564	308	433	613
Plums	2300	76	106	150
Snake cucumber	2000	53	74	105
Squash	2500	42	59	84
Okra	900	117	165	233
Tomato	3500	30	42	60
cucumber	2000	53	74	105
peppers	1500	70	99	140

Broad beans	900	117	165	233
cabbage	3000	35	50	70
lettuce	3500	30	42	60
Radish	1500	70	99	140
parsley	2000	53	74	105
Cauliflower	3000	35	50	70
Egg plants	3500	30	42	60
Tuber onion	2000	53	74	105
Thyme	766	138	194	274
Garlic	1432	74	104	147

4.3. Water demand for horticulture crops in m^3/day:

Item	Year		
	2005	2015	2025
Total number of dunums	2390	3363	4757
Average water requirement/ dunum/ day in m^3	3	3	3
Total required water for horticulture in m^3 = total number of dunums X 3 m^3/ day	7170	10089	14271

5. Total water demand (Horticulture and livestock) in m^3/ day:

Item	Year		
	2005	2015	2025
Livestock total water requirement in m^3/ day	1141	1605	2270
Horticulture total water requirement in m^3/ day	7170	10089	14271
Total water demand in m^3/ day*	8311	11694	16541

***** 1) All calculations based on the assumption that all urban agriculture activities would take place in the urban and peri-urban areas (the span of Nablus municipality water supply service).

* 2) All calculations assuming that sheep and cows will provide same demanded milk quantities according to average monthly consumption from milk, yogurt and cheese.

* 3) All calculations assumed that all vegetables and fruits production will be under irrigation scheme.

* 4) Olive trees where not calculated as it depend on rains for per tree water intake.

* 5) Its assumed that Nablus municipality will fulfill the demanded water through its services.

APPENDIX 2:

DEMANDED AREA FOR INTRODUCING URBAN AGRICULTURE WITHIN NABLUS MUNICIPAL BOUNDARIES BASED ON PER CAPITA MONTHLY FOOD CONSUMPTION FOR SELECTIVE FOOD COMMODITIES FIT

WITH NABLUS ENVIRONMENT

1. livestock demanded area in dunums:

According to Palestinian ministry of Agriculture, the ideal umber per livestock type per dunum is standing as follow:

A. Each 10,000 chickens (for slaughtering) required a space of 1 dunum.

B. Each 30,000 laying hens required a space of 1 dunum.

C. Each 500 heads of sheep or goats require a space of 1 dunum.

D. Each 333 head of bulls or cows require a space of 1 dunum.

These figures assume the intensive production systems where ventilated and equipped sheds must fit with the standards as well as the sanitation requirements where the direction of sheds must be considered according to wind directions, sunshine, as well as other environmental consideration regarding the air and smell (MoA, 2007).

Based on the above indicators and considering the number of livestock as calculated in Appendix 1, the area calculated as follow:

Item	Year		
	2005	2015	2025
Total dunums required for total calculated cows and bulls = total number of calculated bulls and cows / 333 heads per dunum	7.5	10.5	15
Total dunums required for total calculated sheep and goats = total number of sheep and goats calculated / 500 heads per dunum	69	97	137.5
Total dunums required for total calculated poultries for slaughtering = total number of poultries / 10,000 chickens per dunum	10	14	19.5
Total dunums required for total calculated poultries for eggs production = total number of hens / 30,000 hens per dunum	39	55	77
Total required dunums	125.5	176.5	249

2. Horticulture demanded area in dunums:

Crop	Number of demanded dunums		
	2005	2015	2025
Fig	178	251	355
Grapes	87	123	174
Apricot	224	315	445
Almond	434	611	864
Akadenia	83	117	165
pomegranate	308	433	613
Plums	76	106	150
Snake cucumber	53	74	105
Squash	42	59	84
Okra	117	165	233
Tomato	30	42	60
cucumber	53	74	105
peppers	70	99	140
Broad beans	117	165	233

cabbage	35	50	70
lettuce	30	42	60
Radish	70	99	140
parsley	53	74	105
Cauliflower	35	50	70
Egg plants	30	42	60
Tuber onion	53	74	105
Thyme	138	194	274
Garlic	74	104	147
Total	2390	3363	4757

3. Total required space in dunums (1000 m^2) for livestock and horticulture:

Crop	Number of demanded dunums		
	2005	2015	2025
For horticulture	2390	3363	4757
For livestock	125.5	176.5	249
Total in dunums	2515.5	3539.5	5006

APPENDIX 3:

LABOR FORCE DEMANDED WHEN INTRODUCING URBAN AGRICULTURE WITHIN NABLUS MUNICIPAL BOUNDARIES BASED ON PER CAPITA MONTHLY FOOD CONSUMPTION FOR SELECTIVE FOOD COMMODITIES FIT

WITH NABLUS ENVIRONMENT

The direct employment is calculated according to PCBS standards regarding the Palestinian agriculture holdings which indicated that the average labor force stands at 2 permanent agriculture workers per agriculture unit in addition to at least 1 permanent holder of the agriculture unit. The agriculture holding unit is equal to 5 heads of goats or sheep or bulls or cows. 50 poultries and, at least one dunum of cultivated land for agriculture production regardless the land is rent or owned by the agriculture unit holder. (Agriculture survey, basic results 2004/2005). However, based on the required area per unit as calculated in appendix 2, the PCBS standards were applied for horticulture. However, it has been assumed that each intensive livestock farm (as calculated in dunum – appendix 2) referred to one permanent agriculture unit holder and consuming 3 permanent workers according to MoA 2007. Therefore, the direct employment for horticulture is calculated as:

1. Agriculture unit holder: The numbers of calculated dunums (appendix 2) X 1 holder per unit.

2. The permanent horticulture workers number: Total numbers of calculated dunums (appendix 2) X 2 workers.

3. The permanent livestock workers number: Total number of calculated dunums (Appendix 2) X 3 workers.

Business type	**Employment opportunities (persons)**					
	Agriculture unit holder			**Permanent worker**		
	2005	**2015**	**2025**	**2005**	**2015**	**2025**
Livestock labor force demanded	126	177	249	378	531	747
Horticulture labor force demanded	2390	3363	4757	4780	6726	9514
Total	2516	3540	5006	5158	7257	10261

Total assumed employment opportunities:

Business type	**Employment opportunities (persons)**
	Agriculture unit holder

	2005	**2015**	**2025**
Livestock labor force demanded	504	708	996
Horticulture labor force demanded	7170	10089	14271
Total	7674	10797	15267

However, indirect labors can find job opportunities in one of the following un-calculated urban agriculture related sectors: Slaughtering houses, food processing manufactories, storage and packaging facilities, inputs supply, transportation and food distribution, extension services, recycling facilities and composting, etc.

جامعة النجاح الوطنية

كلية الدراسات العليا

الزراعة الحضرية كوسيلة لتخطيط المدن

حالة دراسية (مدينة نابلس)

إعداد

حسام مصطفى كامل الهدهد

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قدمت هذه الأطروحة إستكمالاً لمتطلبات درجة الماجستير في التخطـيط الحضـري والاقليمي بكلية الدراسات العليا في جامعة النجاح الوطنية في نابلس، فلسطين.

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الزراعة الحضرية كوسيلة لتخطيط المدن

حالة دراسية (مدينة نابلس)

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الملخص

تعتبر الحضريه واحدة من أهم التحديات التي تواجه الجنس البشري كما لم يسبق مثيل لها في التاريخ، فلا تعتبر المؤسسات الدوليه أو الحكومية المحليه لأقليم ما مستعده للتعامل بشكل مثالي مع متطلبات هذه الظاهره على الرغم من أن أحداً لا يمكنه اهمالها. فمن المتوقع أن يقطن أكثر من 45% من فقراء العالم المدن الرئيسيه بحلول العام 2020 مما يتطلب جهوداً حثيثه من المخططين لتوفير الخدمات، فرص لعمل، الماء والغذاء لسكان المدن. وفي مدينة نابلس التي تعتبر الحالة الدراسية لهذا البحث والتي من المتوقع أن يبلغ عدد سكانها أكثر من 400 ألف نسمه بحلول العام 2025 ، فان حجم الطلب على السلع الغذائيه الأساسيه سيزداد في الوقت الذي ستتناقص فيه مساحة الأراضي القابلة للزراعة والتي ستترافق مع ازيادة العجز المائي نتيجة للزحف العمراني المستمر. فقد قدرت احتياجات سكان مدينة نابلس من السلع الغذائية الأساسيه في العام 2000 بأكثر من 38 ألف طن في الوقت الذي تشهد فيه المدينة عجزاً مائياً يبلغ أكثر من 1300 كوب ماء باليوم في العام 2005 والمتوقع أن يصل الى أكثر من 30 ألف كوب من المياه بحلول العام 2025. وعليه فان حجم المخلفات والنفايات التي ستنتج من فضلات الطعام في المدينه اضافة الى الكميه الهائله من المياه العادمة والرماديه ستؤثر على البيئه الاجمالية للمدينة التي تعاني كذلك من مشاكل الفقر وعدم توفر فرص العمل و التنافس على رقعة مساحة الأرض وضعف الامكانيات لتوفير الخدمات والبنية التحتيه وغيرها من المشاكل الحضرية الاخرى.

هذا، فقد هدف هذا البحث الى دراسة امكانيات ادخال أنظمة الزراعة الحضرية كوسيله لتخطيط مدينة نابلس ودراسة الأثار السلبية والايجابية للزراعة الحضرية على عملية التخطيط من الناحية

الاقتصادية والبيئية والاجتماعية وكذلك الفيزيائية العمرانيه. وقد خلصت الدراسة الى أن اعتماد منهج الزراعة الحضرية كوسيلة لتخطيط المدن سيوفر فرصاً لاعادة تدوير مخلفات المدينة المائية والعضوية لاستخدامات زراعية في مناطق يتم تحديدها بمحاذاة الحدود البلدية للمدينه، الأمر الذي من شأنه تقليل هجرة سكان الريف للمدينة، ايجاد فرص عمل أفضل للسكان، توفير الغذاء الطازج لسكان المدينة بطرق تضمن حماية بيئة المدينة والحفاظ على مصادرها الطبيعية.

وقد خلصت الدراسة أيضاً الى ضرورة تظافر الجهود بين المؤسسات المدنية والحكومية من اجل سن القوانين التي تكفل ادخال مفاهيم الزراعة الحضرية كوسيلة لتخطيط المدن على أسس المشاركة الشعبية والجماهيرية. في حين ان النتائج الاساسية لهذا البحث تم تبويبها ضمن اطار خطة مقترحه جائت نتيجة لمخرجات البحث سواء المباشره بتحليل البيانات والمعلومات التي تم جمعها أو الغير مباشره التي تمت باجراء سلسة من العمليات الحسابية.

وقد أعتمد البحث على جمع وتبويب وتحليل المعلومات التي حصرت من التقارير الفنية ذات العلاقه، المراجع والكتب والبيانات التي استخدمت ضمن أسلوب SWOT لاظهار نقاط القوه والضعف عند اعتماد الزراعة الحضرية كوسيلة لتخطيط مدينة نابلس.